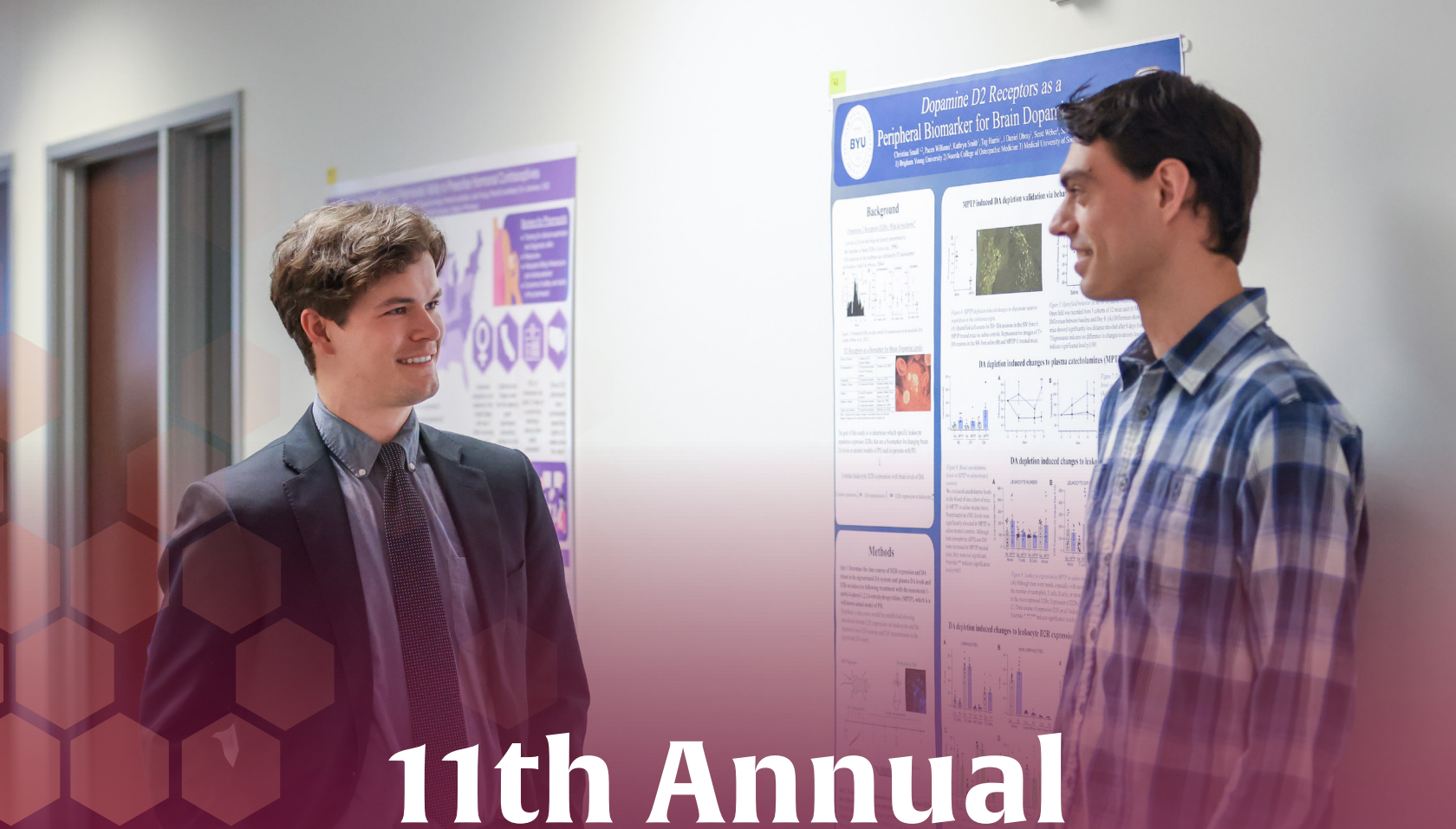

11th Annual Research Symposium Abstracts

SOUTH JORDAN CAMPUS

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ROSEMAN UNIVERSITY
OF HEALTH SCIENCES

RESEARCH SYMPOSIUM -2025

ABSTRACT BOOK

ROSEMAN UNIVERSITY OF HEALTH SCIENCES - SOUTH JORDAN CAMPUS

#1: A Morphological Investigation of Alcohol-Induced Persister Formation

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Purpose

Persister cell bacteria are of significant interest in the scientific and medical fields due to their ability to survive antibiotics and antiseptics and contribute to recurrent infections. While several mechanisms for persister cell formation and survival have been proposed, this study focused on evaluating alcohol as a persister cell-inducing stressor to uncover the morphological characteristics of persister cells.

Methods

Three experiments were conducted on E. coli, S. epidermidis, and N. sicca. First, bacterial growth in various concentrations of alcohol (0%-5% v/v EtOH) was measured over 16 hours, with growth curves recorded hourly by optical density (OD). Second, dose-dependent growth curves were generated on 96-well plates using penicillin, tetracycline, moxifloxacin, across a range of 8-4,096 mg/L. Third, flow cytometry was used to evaluate changes in the membrane potential of S. epidermidis under varying alcohol (0% and 4%) and antibiotic treatments (32mg/L and 1024mg/L).

Results

Exposure to 4% alcohol induced maximal persister cell growth. In the antibiotic trials, except for S. epidermidis treated with moxifloxacin, persister cells exhibited increased susceptibility to the treatments. N. sicca treated with tetracycline showed the largest increase in susceptibility. S. epidermidis colonies demonstrated significant membrane potential depolarization with alcohol exposure, which correlated with increased depolarization as moxifloxacin concentration increased. However, alcohol-induced persister cells showed reciprocal repolarization as moxifloxacin concentration increased

Conclusions

This study reveals that 4% alcohol exposure maximizes persister cell growth, increases antibiotic susceptibility likely due to initial cell weakening, and identifies depolarization as a potential survival mechanism for persister cells. These findings provide new insights into alcohol-induced persister cell dynamics and their response to antibiotic treatment.

#2: Vialinin A, a compound derived from edible mushrooms, acts as a preventive agent against Ocular Inflammation.

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Purpose

Uveitis, a leading cause of visual impairment, is an ocular inflammatory condition with often unknown causes. It can result from infections, autoimmune diseases, or other factors that damage the uveal tract and adjacent ocular structures. While corticosteroids are the standard treatment, their prolonged use is associated with significant side effects, highlighting the need for safer alternatives. Vialinin A, a potent antioxidant and anti-inflammatory compound from the edible Chinese mushroom, shows promise as a therapeutic agent. However, its role in preventing uveitis is unexplored. This study hypothesizes that vialinin A can reduce ocular inflammation under normal and hyperglycemic conditions. To test this, we evaluated its effects on macrophages and human non-pigmented epithelial cells (HNPECs) to assess its systemic and local actions.

Methods

To investigate the anti-inflammatory effects of vialinin A, human non-pigmented ciliary epithelial cells (HNPECs) and THP-1 monocytes were used as in vitro models. Cells were treated with lipopolysaccharide (LPS) and/or high glucose, with or without vialinin A, and cell viability was assessed using the MTT assay. The expression of inflammatory cytokines, chemokines, and growth factors was analyzed using antibody arrays. Additionally, endotoxin-induced uveitis models will be established in normal and diabetic rats to evaluate the effects of vialinin A in preventing ocular inflammation across various ocular tissues.

Results

LPS treatment induced time-dependent cell death in THP-1 monocytes, which was dose-dependently prevented by vialinin A. Similarly, in HNPECs, vialinin A reversed the LPS-induced reduction in cell viability. Hyperglycemia exacerbated the LPS-induced decrease in cell viability, but this effect was also mitigated by vialinin A. Additionally, vialinin A inhibited the expression of various cytokines and chemokines and suppressed NF-κB activation in THP-1 cells. Ongoing studies aim to further elucidate the mechanisms by which vialinin A prevents ocular inflammation, including in vivo experiments using endotoxin-induced uveitis models in normal and diabetic conditions

Conclusions

Our findings suggest that vialinin A may prevent endotoxin-induced ocular inflammation by modulating NF-κB-mediated cytokine and chemokine expression, highlighting its potential as a therapeutic candidate for uveitis.

#3: Lipophilic thiamine derivatives prevent glioblastoma cells growth in culture.

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Purpose

Brain tumors are responsible for over 15,000 deaths per year, with 49% of those tumors defined as glioblastomas, the most malignant and aggressive forms of CNS tumors. Five-year survival rates currently only stand at 6.9%, with treatment options limited to supportive care, tumor resection, and intensive chemotherapy regimens. Some immunotherapies have demonstrated marginal effectiveness but present considerable risks to patients. Thiamine, more commonly known as vitamin B1, has been shown to play a crucial role in regulating cellular metabolism and the nervous system. Benfotiamine and fursultiamine are the lipid-soluble derivatives of thiamine with better absorption and retention rates. Benfotiamine and fursultiamine, with their potent antioxidative and anti-inflammatory actions shown to prevent several complications, including diabetic neuropathy, neurodegenerative diseases, and alcoholic polyneuropathy. However, their anti-carcinogenic effects are not well known. Therefore, we hypothesize that benfotiamine and fursultiamine could prevent the growth of glioblastoma cells.

Methods

Human glioblastoma (U87) cell lines obtained from ATCC were incubated in Eagle's Minimum Essential Media (EMEM) in the absence and presence of various concentrations of benfotiamine and fursultiamine for 24 and 48 h. Cell viability was determined by MTT assay in a time- and dose-dependent manner. The expression of various pro-apoptotic, anti-apoptotic, and other inflammatory factors was determined using specific antibody array kits. Cell migration and invasion were determined by specific methods.

Results

Our results indicate that the thiamine derivatives benfotiamine and fursultiamine decrease the growth of glioblastoma cells. These compounds also prevent glioblastoma cell invasion and migration and regulate the expression of various pro- and anti-apoptotic proteins in glioblastoma cells.

Conclusions

Our studies indicate that lipid-soluble derivatives of thiamine could prevent the growth and invasion of glioblastoma cells in vitro by regulating caspase-3-mediated apoptotic signaling.

#4: Phage Therapy: Potential Applications in Oral Health and Biofilm Control.

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Purpose

Review the potential applications of phage therapy in oral health and biofilm control, focusing on its effectiveness against dental caries, periodontitis, and root canal infections. This review aims to identify and evaluate studies targeting pathogenic oral bacteria, with an emphasis on their specificity, biofilm penetration capabilities, and suitability for clinical applications in dentistry.

Methods

For this literature review, a range of databases were used such as PubMed, Embase, and Web of Science. The search strategy used was a combination of terms such as “Bacteriophage”, “Phage Therapy”, “Oral Biofilm”, “Dental Caries”, “Periodontitis”, and “Root Canal Infection”. Studies selected were published between January 2015 and December 2024. Only English-language articles were considered for this research. Most study designs consisted of experimental and observational studies, including animal research and in-vitro experimental models.

Results

24 articles were used in this literature review. In analyzing these articles, the following topics were identified: phage therapy as a potential treatment for dental caries (8 articles), phage therapy as a potential treatment for periodontal disease/periodontitis (9 articles), and phage therapy as a potential treatment for root canal infection/apical periodontitis (7 articles).

Conclusions

Phage therapy holds significant promise as an alternative to antibiotics and traditional methods for treating oral infections, with isolated phages demonstrating efficacy against biofilms. While current findings are encouraging, limitations in existing research highlight the need for further studies to evaluate phage interactions with the oral microbiome and their clinical applicability. These insights underscore the potential of phage therapy to address antibiotic resistance and improve outcomes in oral health care.

#5: Vialinin A prevents Breast Cancer Cell Growth and Invasion In vitro.

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Purpose

Breast cancer is one of the leading causes of cancer deaths in women worldwide. According to the National Breast Cancer Foundation, one out of every eight women is diagnosed with breast cancer in the US, making it the second most common cancer in American women after skin cancer, and there is an average increase of 0.5% incidence rate of breast cancer in the US between 2001 and 2021. Current breast cancer treatments typically include immunotherapy, chemotherapy, and radiotherapy, with some unwanted side effects indicating the need for novel therapeutic options. Recent studies suggest the potential of several plant-derived natural antioxidants as chemopreventive agents for various cancers, including breast cancer. However, the role of vialinin A, an antioxidant derived from edible Chinese mushrooms (*Thelephora vialis*) is not known. We hypothesized that with its potent antioxidative nature, vialinin A could prevent breast cancer cell growth and spread.

Methods

Human breast cancer cells (MCF-7) were obtained from ATCC and maintained in EMEM media. The cells were treated with vialinin A in a time- and dose-dependent manner. Cell viability was determined by MTT assay and live and dead cell assay. The generation of reactive oxygen species was measured by DCFDA staining. Invasion was determined by scratch assay, while migration was determined by trans-well migration assay. The expression of apoptotic factors was determined by RD systems apoptosis array.

Results

Our results demonstrate that vialinin A ameliorates the growth of breast cancer cells in a dose-dependent manner. Vialinin A prevented the EGF-induced generation of reactive oxygen species. Vialinin A also reduced the EGF-induced invasion and migration of breast cancer cells. Further, vialinin A also regulated the EGF-induced expression of various pro- and anti-apoptotic factors in breast cancer cells. Further, experiments are being conducted to examine its mechanism of action and it's in vivo effects using a nude mouse xenograft model.

Conclusions

Our results suggest that vialinin A could prevent breast cancer cell growth and invasion, indicating its potential chemopreventive role.

#6: The Role of Nutrient Deficiency in Persister Cell Formation- a Morphological Study.

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Purpose

Persister cells are a bacterial phenotype capable of surviving high concentrations of antibiotics hypothesized by entering a dormant, metabolically inactive state, shielding them from treatment. This mechanism is a response to environmental stress and poses challenges in managing hospital-acquired infections, such as catheter-associated urinary tract infections (CAUTI) and ventilator-associated pneumonia (VAP). Despite the significance of persister cells in hospital-acquired infections, little is known about nutrient deficiency as a stress inducer for the formation of persister cells. This study aims to morphologically classify persister cells under nutrient-deficient conditions in Gram-positive and Gram-negative bacteria. This study addresses that gap in the literature by examining a Gram-positive and a Gram-negative bacterium , observing structural changes, and providing insights to guide hospital staff in treating surfaces where these persistent bacteria, like those on ventilators and catheters, thrive. Identifying a morphological mechanism may inform future treatments targeting these resistant cells.

Methods

This study examines *Staphylococcus epidermidis*, a Gram-positive bacterium, and *Escherichia coli*, a Gram-negative bacterium commonly involved in CAUTI. Two characteristics have been studied: growth curves and membrane potential. Nutrient deficiency was induced by altering standard laboratory LB broth with varying standard nutrient levels (0.5%– 7%). Growth curves were analyzed using a spectrophotometer to measure the absorbance. Flow cytometry was used to classify cell events to determine the membrane potential of the different strains. These were classified by a depolarized or polarized state.

Results

Under growth curve analysis, with 0.5% nutrient starvation, both strains exhibited an initial lag in growth when transferred to nutrient-rich broth, followed by reactivation after two hours, mirroring the growth of 1% nutrient-starved bacteria. Flow cytometry analysis revealed a distinct third population in under 0.5%-0% nutrient capacity. This population exhibited a polarized membrane potential, deviating from normaltrends.

Conclusions

The current study indicates a morphological change in the bacteria's membrane structure and a state of metabolic inactivity when starved, which then resumed metabolic activity after a set time. These events could be used in future research to show genetic sequencing changes or bacterial processes that are occurring at those times, to determine a therapy target for persister cells.

#7: Mushroom-derived Antioxidant, Vialinin A, prevents Brain Cancer Growth and Invasion In vitro.

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Purpose

Glioblastoma is a type of brain cancer. Specifically, it is a highly aggressive and fast-growing brain tumor that arises from glial cells in the brain. In the United States, glioblastoma accounts for approximately 15% of all brain and central nervous system tumors and about 50% of all gliomas. Despite recent advancements in treatment strategies, glioblastoma continues to pose a significant challenge, with patients experiencing a poor prognosis and a marked decline in quality of life as the disease advances. Therefore, developing alternative approaches will help tailor healthcare resources, develop prevention strategies, and improve early diagnosis and treatment. Vialinin A is a potent antioxidant compound derived from the Chinese edible mushroom. However, vialinin A's role in preventing glioblastoma is not known. We examined the chemopreventive role of Vialinin A in glioblastoma growth and invasion in vitro.

Methods

Human U-87 Glioblastoma cell lines were obtained from ATCC. Various experiments using specific kits and standard methods explored Vialinin A's different capabilities and downstream effects, such as cell viability, invasion, migration, and apoptosis induction.

Results

Our results indicate that Vialinin A prevents the growth of glioblastoma cells in a time- and dose-dependent manner. It also prevents the invasion and trans-well migration of glioblastoma cells. Further, Vialinin A regulates the expression of various pro-apoptotic and anti-apoptotic factors and other inflammatory factors. Additional studies are in progress to understand the mechanism of action and in vivo effects on glioblastoma growth.

Conclusions

The results of this study indicate that Vialinin A, by promoting apoptotic pathways, could prevent the growth and spread of glioblastoma.

#8: Natural plant-based steroid compound, Laxogenin, prevents hyperglycemia-induced endothelial dysfunction

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Purpose:

Diabetes afflicts hundreds of millions worldwide and predisposes populations to additional risks such as cardiovascular diseases. Endothelial dysfunction is highlighted among the early stages of cardiovascular disease and progresses significantly under hyperglycemia. Prolonged high glucose levels are known to increase reactive oxygen species (ROS) levels, leading to the breakdown of support structures that play a pivotal role in endothelial integrity. The resulting risk for atherosclerosis, coronary artery disease, heart failure, and stroke poses a threat to those living with diabetes. 5α-Hydroxy Laxogenin is a plant-derived natural compound with potential benefits for diabetes management. It improves insulin sensitivity, regulates glucose metabolism, reduces inflammation and oxidative stress, protects pancreatic beta cells, and enhances mitochondrial function. However, its role in endothelial dysfunction is not well known. This study aims to investigate the effect of Laxogenin in high glucose-induced endothelial dysfunction.

Methods:

Human umbilical endothelial cells were treated with various concentrations of Laxogenin (0-100 ug/ml) in the presence and absence of high glucose (25 mM) for 24 hours. Cell viability was determined by MTT assay. Specific kits will be used to determine ICAM, VCAM, and iNOS levels. Next, we will also determine the generation of reactive species, nitric oxide, activation of NF-kB, and expression of inflammatory markers.

Results:

Our results suggest that Laxogenin prevents high glucose-induced apoptosis of endothelial cells in a dose-dependent manner. Additional experiments are being conducted to understand its mechanism of action in restoring hyperglycemia-induced endothelial dysfunction.

Conclusions:

Plant-derived natural steroidal compound Laxogenin prevents hyperglycemia-induced endothelial toxicity.

#9: Use of synthetic water-soluble KCC2 to modulate chloride homeostasis in cultured dopamine-neuron-like cells.

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Purpose

Increasing potassium-chloride cotransporter 2, KCC2 in conjunction with lowering NKCC1 decreases the intracellular chloride levels in the brain. Immature neurons show high levels of NKCC1 expression and low levels of KCC2 activity, therefore immature neurons have high intracellular chloride concentration. A mature neuron switches these expressions and creates a low intracellular chloride concentration. Increased KCC2 expression (decreasing intracellular chloride concentration), which is mostly expressed in the brain, initiates the GABA switch, changing GABA from an excitatory to inhibitory neurotransmitter. KCC2 has been shown to cause reinforcement-seeking behavior. Our project relies on artificially upregulating KCC2 activity to initiate a GABA switch to inhibit reinforcement-seeking behavior.

Methods

We have engineered and synthesized a recombinant water soluble KCC2 transporter that is constitutively active. This protein is produced in the cytosol of E. coli and when administered to mammalian cells or tissues it has the ability to re-insert in the plasma membrane to reconstitute its function. The cells should behave similar to the response to native KCC2 activation. Our goal is to incubate our engineered protein into our cells of interest, SH-SY5Y neuroblastoma cells differentiated into a dopaminergic phenotype, to prove our engineered protein re-inserts into the plasma membrane and upregulates KCC2 function using patch clamp electrophysiology. Differentiating SH-SY5Y cells have historically been used for research involving Parkinson's disease; these cells possess more biochemical, ultrastructural, morphological, and electrophysiological similarity to neurons. Experimentation will have two groups, one control group not incubated with our engineered protein and one test group. Both will be tested using chloride-sensitive electrodes in patch clamp electrophysiology to test the intracellular chloride concentration. Our test groups' chloride reading theoretically will be decreased. This decrease of chloride activates the GABA switch and inhibits reinforcement-seeking behavior and will give us footing to propel our research into animal behavior studies.

Results

Conclusions

#10: Laxogenin prevents Non-Small Cell Lung Cancer Cell Growth

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Purpose

5α-Hydroxy-Laxogenin, a spirostane-type steroid, has been marketed as a potential anabolic agent; however, its anticancer properties remain unexplored. This study investigates the ability of Laxogenin to induce cell death and inhibit invasion/migration using the human non-small cell lung cancer cell lines (A549) in vitro. A549 cells are an aggressive subtype of lung cancer, often associated with tobacco exposure, and its rapid progression makes early intervention crucial for improving patient prognosis. We hypothesize that Laxogenin inhibits the growth and spread of lung cancer cells by preventing growth factor-induced carcinogenic signals and promoting apoptotic signals.

Methods

A549 cells were obtained from the American Tissue Culture Collection and maintained in F12-conditioned media. Cell viability was determined by MTT assay in the absence and presence of various concentrations of Laxogenin. The expression of various inflammatory, anti-, and pro-apoptotic markers was measured by the RD Systems apoptosis array kit. The activity of caspase-3 and cleavage of PARP will be measured by specific kits from Cayman. Cell invasion and migration will be measured by scratch and trans-well migration assays.

Results

So far, our results indicate that Laxogenin prevents the epithelial growth factor (EGF)-induced growth of A549 cells in a time- and concentration-dependent manner. Laxogenin also regulates the EGF-induced expression of inflammatory and apoptotic factors. Additional studies are currently underway.

Conclusions

Our studies indicate that laxogenin could be chemopreventive to lung cancer growth. Further, mechanistic studies are being conducted to understand its potential anti-carcinogenic role.

#11: Cardamomin prevents LPS-induced cytotoxicity and Arachidonic Acid metabolism in Macrophages.

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Purpose

Although antibiotics kill the bacteria during the infections, the bacterial debris contains toxins that initiate immune and inflammatory responses, leading to uncontrolled production of inflammatory cytokines, chemokines, and growth factors. These factors, through autocrine and paracrine manner, propagate inflammatory signaling, leading to tissue damage and dysfunction. Lipopolysaccharides (LPS), a key component of the Gram-negative bacterial outer membrane, are potent endotoxins that activate immune responses, resulting in severe inflammation. Arachidonic acid metabolism is a key pathway activated during this inflammatory response, producing mediators such as prostaglandins, prostacyclins, and leukotrienes, exacerbating inflammation and contributing to tissue damage. Cardamomin, a natural chalcone found in various plant species such as Alpinia katsumadai and Boesenbergia rotunda, has demonstrated various pharmacological properties, including anti-inflammatory and antioxidant effects. However, its specific impact on arachidonic acid metabolism in the context of LPS-induced inflammation remains unexplored. This study explores the potential of Cardamomin as a therapeutic agent by examining its regulatory effects on LPS-induced arachidonic acid metabolism, providing insights into its efficacy in mitigating inflammation and associated complications.

Methods

Human monocyte-derived macrophages (Thp1) cells were grown and maintained in DMEM media. Cells were treated with LPS in the absence and presence of different concentrations of cardamon. Cell viability was determined by MTT and live and dead cell assay kits. DCFDA staining will determine the generation of reactive oxygen species. Specific assay kits will determine the activation of NF-kB, cyclooxygenase, and thromboxane synthase and the production of prostaglandins, prostacyclins, and leukotrienes.

Results

Our results so far indicate that Cardamomin alone has no effect on the Thp1 cells' growth. However, it prevented the LPS-induced cell death. Further experiments are currently in progress.

Conclusions

Cardamomin prevents LPS-induced cytotoxicity. Additional mechanistic studies are in progress.

#12: Persister Cell RNA Sequencing Project.

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Purpose

Persister cells, a subtype of bacteria, are of increasing interest in the scientific and medical communities due to their ability to survive harsh conditions, such as antibiotic treatment, presence of alcohol, or extreme temperatures, leading to recurrent infections, especially in hospitalized patients. These cells exhibit distinct morphological features that contribute to their persistence. While various mechanisms of persister cell formation have been proposed in prior research, this study specifically investigates the genetic basis of these mechanisms in the presence of alcohol, focusing on RNA sequences. In the current study, the aims were 1) to test ethanol as a stress inducer of persister cells under multiple conditions, and 2) to identify specific genes that are responsible for persister cell formation in bacterial strains that differ in morphology, metabolism, and cell wall composition.

Methods

Equivalent concentrations of Escherichia coli, Staphylococcus epidermidis, and Neisseria sicca were inoculated overnight at 37ºC with alcohol concentrations ranging from 0%-5%. Samples of each bacterial strain were collected at 24 hours, 48 hours, and 72 hours and RNA was extracted. Total RNA sequencing will be conducted by Zymo Research. Analysis will be performed to identify differentially expressed genes in response to alcohol exposure and their potential role in persister cell formation.

Results

Experiments with bacterial alcohol exposure under varying conditions have been completed. Total RNA sequencing and analysis is forthcoming.

Conclusions

Prior research has shown the presence of specific genes that play a role in persister cell dormancy. Genes like carB, rpoS, and oxyR commonly decrease metabolic activity to withstand the presence of alcohol and are expected to be seen in these persister cells once RNA sequence analysis is complete. As persister cells continue to cause infection in patients who have been hospitalized long-term, these findings may provide new insight into the genetic mechanisms underlying alcohol-induced persister cells and highlight potential targets for therapeutic intervention.

#13: Chemopreventive Potential of a Mushroom-Derived Antioxidant in Inhibiting Pancreatic Cancer Growth

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Purpose

Pancreatic cancer is a deadly form of cancer that develops in the tissues of the pancreas. This disease remains asymptomatic in early growth and is often not diagnosed until later. Further, pancreatic cancer is the third most common cause of cancer death in the United States. In 2024, it was estimated that 66,400 people will be diagnosed with the disease, and of those, 51,750 are expected to die. There are limited treatment options available, such as surgical resection and chemotherapy, yet, these tend not to be curative. Therefore, there is a high demand for developing new drug therapies. Vialinin A is a compound isolated from the Chinese mushroom *Thelephora vialis*, which exhibits anti-inflammatory and antioxidant properties, however, its anti-carcinogenic effects have not been well studied. In this study, we investigated these potential anti-cancer effects in pancreatic cancer cells.

Methods

Human Pancreatic adenocarcinoma cells (MIA PaCa-2) were treated with various concentrations (0-100 uM) of Vialinin A for 24 hours. Cell viability was assessed through the MTT assay, as well as live and dead cell staining. Apoptosis will be determined by Annexin-V staining and caspase-3 activity. Specific antibody arrays will be used to measure the expression of various apoptotic proteins, oncoproteins, tumor-suppressor proteins, and other carcinogenic markers. Scratch and trans-well migration assays will be used to detect the invasion and migration of cancer cells.

Results

Our preliminary results suggest that Vialinin-A dose-dependently prevents pancreatic cancer cell growth. Vialinin-A also regulated the expression of various apoptotic proteins in pancreatic cells. Additional experiments are currently in progress.

Conclusions

Our data indicates that Vialinin-A could prevent pancreatic cell growth. Further, we expect that our results could advocate for a broader utilization of non-conventional and plant-derived treatments and meet the demand for new drug therapies in pancreatic cancer care.

#14: A *Galleria mellonella* Study: Protective Effects of Sulforaphane on Immune Function in Binge Alcohol Exposure.

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Purpose

Alcohol is associated with increased mortality and morbidity. Pulmonary infections with opportunistic pathogens can occur in healthy humans; however, hazardous alcohol exposure like binge alcohol intoxication (≥ 0.08% BAC) is a major risk factor. We've previously investigated the efficacy of Sulforaphane (SFN) prophylaxis in protecting human and murine alveolar macrophage function against opportunistic infections when exposed to binge alcohol conditions in vitro. However, an in vivo model investigating SFN and hazardous alcohol exposure in the context of infection is not well understood. The aim of this study is to 1) establish a *G. mellonella* larvae model by determining the LD50 of alcohol, SFN, Gram-Positive S. epidermidis, and Gram-Negative *B. thailandensis* and 2) test the protective effects of SFN against a bacterial infection after hazardous alcohol exposure.

Methods

Survival curves were generated using data collected at 24-hour intervals over a 72-hour period following 10µL standardized injections of SFN, alcohol, *S. epidermidis*, and *B. thailandensis*. Injections were standardized to 10µL per TruLarv instructions, and deaths were assessed based on melanization and behavior of larvae.

Results

Survival curves indicated that SFN concentrations below 10µM were not lethal on *G. mellonella* larvae, demonstrating greater than 80% survival up to 50µM. Survival curves indicated that alcohol concentrations from 0.08-0.6% showed equal lethality, demonstrating 80%. Survival curves indicated that *S. epidermidis* and *B. thailandensis* exhibited dose dependent lethality, demonstrating a LD50 for concentrations greater than 105 CFU for S. epidermidis and greater than 102 CFU for *B. thailandensis*.

Conclusions

Current data yields that SFN, *S. epidermidis*, and *B. thailandensis* exhibit dose dependent lethality in *G. mellonella* larvae, demonstrating potential in using this model in studying drug-immune system interaction with opportunistic infections, while larvae alcohol metabolism may provide a unique model to study hazardous alcohol consumption. Future experiments will seek to explore whether SFN prophylaxis will preserve the larvae immune system's ability to fight against *S. epidermidis* and *B. thailandensis* in the context of hazardous alcohol consumption. Taken broadly, these studies help to demonstrate efficacy of SFN prophylaxis in an ER or post-operative setting to protect against opportunistic pulmonic infections in vulnerable populations.

#15: Vialinin A prevents lipopolysaccharide-induced cytotoxicity of human dermal fibroblasts.

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Purpose

Vialinin A is a naturally occurring p-terphenyl compound found in the edible Chinese mushrooms *Thelephora vialis* and *Thelephora terrestris*. Importantly, recent studies have demonstrated the anti-inflammatory and anti-angiogenic properties of this compound. However, the role of vialinin A in preventing dermal fibroblast cytotoxicity is unknown. This study investigated how vialinin A prevents LPS-induced dermal fibroblast apoptosis.

Methods

Human dermal fibroblasts (FDFs) were treated with LPS in the absence and presence of vialinin-A. Cell viability was determined by MTT assay. Specific kits were used to measure the activation of caspase-3 and the generation of reactive oxygen species. Antibody arrays were used to assess the expression of various apoptosis markers. Specific enzymatic assay kits were also used to determine the activation of antioxidative enzymes.

Results

Our results suggest that Vialinin A prevents LPS-induced decrease in cell viability in a dose- and time-dependent manner. Further, Vialinin A prevents LPS-induced activation of caspase-3 and generation of reactive oxygen species. Vialinin A also regulated LPS-induced expression of various anti- and, pro-apoptotic, and inflammatory markers. Vialinin A also restored the LPS-impaired antioxidative enzyme activities such as catalase, SOD, and glutathione peroxidase in HDFs.

Conclusions

Our results suggest that vialinin A prevents bacterial endotoxin-induced toxicity in human dermal fibroblasts.

#16: A Survey of Medical Students' Knowledge of Skin Cancer and Sun Protection

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Purpose

Skin cancer is regarded as the most common cancer in the United States despite screenings being relatively non-invasive and sun-protective products readily available. Numerous studies indicate that medical students lack knowledge regarding skin cancer and sun protection. As future providers, it is vital that medical students appreciate the seriousness of skin cancer and how to prevent sun damage. Thus, the purpose of this study is to assess the extent of medical students' understanding of sun-protective practices and general skin cancer knowledge.

Methods

Data will be collected from a single institution beginning in January 2025 to allow sufficient time for first- and second-year students to develop basic skin-related physical exam skills and complete a dermatology course, respectively. Likewise, third- and fourth-year students attained clerkship experience and patient management skills. Modes of recruitment: group chats, flyers, and in-person solicitation. Target sample size is a minimum of 200 responses and study duration is up to 1 year. Medical students are recruited to complete a voluntary, anonymous 27-question survey consisting of "quiz" style questions addressing skin cancer, benign or pre-malignant lesions, sun protection, and previous experience with skin cancer or dermatology. For instance, participants are asked to identify the most common type of skin cancer and determine if statements such as "dark clothing offers greater sun protection" is true. Survey questions are either original or adapted from a published survey. Age, gender, hometown size, and skin type according to the Fitzpatrick classification are collected to evaluate trends between demographics and the number of correct answers. Class year and previous dermatological experience may identify participants' background knowledge. Upon completion of the survey, participants can opt into a raffle for a $25 gift card.

Results

Preliminary data in progress. Following closure of the study, descriptive and statistical analyses will be performed. Comparison of responses by classes, clinical experiences and student's clinical interests are current points of interest.

Conclusions

We predict medical students lack basic knowledge of skin cancer and sun protection. Furthermore, we believe our study may support previous claims that in-depth dermatological curriculum in medical education is essential.

#17: Prevention of Melanoma growth and invasion by Lipophilic Vitamin B1 derivatives.

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Purpose

In the United States, melanoma is one of the most common cancers among Americans. According to the Skin Cancer Foundation, one in five Americans will develop melanoma by the age of 70. Increased oxidative stress due to unprotected exposure to UV light and tanning beds leads to damage to skin cells and melanoma progression. Increased free radicals generated by oxidative stress could lead to genomic instability and mutations that trigger melanoma growth. Vitamins, including vitamin B1, are molecules readily used by biological systems to counteract oxidative stress and have been shown to modulate inflammatory response. Thus, the usage of vitamins as a preventative therapy for at-risk patients is a promising approach to decreasing the incidence and progression of melanoma. Currently, there is insufficient research on the chemopreventive efficacy of Vitamin B1 derivatives, Benfotiamine and Fursultiamine. Therefore, we hypothesize that Benfotiamine and Fursultiamine could inhibit melanoma cell growth and invasion through anti-oxidative properties.

Methods

Murine melanoma cells, B16-F10, were obtained from ATCC and maintained with DMEM media. Cells were treated with varying concentrations of Benfotiamine and Fursultiamine for 24 h. MTT assay was carried out to detect the cell viability. RD systems Mouse Apoptosis Arrays were used to detect the expression of pro- and anti-apoptotic markers. Invasion and migration of melanoma cells were detected by scratch and transwell migration assays.

Results

Our data suggest that Benfotiamine and Fursultiamine effectively prevented melanoma cell growth in B16-F10 cells. Further, they prevented the invasion and migration of cancer cells. In melanoma cells, Benfotiamine and Fursultiamine also regulated the expression of various anti-apoptotic, pro-apoptotic, and inflammatory markers.

Conclusions

Our results suggest that lipophilic vitamin B1 derivatives prevent melanoma cell growth and invasion, indicating their chemopreventive effects.

#18: Potential Benefits of Vialinin-A on Doxorubicin-induced Endothelial cell toxicity.

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Purpose

Doxorubicin (DOX), an anthracycline, is an antineoplastic agent for multiple cancers but has established dose-dependent, cumulative, and progressive cardiotoxicity. DOX is a known inducer of reactive oxygen species (ROS), leading to increased oxidative stress. The oxidative stress generated by DOX can alter cellular redox balance by modulating various oxidative and anti-oxidative pathways, causing cellular toxicity. Clinically, DOX and other anthracyclines have historically been correlated with reduced left ventricular ejection fraction and symptomatic heart failure in approximately 5% of patients. Efforts to reduce the cumulative dose to 400mg/m2 have been successful in curbing the heart failure rate to 3.5%. Due to its efficacy, Doxorubicin continues to be a chemotherapeutic of choice, but its success comes at a high cost to a patient's quality of life. Vialinin A (VA) is an antioxidant extracted from Chinese edible mushrooms *T. terrestris* and *T. vialis*. However, its potential to restore endothelial toxicity is not known. In this study, we have investigated how VA regulates DOX-induced cytotoxicity in vitro.

Methods

Human vascular endothelial cells (HUVECs) were treated with DOX in the absence and presence of VA. Cell viability was measured in a dose- and time-dependent manner. Apoptosis and the formation of reactive oxygen species were detected using specific kits. A human apoptosis array was used to detect the expression of apoptotic markers, and enzymatic assays were used to detect the activation of anti-oxidative enzymes.

Results

Our results indicate that VA prevented the DOX-induced decrease in cell viability. Further, VA also prevented the apoptosis of endothelial cells and the activation of caspase 3. Furthermore, VA prevented the DOX-induced ROS generation and restored the activities of antioxidant enzymes such as catalase and glutathione peroxidase. VA also regulated the expression of various apoptotic markers in HUVECs.

Conclusions

Our results suggest that VA could be used to prevent DOX-induced endothelial cytotoxicity and indicate that it could be used to control vascular side effects of anthracyclines.

#19: Psilocybin in Action: Serotonergic and Neurotrophic Synergy in Microglial Modulation.

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Purpose

Psilocybin, a serotonergic psychedelic, has demonstrated promising therapeutic effects in neuropsychiatric disorders, including depression. While its neuroplastic and immunomodulatory properties are well-documented, the underlying mechanisms remain poorly understood. This study investigates the immunomodulatory and neurotrophic effects of psilocybin and its active metabolite psilocin on microglial cells, which are pivotal mediators of neuroinflammation and synaptic plasticity.

Methods

Using in vitro models of resting and LPS-activated microglia, we evaluated the effects of psilocybin and psilocin on the expression of pro-inflammatory cytokines (TNF-α), anti-inflammatory cytokines (IL-10), and neuroplasticity-related markers (BDNF). Receptor-specific contributions were assessed using selective antagonists for 5-HT2A, 5-HT2B, 5-HT7, TrkB, and AhR.

Results

Psilocybin and psilocin significantly suppressed TNF-α expression while upregulating BDNF levels in activated microglia. The suppression of TNF-α depended on 5-HT2A, 5-HT2B, 5-HT7, and TrkB receptors, while BDNF expression was mediated through 5HT2A, TrkB and AhR pathways. Interestingly, psilocin's effects on BDNF required AhR activation, whereas its anti-inflammatory actions appeared AhR-independent. Surprisingly, psilocybin and psilocin did not increase IL-10 to suppress LPS-induced inflammation under normal conditions. In contrast, blockade of the above-mentioned receptors led to psilocybin and psilocin-induced increases in IL-10 levels, especially in cases that reversed their effect on BDNF. These findings suggest a psilocybin/psilocin-induced reallocation of cofactors and signaling mediators between IL-10 and BDNF, revealing a balance between neuroplastic and immunomodulatory outcomes.

Conclusions

This study highlights psilocybin and psilocin's dual capacity to modulate neuroinflammation and promote neuroplasticity via microglial phenotypic shifts. By elucidating receptor-specific and intracellular mechanisms, these findings enhance our understanding of psilocybin's therapeutic potential, offering new avenues for treating neuropsychiatric disorders linked to inflammation and impaired neuroplasticity. Further research is warranted to evaluate these findings in vivo and determine their clinical implications.

#20: An Antioxidant Derived from Edible mushrooms prevents Melanoma growth In vitro.

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Purpose

Melanoma is the second most common invasive cancer and has a high potential for invasion and metastasis. Oxidative stress plays a significant role in melanoma development and progression. Various antioxidants, vitamins, and phytochemicals have effectively prevented melanoma growth. However, the chemopreventive potential of vialinin-A, a p-terphenyl antioxidant derived from edible mushrooms, remains unexplored. Based on its potent antioxidant and anti-inflammatory properties, we hypothesized that vialinin-A could inhibit melanoma cell growth and invasion.

Methods

B16-F10 melanoma cells were treated with or without varying concentrations of vialinin-A. Cell viability was assessed using the MTT assay, while apoptosis was analyzed through live and dead cell assay. The expression of various anti-apoptotic and pro-apoptotic factors was evaluated using antibody arrays. Caspase-3 activation and reactive oxygen species (ROS) production were measured using specific assay kits. Invasion and migration of melanoma cells were detected by scratch and trans-well migration assays.

Results

Our results indicate that vialinin-A inhibits melanoma cell growth in a dose-dependent manner. Treatment with vialinin-A effectively reduced the invasion and migration of melanoma cells, suppressed reactive oxygen species generation, and promoted apoptosis in B16-F10 cells. Additionally, vialinin-A enhanced caspase-3 activation and PARP protein cleavage. Furthermore, it modulated the expression of various anti-apoptotic, pro-apoptotic, and inflammatory markers in melanoma cells.

Conclusions

Our data indicates that vialinin-A could prevent melanoma cell growth and invasion by modulating oxidative stress-regulated apoptotic pathways. These results suggest that vialinin-A has potential chemopreventive effects.

#21: Investigating Fetalgro EX as an Alternative to Fetal Bovine Serum in Supplementing Cell Culture Growth.

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Purpose

Fetal bovine serum (FBS) has long been used as a cell culture supplement in laboratory studies across the world. Although its constituents are not well-defined, it is estimated to house more than one thousand components. Its plentiful source of carbohydrates, proteins, growth factors, etc. contributes to an optimal environment in which many cell lines flourish. However, FBS is a byproduct of the meat industry, making its availability unpredictable and costly. Consequently, this drives up prices to acquire FBS. To combat this issue, serums have been developed from alternative sources to improve reliability and save costs. Studies are ongoing to investigate human platelet lysate (HPL), umbilical cord serum (UCS), serum-free media, and other bovine products on cell culture development. FetalGro EX (FEX), a new supplemental media to enter the market, is much cheaper than typical FBS products and more reliably sourced. An in-house study indicates that media containing FEX supply growth rates equal to or superior to media with FBS. Here we investigate its effectiveness in promoting cell growth and doubling-time in several additional cell lines compared to FBS.

Methods

Various cell lines will be cultured—including PC12, ARPE, C8D1A, C6, SH-SY5Y—with predetermined concentrations of FEX and FBS in separate groups. Once confluent, cells will be passaged and concentrations measured using an automated cell counter. In addition, cell viability assays will be conducted.

Results

Preliminary tests with C6, rat glioma cells, show an equivalent doubling time, with improved cell viability in Fetalgro EX having 84.5% viable cells compared to 81.1% with FBS. Additionally, C8D1A, mouse astrocyte cells, exhibit a slight difference in doubling time and cell viability with FBS being 2.2 days and Fetalgro EX 2.7, with cell viability of 81% and 79%, respectively.

Conclusions

Although more research is required to further address the strengths and limitations of Fetalgro EX, early findings indicate that there is no difference in doubling-time or cell viability across multiple cell lines, possibly providing a more cost-effective supplemental media for cell culture research.

#22: Xylazine's Cytotoxic Effects on Central and Peripheral Tissues—Deciphering a Biphasic.

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Purpose

Xylazine, an α2-adrenoceptor agonist, is commonly used as a veterinary anesthetic. Sharp exacerbations of the U.S. opioid overdose crisis are linked to the polysubstance use of synthetic xylazine, often causing non-healing ulcers and abscesses in chronic users. Xylazine worsens brain hypoxia by inducing vasoconstriction in local blood vessels, impairing keratinocyte proliferation and migration, and reducing skin perfusion, which delays re-epithelialization leading to chronic skin ulcers. While xylazine is well-documented in veterinary medicine, its pharmacological features associated with substance abuse are less understood. This study aimed to 1) test xylazine's cytotoxicity in a dose-specific manner 2) test xylazine's effect in brain and peripheral tissues, and 3) assess cytokine inflammatory responses of skin epithelial cells at cytotoxic and noncytotoxic doses of xylazine.

Methods

Lactate dehydrogenase (LDH) release in RAW264.7 macrophages and SIM-A9 microglial cells were measured to assess cytotoxicity. Xylazine was serial diluted in PBS from 2 mg/mL to 1 pg in saline. Immunomodulating effects of xylazine were tested using varying doses of LPS (1 or 10ug) or xylazine (10-12mg/mL to 1.5 mg/mL) via ELISA following the manufacturer's protocol.

Results

Contrary to conventional linear dose-response relationships, our findings revealed xylazine's cytotoxicity exhibited a biphasic pattern, with heightened toxicity observed at both extremes of a U-shaped curve. The LC30 was greater in microglial cells compared to RAW264.7 macrophages, indicating greater potency in brain tissues. This shared response in both tissue types suggest a common underlying mechanism and signaling pathways in xylazine-induced cytotoxicity. We anticipate xylazine will affect inflammatory markers in a similar pattern to its biphasic cytotoxicity, with increased levels of TNF alpha and decreased levels of IL-10 observed at both extremes of a U-shaped curve.

Conclusions

Understanding the pharmacology of xylazine is crucial for refining dosage recommendations and enhancing the safety profile. To better understand xylazine's signaling pathways, our future directions include extending the study beyond xylazine to 1) include the impacts of morphine-based compounds on wound healing, immune response, and inflammatory pathways, and 2) using vasodilators and growth factors to mitigate xylazine induced skin ulcers.Harm reduction-informed public health guidelines and programs are urgently needed to prevent and respond to xylazine-involved overdoses more effectively.

#23: Birthplace Affects Health: The Impact of Geographic Origins in the United States on Gut Microbiome Composition and Dementia Risk.

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Purpose

The gut microbiome is comprised of a complex community of microorganisms residing in the gastrointestinal tract which plays a crucial role in physiological health and neurological function via the gut-brain axis. The gut-brain axis is a complex, bidirectional communication system that connects the gut and brain through neural, hormonal, and immune pathways, allowing the gastrointestinal system to influence brain function, behavior and overall mental health. Dementia is a growing public health concern in the United States, with its prevalence steadily increasing as the population ages. This study aims to investigate the connection between birthplace and dementia with a focus on factors that influence early gut microbiome composition. We explore different factors that can influence gut microbiome composition such as mode of delivery (C-section vs vaginal delivery), climate, maternal use of antibiotics, maternal obesity, socioeconomic status and genetic factors that affect the gut microbiome.

Methods

To achieve our objective, we will search the current literature in medical and scientific databases focusing on key words such as, “Brain-gut axis”, “Dementia”, “birthplace in the United States” to guide our search.

Results

This approach will allow us to connect data and allow us to determine whether geographic disparities in the gut microbiome exist and how these trends can predict dementia risk. We expect to develop this connection with our current limited understanding of the gut-brain axis and its correlation to dementia, while also discovering potential gaps in the current literature.

Conclusions

These gaps will serve to uncover and expose the evolution of this area of research and provide key starting points for future research.

#24: Lipophilic thiamine derivatives prevent bacterial endotoxin-induced cytotoxicity in human dermal fibroblasts.

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Purpose

Oxidative stress caused by bacterial infections significantly challenges patients in restoring and healing their wounds. Specifically, patients with diabetes often present with a diminished immune response and are more susceptible to bacterial infections due to increased oxidative stress as a result of increased cytokine production and delayed wound healing. Lipopolysaccharide (LPS), a cell surface protein found in Gram-negative bacteria, initiates an inflammatory response and causes tissue damage and dysfunction. In this study, we examined the role of two lipophilic derivatives of thiamine, Benfotiamine and Fursultiamine, in diminishing the inflammatory impact triggered by LPS and promoting healthy fibroblast growth.

Methods

To assess the impact of these derivatives on fibroblast viability, human dermal fibroblasts (HDFs) were exposed to various concentrations of benfotiamine or fursultiamine for 24 hours. Cell viability was determined by MTT assay. The expression of various inflammatory cytokines, chemokines, and growth factors will be examined by protein array kits. Activation of antioxidant enzymes, NF-kB, generation of reactive oxygen species, and lipid peroxidation will be measured using specific assay kits. We next plan to examine their effect in an in vivo wound healing model.

Results

Preliminary findings suggest that LPS decreased macrophage viability, and both benfotiamine and fursultiamine restored cell viability. Further, these compounds also regulated the expression of various pro-inflammatory markers. Additional studies are currently in progress.

Conclusions

Our results suggest that lipophilic thiamine derivates could prevent LPS-induced cell death of fibroblasts by regulating the expression of pro-inflammatory markers.

#25: Characterizing The Structural Interconnectedness of the Anterior Talofibular Ligament, Calcaneofibular Ligament, and Arciform Fibers.

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Purpose

The stability of the ankle joint relies on the integrity of its ligamentous structures, particularly the Anterior Talofibular Ligament (ATFL) and Calcaneofibular Ligament (CFL). Traditionally regarded as independent entities, emerging evidence suggests that arciform fibers connect the ATFL and CFL, forming a cohesive Lateral Fibulotalocalcaneal Ligament (LFTCL) complex. This study aimed to explore the anatomical and functional relationships between the ATFL and CFL, with a focus on arciform fibers, to better understand their role in the lateral ankle ligamentous complex.

Methods

A layer-by-layer dissection of 12 cadaveric ankles was performed to evaluate the lateral ankle ligamentous complex. Nine ankles were deemed viable for data collection. The ATFL and CFL were identified and measured in neutral, plantarflexion, and dorsiflexion positions using digital calipers and tape measures. Arciform fibers were identified based on their connections between the distal lateral malleolus, ATFL, and CFL. Statistical analysis was conducted to compare ligament lengths at rest and during movement.

Results

Arciform fibers were present in 11 of the 12 ankles dissected, predominantly connecting the inferior fascicle of the ATFL to the CFL. The average arciform fiber length was 16.9 mm (left ankle, ATFL) and 19.8 mm (left ankle, CFL); for the right ankle, the lengths were 13.8 mm and 15.8 mm, respectively. The ATFL superior fascicle exhibited a greater change in length during plantarflexion compared to its inferior fascicle, while dorsiflexion caused minimal change in both fascicles.

Conclusions

The results support the concept of the LFTCL complex as an integrated ligamentous structure. Our findings suggest that the arciform fibers contribute to transmitting tension between the CFL and the inferior fascicles of the ATFL, enhancing ankle stabilization. The arciform fibers exhibit a critical role in transmitting tension between the ATFL and CFL, particularly during plantarflexion, which may help contribute to ankle stabilization. Future studies will investigate the biomechanical properties and tissue characteristics of the arciform fibers through advanced imaging modalities such as ultrasound and immunohistochemistry, with implications for diagnosing and treating ankle injuries.

#26: Exploring the Therapeutic Potential of Resveratrol in Substance Use Disorders: A Systematic Review of its Effects on KCC2 Expression.

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Purpose

Substance use disorders are a major public health challenge that greatly necessitates innovative therapeutic strategies. One target that shows great merit is the K+-Cl- cotransporter 2 (KCC2) which is a neuronal chloride transporter that plays a critical role in maintaining inhibitory neurotransmission. There is much existing evidence that suggests KCC2 modulation could have therapeutic potential in addressing the dysregulated inhibitory neurotransmission seen in substance use disorder. However, there are currently no drugs that activate KCC2 that are approved for humans. A class of compounds known as KCC2 expressing enhancing compounds (KEECs) have been shown to increase KCC2 expression. Among these, resveratrol, primarily known for its action on the SIRT-1 protein, has demonstrated the ability to enhance KCC2 expression. This systematic review aims to compile and analyze evidence connecting KEECs, such as resveratrol, to substance use disorders, with a particular focus on nicotine and alcohol abuse.

Methods

This systematic review will gather and evaluate studies investigating the relationship between resveratrol and substance use. The searches will be performed in major databases such as PubMed/MEDLINE, SciFinder, Embase, PsychInfo, Cochrane Library, Clinical Key, and AccessMedicine. A combination of keywords related to resveratrol, KCC2, and substances of abuse will be utilized. Eligibility criteria for article selection will include all animal or human studies investigating the relationship between resveratrol and recreational and/or prescription drug use. In addition to keywords, the AI screening tool, ASReveiw, will be used to help identify relevant articles. Once all of the relevant literature is identified, duplicate reports will be screened out via the automated tool Deduklick, and then verified manually. Data from these studies will be analyzed to identify patterns and gaps in the literature, providing a foundation for understanding resveratrol's potential therapeutic role in substance use disorders.

Results

Conclusions

#27: Exploring the Role of 3D-Printed Scaffolds in Periodontal Tissue Regeneration.

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Purpose

Tissue engineering presents innovative opportunities for the restoration and regeneration of damaged bone and soft tissues. Scaffolds, engineered from biomaterials, provide structural support and an optimal environment for cell attachment, proliferation, and tissue regeneration.

Methods

This review examines the materials, fabrication techniques, and designs employed in 3D-printed scaffolds, emphasizing their advantages and future potential. Additionally, it highlights their application in periodontal tissue regeneration.

Results

Each type of tissue requires scaffolds with specific properties, including porosity, mechanical strength, and biodegradability, to facilitate cellular activity and growth. The foundational components of tissue engineering include scaffolds, cellular elements, and signaling molecules. Scaffold properties are determined by the biomaterial selected:

Conclusions

The primary goal of 3D-printed scaffolds is to replicate the natural behavior of periodontal tissues. Their adaptability and versatility make them a promising tool in regenerative medicine. Ongoing technological advancements are expected to make 3D biofabrication a reliable and efficient approach for developing personalized treatment platforms.

#28: In-silico modeling and characterization of KCC2 protein interaction with a small molecule direct agonist identifies potential binding sites for modulating behaviors associated with substances of abuse

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Purpose

KCC2 is a potassium-chloride cotransporter essential for neuronal function by regulating GABAergic signaling through chloride gradients. Maintaining this gradient is critical for balancing excitation and inhibition in the brain. Dysregulation of KCC2 has been linked to epilepsy and seizures, and recent studies suggest that KCC2 inhibition may contribute to behaviors observed in chronic opioid dependence. This evidence positions KCC2 as a promising therapeutic target for modulating substance abuse-related behaviors. However, few small-molecule agonists targeting KCC2 have been identified, and no definitive active binding sites have been thoroughly characterized. This study employs a machine-learning computational approach to model KCC2 protein interactions with a direct agonist, identifying nine potential binding sites.

Methods

An in-silico model of KCC2 was generated using published cryo-EM structural data from the RCSB Protein Data Bank. The protein surface was analyzed for potential active sites by evaluating parameters such as size, depth, hydrophobicity, and capacity for intermolecular interactions, including hydrogen bonding and Van der Waals forces. Ligand models for experimental agonists and FDA-approved negative controls were prepared, forming a small-molecule library. This library was screened against the identified binding sites using a rigid docking protocol. Ligand interactions were scored based on parameters including Van der Waals energy, Coulomb energy, hydrophobicity, and hydrogen bonding potential.

Results

Surface analysis revealed nine potential active sites on KCC2 with SiteScores ranging from 0.895 to 0.979, indicating high reliability in distinguishing drug-binding regions. The highest-scoring site was in the transmembrane domain (SER896-PHE1090). Key residue interactions consistently involved HIE1051 (Pi-Pi stacking), ASN1086 (hydrogen bonding), and PHE1090 (Pi-Pi stacking) across all agonist candidates. Agonist candidates averaged a docking score of -4.5228, compared to -3.6087 for negative controls, supporting the specificity of these binding sites.

Conclusions

In conclusion, this computational approach identified nine promising KCC2 binding sites, providing insights for the rational design of novel therapeutics. Although these scores are lower than those for well-characterized protein-ligand interactions, improvements could be made through induced-fit modeling to account for protein conformational changes. While further binding and functional assays are needed to validate these interactions, our findings offer potential avenues for developing treatments aimed at modulating behaviors associated with substance abuse.

#29: Investigating Biomarkers of Anxiety Amelioration with Heterodyned Whole-Body Vibration using EEG.

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Purpose

A novel technology, coined heterodyned whole-body vibration (HWBV) has shown potential in treating anxiety associated with opioid withdrawal. This technology utilizes specific activation of cervical mechanoreceptors to enhance mesolimbic dopamine. Impact of HWBV on typical cortical indices of anxiety remains to be characterized. This study aims to utilize electroencephalography (EEG) to characterize emotional affective states following HWBV-induced anxiety amelioration. Analyzing the EEG data obtained in conjunction with HWBV may identify specific markers and underlying mechanisms important for understanding how HWBV and cervical mechanoreceptor activation impacts brain function and the hallmarks of its induced reduction of anxiety.

Methods

EEG recordings of each participant will be obtained. Recordings will include (in this fixed order) an auditory evoked potential test (AEP), 5 minutes baseline with eyes closed, 10 minutes during HWBV treatment, 5 minutes with eyes closed post HWBV treatment, and a final AEP. Collected data will be compared against known biomarkers of both trait and state anxiety in stressed and relaxed states to observe the effects of the HWBV. These biomarkers include theta/beta ratios, total beta power in the frontal and parietal lobes, trends of beta power in all brain regions and whole head delta power for the trait anxiety state. For the state anxiety state we will investigate gamma power, the theta/beta ratio in the frontal lobes, beta power in the parietal lobes, and the alpha/beta ratio in the frontal lobes. This data will provide us insight into the acute effects of HWBV on typical anxiety biomarkers shown with EEG. We also have a collection of EEG data from a previous study that will allow us to look for any observable long-term effects of the HWBV. We will be able to use this data alongside the acute data collected to see if there are noticeable changes to someone's EEG both in the long-term and short-term use of the HWBV.

Results

Conclusions

We anticipate that the data collected from test trials will show a significant change in EEG biomarkers of anxiety, thus providing us with more insight on the possible mechanisms and results of HWBV.

#30: Drinking and Smoking: Alcohol and Nicotine's Immunologic Effects on Central and Peripheral Tissues In vitro.

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Purpose

Nicotine and alcohol are the most widely abused substances in the U.S. Rising nicotine use in America is driven by E-cig popularity. The harmful effects of alcohol and nicotine alone, such as ROS-mediated cytotoxicity, tissue damage, and cancer, are well described; however, less is known of the combined effects. The study aimed to examine dose-specific cytotoxic effects of alcohol and nicotine individually and their combined impact on brain and peripheral tissues.

Methods

The primary readout was lactate dehydrogenase (LDH) in RAW264.7 macrophages and SIM-A9 microglial cells to determine dose-dependent cytotoxicity. Alcohol was administered in media supplemented with doses tittering (0.05 – 0.25% v/v), whereas nicotine was administered in media supplemented with doses tittering (0.1 – 8 ug/ml). For the combined experiments equivalent doses were based on the percent cytotoxicity of the substance per cell line. Ratios (1:1, 2:1, 1:2, 5:1, 1:5, 10:1, or 1:10) of nicotine and alcohol cytotoxicity were tested after 2 hours of incubation based on levels of Formazan in the solution.

Results

Our findings showed nicotine's cytotoxicity followed a biphasic pattern, with reduced toxicity at both ends of an inverse U-shaped dose-response curve. The findings show an inverse U-shaped dose effect, with nicotine being less potent on brain-derived macrophages than gut-derived macrophages. Alcohol exhibited a linear dose-response curve, with alcohol more potent on brain-derived macrophages compared to gut-derived macrophages When combined in different ratios (nicotine : alcohol) the ratios demonstrated a significant increase in cytotoxicity at 1:5 compared to 5:1. However, cytotoxicity at 10:1 was significantly increased compared to 1:10.

Conclusions

Misusing alcohol and nicotine can lead to dependence and tolerance. Understanding the pharmacology of alcohol and nicotine alone is crucial for understanding the poly drug effect. The current study elucidates the clinically relevant use of alcohol and nicotine as poly drug use in different quantities. Future directions include 1) evaluating the cytokine inflammatory responses and testing the therapeutic potential of alternative treatments to mitigate the deleterious effects of alcohol and nicotine poly abuse. This research may guide clinicians in developing targeted interventions to mitigate the systemic damage caused by alcohol and nicotine and improving patient outcomes.

#31: The Correlation Between Temporomandibular Disorder (TMD) and Vitamin D Deficiency.

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Purpose

Temporomandibular disorder (TMD) affects the temporomandibular joint, muscles, and related structures, leading to pain and reduced quality of life. Vitamin D deficiency, a global health concern, is important for bone, immune health, and inflammation. However, the connection between vitamin D deficiency and TMD development or progression is not well understood. The aim of this literature review is to look at the link between vitamin D deficiency by Investigating how vitamin D deficiency co could contribute to TMD development and progression.

Methods

A literature review search was conducted across PubMed, Scopus, and Web of Science databases from their inception until February 2024. The search was carried out following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to identify studies that evaluate the impact of vitamin D on temporomandibular disorder (TMD).

Results

680 numbers of studies were identified through the search query, with 15 numbers of studies meeting the inclusion criteria. The key findings across these studies indicated that vitamin D levels influenced the progression of TMD. Additional observations showed that vitamin D levels varied across different age groups and appeared to be linked to the development of TMJ/TMD.These results will consolidate evidence from observational studies, randomized controlled trials,and retrospective analysis. They will draw the correlation between poor vitamin D levels and the risk of progression or alleviation of symptoms. We will also discuss the potential therapeutic use of vitamin D for TMD management.

Conclusions

This literature review provides evidence suggesting a link between vitamin D deficiency and TMD. The findings recommend that TMD patients, particularly those at high risk of deficiency, undergo vitamin D testing. Vitamin D supplementation may serve as a beneficial adjunct treatment, especially for those with low levels. However, the optimal dose and duration of supplementation remain unclear. Further high-quality randomized controlled trials are needed to determine the most effective methods for vitamin D supplementation and its impact on TMD treatment. Future research should also explore the mechanisms by which vitamin D influences TMD.

#32: Evaluation of seven commercially available DNA extraction kits for ocular tissues.

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Purpose

DNA extraction kits are traditionally developed to work with liquid tissues such as blood, saliva, and swabs, but some have been proposed to work with solid tissues. Somatic variation in cancers can be important for tumor subtyping and treatment guidance, including ocular tumors. Additionally, epigenetic marks such as 5-methylcytosine (5mC) and 5-hydroxymethylcytosine (5hmC) are tissue-specific and change in disease states, particularly evident in diabetic retinopathy and age-related macular degeneration. Commercial DNA extraction kits are available from several vendors, but the various kits have different strengths and weaknesses, and the removal of PCR inhibitors will vary with each kit. This project investigates the yield and purity of DNA from ocular tissues using commercial DNA extraction kits. We have previously presented some results on this topic but this abstract highlight new results that have not yet been presented.

Methods

Cornea, neural retina, RPE/choroid layer, and optic nerve tissues were collected from bovine eyes and aliquoted into 25 mg aliquots. Extractions were performed using commercially available kits: GenFind V3 (Beckman Coulter), EchoLUTION (BioEcho), genomicPrep Mini Spin (Cytiva), Monarch HMW DNA (New England Biolabs), Chemagic DNA Cyto Pure (Perkin Elmer), QIAamp DNA Mini (Qiagen), and GeneJet (Thermo Fisher). DNA was quantified using the Qubit Fluorometer and molecular weight was checked by agarose gel. Several more kits are currently being tested.

Results

All kits yielded high molecular weight DNA (above 20 kbp). The Monarch HMW kit yielded DNA with higher molecular weights. DNA yields per milligram of tissue were highest using the QIAamp DNA Mini for neural retina and RPE/choroid, but highest using the genomicPrep Mini Spin for the cornea and highest using the Chemacic Cyto Pure for the optic nerve. Additional kits are currently being tested, but initial results indicate that several commercial kits will be sufficient for DNA extraction of ocular tissues.

Conclusions

This abstract presents results from kits that we have not previously tested (EchoLUTION, QIAamp DNA Mini, and Chemagic Cyto Pure). The EchoLUTION kit protocol is the fastest and simplest of the protocols tested. All kits tested yielded sufficiently high quantities of DNA, and all yielded high molecular weight DNA. Further testing will examine sample purity.

#33: To investigate the effects of smokeless tobacco and affiliates on the epigenetic changes and biomarkers that play a role in tumor genesis.

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Purpose

The increasing prevalence of smokeless tobacco (ST) use has raised concerns about its potential to contribute to cancer development through epigenetic alterations and biomarker changes. This literature review aims to investigate the role of smokeless tobacco and its associated products in influencing epigenetic mechanisms and biomarker profiles that may promote tumorigenesis.

Methods

A literature search was conducted on the following databases: PubMed and Science Direct using the key words “smokeless tobacco”, “molecular biomarkers”, “epigenetic changes”, and “DNA methylation”. A comprehensive search was used to review and evaluate studies based on their relevance to the topic, methodologies, and findings. The defined inclusion criteria were based upon date with articles ranging from 2013 to 2025. Based on the inclusion/exclusion criteria, only articles written in the English language were used for this review.

Results

Several genes have been implicated in the adverse effects of smokeless tobacco consumption. These include TUSC3, p53, p21 and are essential players in the direction of tumor cells. In addition, molecular biomarkers such as long non-coding RNAs (lncRNAs), micro-RNAs (miRNAs), IL-6, IL-1, IL-8, and TNF-alpha are observed to be altered in patients exposed to smokeless tobacco. Proteomic research has also been instrumental in determining the expression of Ig Kappa chain C region (IGKC), Isoform 2 of fructose-bisphosphate aldolase A (Aldolase A), and serum albumin.

Conclusions

This research is ongoing; however, the molecular biomarkers listed above give a visual progression of head and neck cancer. The evaluation of these genes and proteins may serve a potential in early detection and therapeutic treatment of disease.

#34: Sustainable Smiles: Green Orthodontics for a Better Tomorrow

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Purpose

The growing impact of climate change has elevated sustainability to a critical priority across all sectors of healthcare, including orthodontics. Orthodontic materials and clinical practices have an enormous environmental impact that necessitates innovative solutions that balance functionality with ecological responsibility. To explore sustainable strategies in orthodontic practice, focusing on materials, waste reduction, and digital innovations, highlighting their impact on reducing the environmental footprint while maintaining clinical efficacy.

Methods

A review of relevant literature regarding clinical guidelines, and emerging practices in sustainable orthodontics was undertaken. Data were collected from peer-reviewed articles, case studies, and reports on eco-friendly materials, waste management strategies, and digital solutions in orthodontic practice. Key themes on practical approaches to integrating sustainability into orthodontics were identified and synthesized.

Results

Sustainable materials include biodegradable aligners, recyclable packaging, and reusable brackets and wires that can be sterilized and reused. Digital impressions can replace traditional materials, offering precision and reducing waste. 3D printing and recycling optimizes material use in aligner production. Waste reduction practices emphasize the use of reusable alternatives, such as autoclavable instruments and biodegradable gloves. Bulk ordering and sustainable packaging can enhance efficiency. The digital transition, including paperless patient records and appointment systems, minimizes paper waste. Patients can be motivated to use eco-friendly oral hygiene products such as bamboo toothbrushes.

Conclusions

Sustainable orthodontic practices present an opportunity to reduce environmental impact while upholding clinical excellence. By adopting eco-friendly materials, reducing waste, and transitioning to digital systems, orthodontic professionals can contribute to a greener future for healthcare.

#35: Unraveling Physiologic Mechanisms in Passive and Active Mechanoreceptor Stimulation.

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Purpose

Treatment modalities aimed at improving physiological and psychological well-being often focus on mechanoreceptor stimulation or modulation. To better understand their impact, it is necessary to explore how these interventions influence the body's main physiological systems. This literature review examines the acute effects and underlying biological mechanisms of two intervention categories—active stimulation and passive mechanical stimulation. Active stimulation was defined as high intensity cardiovascular and muscular stimulation including running and weightlifting. Passive mechanical stimulation includes osteopathic manipulative treatment (OMT), chiropractic manipulative therapy (CMT), heterodyned whole-body vibration (HWBV), and massage therapy. Specifically, this review investigates how these interventions impact five key body systems: cardiovascular, orthopedic, endocrine, neurological, and psychological.

Methods

This review synthesizes current research on active and passive mechanoreceptor activation and their effects on major body systems. Articles were collected from PubMed, focusing on randomized controlled trials, meta-analyses, and systematic reviews that evaluated the effects of these interventions on the five key physiological systems. These results were then compared to identify possible overlapping mechanisms and to identify if one form of intervention has a greater impact in a specific system over the other. Gaps in current research were noted to identify areas where more evidence/research is needed.

Results

Conclusions

Early findings suggest that the two intervention categories influence well-being with overlapping mechanisms across neurological, psychological, endocrine, cardiovascular, and orthopedic domains. For instance, passive mechanoreceptor stimulation by HWBV and OMM showed promise in reducing anxiety through mechanoreceptor activation and oxytocin release. Active mechanoreceptor stimulation by running or cardiovascular and high impact exercises consistently demonstrated enhanced endorphin release and receptor expression, contributing to the "runner's high", while contributing to heart health. Understanding the mechanistic effects of treatment modalities will provide a foundation for future research to develop more targeted treatment options for patients.

#36: Oral Cancer and the Impact of Glossectomy: Challenges and Pathways to Recovery.

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Purpose

Glossectomy is performed to treat and extract the malignant lesions of the tongue. The purpose of the study was to explore the effects of glossectomy on speech and introduction to speech therapy. It also focused on the mental health of patients with oral cancer during and after treatment including issues of financial burden, reentering society, and quality of life post treatment.

Methods

The systematic review was conducted using databases such as PubMed, ScienceDirect, JAMANetwork, and NIH, focusing on studies published between 2001 and 2023. The review included cross-sectional and prospective studies, original research, and review articles. Relevant primary studies were assessed based on predetermined inclusion criteria to ensure alignment with the research objectives.

Results

The reviewed literature showed high-quality studies with minimal bias. Findings indicated that oral cancer patients undergoing partial glossectomy have a better chance for speech retention, facilitated by speech therapy methods, including sign language. Regarding cost, early-stage intervention with single modality treatments were less costly than late-stage, multi-modality treatments. Additionally, concerns regarding appearance and reintegration into society were prevalent among participants, with many facing challenges in resuming daily activities post-treatment. Mental health outcomes revealed that more than 40% of patients experienced worsened depression during treatment.

Conclusions

Partial glossectomy is preferred due to its potential for smoother integration to society and improved speech recovery with therapy. Mental health support remains a key focus as oral cancer patients navigate through the ongoing challenges.

#37: Gas Station Heroin: Tianeptine's Immunomodulatory Effects on Central and Peripheral Tissues In vitro

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Purpose

Tianeptine, a tricyclic antidepressant acting on mu-opioid receptors, is approved for major depressive disorders in many countries but not in the United States. Known colloquially as "gas station heroin," tianeptine is prone to abuse due to its euphoric effects and rapid tolerance. However, its immunomodulatory effects remain under-researched. This study aimed to evaluate 1) immune regulation and anti-inflammatory properties of tianeptine in a dose-specific manner and 2) its effects on brain and peripheral tissues.

Methods

Cytotoxicity was measured in RAW264.7 macrophages and SIM-A9 microglial cells using lactate dehydrogenase (LDH) assays across doses (10 mcg/ml to 0.01953 mcg/ml) over 2 hours. Baseline levels of TNF-α and IL-10 in LPS-treated cells were measured by ELISA. IL-10 and TNF-α expressions were evaluated for pre- and post-tianeptine treatment. Phagocytic function was assessed using fluorescently labeled E. coli, and fluorescence mean intensity (FMI) was quantified to measure engulfment by macrophages and microglia.

Results

Tianeptine exhibited U-shaped dose-dependent cytotoxicity in both macrophage types. Baseline IL-10 expression was significantly increased compared to LPS controls, while TNF-α expression decreased approximately 8-fold. IL-10 release was higher in SIM-A9 microglia than in RAW264.7 macrophages at equivalent doses, while TNF-α suppression was comparable in both. Pre- and post-treatment with tianeptine significantly reduced IL-10 and TNF-α compared to untreated inflammation levels. Tianeptine also reduced macrophage phagocytic function in RAW264.7 cells in a dose-dependent manner but increased phagocytic function in SIM-A9 cells.

Conclusions

Tianeptine's biphasic cytotoxicity and modulation of inflammatory cytokines suggest immunomodulatory properties distinct between peripheral macrophages and microglia. These findings underscore the importance of understanding tianeptine's pharmacological pathways in addressing misuse and its safety profile. Future studies should focus on identifying receptors involved in tianeptine's immune effects and conducting in vivo modeling to expand these findings.

#38: Evaluating Sexual Dimorphism in Foramen Magnum Dimensions: A CBCT Study

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Purpose

Sex estimation is a critical component of personal identification in forensic investigations. While the bony pelvis is the most reliable skeletal structure for determining sex, its accuracy diminishes over time due to post-mortem alterations such as porosity and fractures. This necessitates the development of additional reliable methods for sex estimation. This study aimed to evaluate the dimensions of the foramen magnum for assessing sexual dimorphism using CBCT.

Methods

This study analyzed 180 cone-beam computed tomography (CBCT) scans from the archives of the Department of Orthodontics and Dentofacial Orthopaedics. This study analyzed 180 CBCT scans of individuals aged 20–30 years, with full field-of-view (FOV) CBCT images. Measurements included the sagittal diameter (FMSD), transverse diameter (FMTD), and circumference of the foramen magnum, obtained from axial sections. One-way ANOVA was used to evaluate differences between male and female subjects.

Results

The analysis revealed statistically significant differences between males and females for all measured variables. Males demonstrated larger measurements across all variables compared to females (p<0.001). These findings confirm the presence of sexual dimorphism in foramen magnum dimensions in the South Indian population. In mass disasters, where intact skeletons are rare, sex determination based on fragmented bones becomes challenging. Sex determination accuracy declines to 80–90% with the skull alone. The observed sexual dimorphism in foramen magnum dimensions provides a reliable alternative for sex estimation in such cases.

Conclusions

CBCT-based measurements of the foramen magnum demonstrate significant sexual dimorphism, making them a valuable tool for sex determination in forensic contexts. This method is particularly useful when traditional skeletal markers are unavailable or compromised. The results contribute to establishing population-specific norms for sex identification and highlight the utility of orthodontic diagnostic tools in forensics.

#39: **A Literature Review on Advancements in Pharmacovigilance Through Utilization of Digital Health Platforms: Health Forum Data, NLP, and Patient Perspectives of Adverse Drug Reactions**

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Purpose

The purpose of this literature review is to conduct a comprehensive, systematic review of existing research that explores the utilization of patient health forums as an important tool for pharmacovigilance surveillance in healthcare. Specifically, this research aims to analyze how patients discuss and perceive medications, including their efficacy, side effects, and adverse reactions, within these digital platforms. This review seeks to identify key trends, insights, and gaps in the understanding of patient-reported experiences.

Methods

A literature search was conducted across MEDLINE, Cochrane, and PubMed for studies published between January 2000 and February 2024. The search used keywords and MeSH terms related to health forums, medication usage, and adverse drug reactions. Studies included were those that employed social media and health forum data analysis methods, such as text mining and sentiment analysis, to examine patient perspectives on medications and their associated adverse reactions. Machine learning models were applied to identify patterns in patient-reported outcomes.

Results

The final analysis included 7 articles from 5 journals, revealing three key themes. First, three studies explored the use of health forum data and natural language processing (NLP) to analyze patient-reported adverse drug reactions (ADRs). Second, one article examined patient perceptions through online health forums, highlighting the role of digital platforms in shaping treatment decisions. Lastly, three articles focused on ADRs related to chronic diseases, particularly long-term medication use. These findings highlight the diverse methodologies used in pharmacovigilance research.

Conclusions

This review synthesizes research on health forum surveillance, focusing on chronic conditions and patient-reported insights into medications and adverse reactions. It highlights the potential of online platforms to enhance pharmacovigilance by providing valuable real-world evidence that can inform healthcare practices and improve medication safety. However, further research is needed to refine methodologies, address data quality gaps, and explore the broader impact of digital patient engagement on pharmacovigilance and pharmacists services.

#40: **Holistic Management of Glucose Dysregulation Mimicking Autoimmune Disease: Case Investigation**

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Purpose: A 13-year-old female presented with anti-nuclear antibodies (ANAs), chronic migraines, joint swelling, skin desquamation, frequent epistaxis, and severe psychiatric symptoms, including multiple hospitalizations for suicide attempts. Despite consultations with over eight specialists in various fields, her symptoms persisted, and she was referred to rheumatology for suspected autoimmune disease (SLE). Negative laboratory tests for celiac disease, Crohn's disease, and gluten sensitivity, combined with atypical clinical features (appearance of speckled nuclei), prompted an exploration of glucose dysregulation as a possible underlying etiology.

Methods: Continuous glucose monitoring (CGM) revealed significant glycemic variability, nocturnal glucose fluctuations, and non-feeding glucose spikes above 180 mg/dL, suggestive of hypothalamic dysfunction. These findings supported the hypothesis that glucose dysregulation was contributing to systemic inflammation and the production of ANAs, causing or exacerbating psychiatric symptoms. A ketogenic diet (<15 g carbohydrates/day) was prescribed to recalibrate metabolic homeostasis. Within one month, glycemic stability markedly improved (mean glucose: 108 mg/dL, CV 14%), and ANAs were no longer detectable. By 3 months, upon reintegration of a standard diet, all physiological symptoms had been completely resolved.

Results: This intervention not only resolved the patient's physiological symptoms but also led to the complete remission of generalized anxiety disorder (GAD) and major depressive disorder (MDD), as confirmed by follow-up neuropsychological evaluations and psychiatric evaluation. This case highlights the critical role of glucose dysregulation in mimicking autoimmune diseases, raising concerns about the potential for misdiagnosis and unnecessary treatments. Overdiagnoses and overtreatment for SLE may be reduced by screening for glycemic control indices that can mimic autoimmune markers and symptoms.

Conclusions: The integration of metabolic and systemic evaluations into autoimmune workups offers a transformative approach to differential diagnosis, preventing lifelong medications and fostering improved patient outcomes. This case underscores the value of holistic, osteopathic care, emphasizing the body's innate ability to self-regulate and heal when systemic imbalances are addressed. Further investigation into the hypothalamic-glucose-ANA pathway is warranted to clarify the mechanisms underlying autoimmune mimicry and refine diagnostic criteria. By identifying and addressing metabolic drivers of immune dysregulation, clinicians can enhance diagnostic precision, promote personalized treatment strategies, and improve the standard of care in complex, multifactorial cases.

#41: **Investigating the Metabolic Effects of Ultrasound-Induced Lipolysis**

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Purpose: Ultrasound therapy has emerged as a highly promising non-invasive approach for fat reduction and body contouring. This study explores the comparative efficacy of high-frequency (200 kHz–3 MHz) and low-frequency (35 kHz–45 kHz) ultrasound in inducing lipolysis. Additionally, it seeks to elucidate the metabolic pathways involved in lipid mobilization, oxidation, and redistribution. The goal is to address significant gaps in current literature and optimize clinical protocols for safe and effective therapeutic applications.

Methods: This prospective study includes participants who undergo three sessions of ultrasound therapy targeting abdominal quadrants. High-frequency ultrasound focuses on superficial fat layers through thermal mechanisms, while low-frequency ultrasound relies on mechanical cavitation to disrupt deeper adipose tissues. Pre- and post-treatment assessments include waist circumference, weight, basal metabolic rate (BMR) measured via VO2 max, body composition, and comprehensive lipid profiling, measured again at 1-week post treatment to determine possibilities of redeposition. Key metrics—triglycerides, total cholesterol, VLDL, LDL, HDL, apolipoproteins, and ketones—are evaluated at baseline, 1- and 2-hours post-treatment, and 1-week post-intervention, as well as CGM and continuous finger-prick ketones and triglycerides.

Results: Preliminary findings demonstrate significant reductions in waist circumference (average 3.12 inches) and modest weight loss (0.47 pounds). Low-frequency ultrasound shows superior efficacy in reducing deeper adipose tissue compared to high-frequency ultrasound, though both modalities achieve clinically relevant fat reduction. Adjunctive therapies (OMM lymphatic techniques, walking, red light therapy) may prove effective in facilitating lipid clearance, improving systemic metabolism, and mitigating potential lipid redistribution to ectopic sites.

Conclusions: This study advances the understanding of ultrasound-induced lipolysis, offering new insights into its mechanisms and clinical applications. By addressing the redistribution and metabolism of mobilized lipids, it provides a foundation for safe, integrative treatment plans tailored to individual needs. These findings have far-reaching implications for managing obesity, metabolic disorders, and aesthetic concerns through non-invasive methods. The proposed efficacy of combining ultrasound therapy with adjunctive interventions positions this approach as a transformative tool in both aesthetic and metabolic medicine. This research contributes significant value to the scientific community and highlights the potential for ultrasound therapy to redefine standards in non-invasive body contouring and metabolic health.

#42: Assessing the Effects of Mouthguards and Jaw Clenching on Athletic Strength: A Scoping Review

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Purpose: Mouthguards are commonly used in sports to prevent dental injuries, but their impact on strength remains a subject of debate. Strength, defined as the maximum force muscles can exert, is crucial for activities requiring sustained force, while power involves exerting force quickly for explosive movements. This review focuses specifically on strength, examining how mouthguards and jaw clenching impact maximum force in strength-centric exercises. This review aims to synthesize the literature on how different types of mouthguards and jaw-clenching techniques influence strength.

Methods: The research team followed PRISMA guidelines for article extraction, initially identifying 163 records through database searches. After applying inclusion/exclusion criteria, 10 articles were included in this review. Data sources included PubMed, Scopus, and Web of Science. Full-text review and data extraction were performed, revealing that 90% of the studies employed crossover designs allowing for within-subject comparisons of different treatments.

Results: Analysis of the 10 articles (N = 20 studies) indicated that different mouthguard and clenching conditions influenced strength outcomes. For upper body strength (N = 13 studies), four studies showed a significantly positive effect from mouthguard use compared to clenching and habitual jaw position, while six studies reported a positive but non-significant effect. Regarding lower body strength (N = 7 studies), five studies indicated a significantly positive effect. The data revealed that, when biting or clenching, custom-made mouthguards were more effective in enhancing strength compared to over-the-counter options.

Conclusions: Athletes, when biting or clenching, while wearing a custom-made mouthguard, can potentially enhance upper body as well as lower body strength performance.

#43: Visual Effects of Sodium Hypochlorite on Inflamed and Necrotic Pulp Tissue

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Purpose: Classic literature supports copious irrigation with sodium hypochlorite during root canal procedure for the purposes of gross / bulk irrigation, disinfection, and dissolving pulp tissue. Pulp tissue contains nerves, arterioles, venules, and lymphatic vessels, held together by fibrous connective tissue.

Methods:

Results: Clinical Case: A patient presents for a root canal on tooth #29. Endodontic diagnosis was necrotic pulp, symptomatic apical periodontitis. Clinical findings, diagnostic tests, and radiographs will be depicted in the poster. During the access phase, a segment of necrotic pulp was removed. The attending Endodontic faculty identified this occurrence as a unique undergraduate dental student teaching opportunity to demonstrate the effect of sodium hypochlorite. The necrotic pulp tissue segment was measured and placed in a dappen dish containing 3% sodium hypochlorite. Photographs were taken every 5 minutes until the necrotic pulp dissolved. A detailed "Time Map" of all photographs demonstrating the effect of sodium hypochlorite on the necrotic pulp will be displayed. In vitro considerations: 3% sodium hypochlorite, room temperature, and no agitation or fluid turbulence. Supporting literature will be footnoted.

Conclusions: This poster will contain photographs demonstrating the clinical effect of sodium hypochlorite on inflamed pulp tissue during access preparation of a maxillary molar and a mandible molar. It will provide a graphic presentation when teaching the effects sodium hypochlorite irrigation during root canal treatment. It has applications beyond just the teaching of undergraduate dental students, it can also be used to show the often-unseen effects of sodium hypochlorite during the calibration of clinical faculty.

#44: Retrospective Analysis of Angiotensin Receptor Blockers and Knee Cartilage Volume in Osteoarthritis: Evidence from the Osteoarthritis Initiative

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Purpose: Osteoarthritis (OA) is a degenerative joint disease, predominantly affecting middle-aged and older adults, with the knee being the most commonly impacted joint. OA is a major cause of morbidity and disability. Angiotensin receptor blockers (ARBs), such as losartan, have shown cartilage-protective effects in murine models, possibly by inhibiting TGF-beta. Since ARBs are widely prescribed for cardiovascular conditions, their use in OA patients may confer incidental benefits in reducing cartilage loss. This study aimed to assess the association between ARB use and knee cartilage volume retention using data from the Osteoarthritis Initiative (OAI).

Methods: This retrospective analysis utilized OAI data from 4796 participants aged 45-79, enrolled between February 2004 and May 2006. The analysis focused on the progression subcohort, including 1390 subjects with symptomatic and radiographic knee OA. OA was defined by frequent knee symptoms and tibiofemoral osteophytes on radiographs. A control group of 122 non-exposed subjects was identified. Relevant datasets included demographic data, medication use, and MRI-based cartilage volume measurements at baseline and 12, 24, 36, and 48 months. Normalized cartilage volume was calculated as cartilage volume divided by the total subchondral bone area. Data sets were analyzed using SAS software Mean and standard deviation values for ARB users and non-users were reported for each drug and time period of observation.

Results: MRI observations totaled 4122, 3409, 3219, 828, and 1250 for non-ARB users, and 281, 1950, 1873, 216, and 453 for ARB users at 0, 12, 24, 36, and 48 months, respectively. ARB medications included candesartan, irbesartan, losartan, olmesartan, and valsartan, with use durations ranging from less than one month to over five years. Both groups showed a decline in cartilage volume over time, but ARB users exhibited a lower rate of loss. While this trend suggests a potential protective effect, differences were not statistically significant.

Conclusions: This study suggests that ARB use may be associated with reduced cartilage loss in knee OA patients. Further research is needed to evaluate demographic and clinical factors influencing ARB effectiveness in slowing cartilage degeneration.

#45: Autologous Particulate Dentin Grafts vs. Traditional Methods: A Scoping Review

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Purpose: To evaluate dentin-based grafts against traditional materials.

Methods: Prisma review of articles. Exclude all non-human cases

Results: Pending

Conclusions: Pending

#46: Venous thromboembolism prophylaxis in orthopedic surgery: a narrative review

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Purpose: Venous thromboembolism (VTE) is a major complication of orthopedic surgery and can lead to complications including pulmonary embolism, stroke, or even death. Given the increase in frequency of orthopedic procedures worldwide, VTE prophylaxis has thus become an increasingly popular topic of both active research and clinical trials. This narrative review aims to summarize current approaches to VTE prophylaxis for patients undergoing orthopedic surgery while also considering current trends in research surrounding potential updates to clinical recommendations and establishing a clear case for the role of patient-centered therapeutic approaches when looking to manage orthopedic postoperative VTE and associated complications.

Methods: A narrative review was performed based on existing literature published on the topic of VTE prophylaxis in orthopedic surgery between the dates 1.1.2012 and 12.31.2023. Articles were searched for using a combination of four key terms combined with Boolean operators and were searched for on three major databases – Google Scholar, PubMed, and ScienceDirect. Findings were combined with and compared to recommendations from major relevant professional organizations.

Results: A wide variety of guidelines for both chemoprophylaxis and mechanical prophylaxis were considered, with findings of particular interest being support for industry-standard low-molecular-weight heparin (LMWH) and direct oral anticoagulant (DOAC) chemoprophylaxis, along with increased interest in aspirin. The evidence also supports mechanical prophylaxis in conjunction with chemoprophylaxis. These mechanical prophylactic options primarily include intermittent pneumatic compression (IPC) devices, graduated compression stockings, and early mobilization protocols. Of additional interest, current clinical trials of new potential Factor XI and Factor XIa inhibitors demonstrate in Phase 2 data showing decreased risk of bleeding while increasing the chances of successful clot prevention, though data is limited at this time as these drugs are currently in Phase 3 trials.

Conclusions: Given that few validated VTE risk prediction score calculators exist, it is the recommendation of the authors to enhance risk stratification and personalized medicine by developing an orthopedic-specific risk assessment model to assist decision-making, risk factor identification, and overall provision of comprehensive, personalized care designed to optimize quality of life and maximize management of orthopedic postoperative thromboembolic complications.

#47: Effect of routine third trimester ultrasounds on maternal mental health in low-risk population in Utah

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Purpose: One in five pregnant women in the United States experience a maternal mental health condition. Within Utah from 2018-2022, during pregnancy, 22.7% of women experienced depression and 31.6% experienced anxiety, and 15.1% experienced postpartum depression. These data represent a prevalence higher than the national average. Third trimester ultrasound (TTUS) is not a standard of care performed in the United States currently. Previous TTUS research has mainly focused on the financial burden and birth outcomes rather than maternal mental health. Literature on first trimester ultrasound has demonstrated a notable impact on maternal mental health, but these outcomes within the third trimester and after birth are limited. The purpose of this study is to determine the effect of TTUS on mental health outcomes for expectant mothers.

Methods: Pregnant women will be recruited from Utah and will complete the informed consent process. TTUS will occur after 28 weeks of gestation at the Noorda College of Osteopathic Medicine. The subjects will complete the PHQ-9, GAD-7, and the MSPSS during the ultrasound appointment, 6 weeks postpartum, and 6 months postpartum. Statistical analysis will employ multivariate repeated measures ANOVA to determine the impact of the third trimester ultrasound on maternal mental health outcomes.

Results: Work in Progress: We hypothesize that individuals who receive a third trimester ultrasound will exhibit decreases in standardized mental health scores compared to baseline.

Conclusions: Work in Progress: We aim to prove there is an improvement in maternal mental health with routine third trimester ultrasounds.

#48: Evaluating Workflow Efficiency: Two-Day Versus One-Day Pre-Planning in Outpatient Infusion Clinics

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Purpose: The increasing demand for outpatient infusion services requires efficient strategies to improve clinic operations. Currently, the standard of practice includes working one day in advance. A previous study at Sylvester Comprehensive Cancer Institute demonstrated that working one day in advance significantly reduced chemotherapy preparation times by 31%. Our study aimed to assess the impact of extending the work ahead time to verify non-chemotherapy orders from one day to two days in advance at the Intermountain Outpatient Infusion Clinic.

Methods: A retrospective analysis was conducted comparing times from pharmacy verification to nursing staff readiness ("tag off" times) for non-chemotherapy medications prepared one day vs. two days in advance. Data was collected over two periods: business days from October 2nd- October 31st, 2023 (1 day advanced) and May 23rd-June 21st, 2024 (2 days advanced).

Results: 22 timestamps were collected in both the October and May periods. The average "tag off" time improved significantly by 32.2% from 1:47 PM to 9:20 AM with the 2-day advance preparation system. This improvement represents a decrease of 4 hours and 45 minutes.

Conclusions: This review demonstrated that working two days in advance can significantly reduce pharmacy turnaround time. This approach provides healthcare providers such as pharmacists and nurses additional time to address potential issues, enhances overall efficiency, ensures timely patient therapy, and emphasizes workflow adjustments' importance in improving healthcare delivery and reducing treatment delays.

#49: Innovations and Adaptations of Laparoscopic Surgery to Resource-Limited Settings in Low and Middle-Income Countries (LMIC's)

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Purpose: To assess the innovations and adaptations that facilitate the implementation of laparoscopic surgery in resource-limited settings in low- and middle-income countries (LMICs), identify associated challenges, and evaluate the benefits and outcomes of these adaptations.

Methods: A literature review was conducted to evaluate innovations, challenges, and outcomes of laparoscopic surgery in low- and middle-income countries. Systematic searches across five databases used keywords such as “laparoscopic surgery,” “LMICs,” and “resource-limited settings.” Studies meeting inclusion criteria focused on equipment adaptations, training methods, procedural modifications, barriers to implementation, and clinical outcomes. Data were thematically synthesized into four key domains: equipment innovations, training strategies, challenges, and clinical benefits. The quality of evidence was assessed, and findings were finalized through reviewer consensus. Seventeen peer-reviewed studies published between 2013 and 2024 were included.

Results: Innovations in laparoscopic surgery for LMICs include reusable instruments, low-cost equipment, and gasless laparoscopy, with adaptations such as repurposing urine bags for fluid collection and nasogastric tubes for CO_2 insufflation. Training strategies, including simulation, telemedicine, and on-site programs, effectively built surgical capacity, while procedural modifications, such as single-incision techniques, addressed resource constraints. Challenges include high equipment costs, maintenance issues, and reliance on foreign trainers. Conversion to open surgery was linked to factors like BMI > 25 kg/m² (OR 4.6), intraoperative complications (OR 12.6), and equipment malfunctions (OR 9.4). Despite barriers, laparoscopic surgery improved outcomes, with lower complication rates (1.6%), fewer open conversions (1.9%), reduced infections (OR = 0.53), and fewer overall complications (OR = 0.43). Collaboration, sustainable training, and innovative approaches like the "surgathon" model were key to successful implementation.

Conclusions: Laparoscopic surgery in LMICs offers significant clinical benefits but requires context-specific solutions to address persistent barriers. Innovations in equipment, training, and procedural techniques have demonstrated feasibility and effectiveness in resource-limited settings. Sustained efforts, including international collaboration and local capacity building, are essential to ensure scalability and long-term impact. Future research should focus on optimizing strategies to overcome financial and organizational constraints, fostering sustainable surgical ecosystems in LMICs.

#50: Characterization of Arciform Fibers in the Lateral Fibulotalocalcaneal Ligament Complex Using RNA Extraction and Immunohistochemical Analysis

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Purpose: The lateral fibulotalocalcaneal ligament (LFTCL) complex is composed of the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL), and the arciform fibers that connect them. These arciform fibers contribute to lateral ankle stability by limiting movement in the inferior fascicle of the ATFL during plantarflexion. Understanding the composition of these fibers is essential for improving surgical interventions and rehabilitation protocols related to lateral ankle instability. This study aims to characterize the protein structures of the arciform fibers within the LFTCL complex.

Methods: LFTCL complexes were harvested from cadaveric specimens in the Noorda College of Osteopathic Medicine Anatomy Lab. RNA will be extracted and purified from the tissue samples, followed by PCR amplification to quantify protein expression in the ATFL, CFL, and arciform fibers. Immunohistochemical (IHC) staining will be performed to localize and qualitatively analyze the identified proteins in the arciform fibers. Statistical analysis will then be conducted to compare protein profiles across all sample types.

Results: As this is an ongoing study, preliminary results are not yet available.

Conclusions: This study will provide insights into the protein composition of the arciform fibers, enhancing our understanding of their structural integrity and functional role. These findings could pave the way for biomechanical modeling of lateral ankle stability and the development of advanced surgical techniques. Further exploration into the structural integrity and function of the arciform fibers will be needed to optimize injury prevention and rehabilitation strategies.

#51: Effects of HVLA on Shoulder Mobilization and Baseball Pitch Velocity with DARI Motion Capture

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Purpose: Baseball pitchers are constantly trying to increase their speed on their pitches. Some aspects of the pitching motion that affect velocity are the degree of external rotation (ER) and shoulder internal rotational velocity (IRV). While stretching and warming up the shoulder joint can allow for more ER and IRV, additional methods to achieve better results should be explored. This study aims to look at the benefits of high velocity low amplitude (HVLA) treatment of the shoulder joint and surrounding structures articulating with the shoulder. Hypertonicity of surrounding musculature, lack of movement in the joint space, and inappropriate alignment of the joints can lead to impairment of proper pitching mechanics and can reduce total shoulder rotation. HVLA works to release restriction in the joints through a therapeutic force into the affected area to improve range of motion. The purpose of this study is to examine the effects of HVLA treatment on pitchers and explore the possibility of therapeutic treatment to increase shoulder range of motion, IRV, and pitch velocity.

Methods: Participants will complete a standardized shoulder warm-up and will undergo a DARI motion capture (DMC) screen to establish a baseline external rotation and internal rotation velocity. The participants will be analyzed for 10 sequential pitches to establish a baseline average pitch velocity. All subsequent measurements will be taken under the experimental or control group conditions. Participants will be included in both the experimental and control conditions on separate occasions. Each group will be screened for individual somatic dysfunctions of the shoulder girdle of their throwing arm prior to receiving any treatment. The experimental group will receive HVLA for each corresponding dysfunction while the control group will receive a sham treatment. After receiving treatment, another DMC and pitch analysis will be completed. These results will be compared to baseline for each individual player prior to data analysis.

Results: Data collection has not begun.

Conclusions: We hypothesize that HVLA treatment will lead to greater shoulder mobility and pitch velocity. If this holds true, these findings will provide opportunities for osteopathic physicians to enhance athletic performance.

#52: A Literary Review of Physician Approaches to Patient Care: Implications for Cancer Care

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Purpose: In 2021, almost 2 million people had their lives uprooted by a diagnosis of cancer. While advancements are made daily in cancer research and therapy, a patient's emotional state is often overlooked. One method to address this is maintaining an empathic, patient-oriented approach when working with cancer patients. We hypothesize that when a physician uses an empathetic approach when delivering bad news, the patient feels comfortable asking questions, understands their diagnosis more, and feels supported, leading to more personalized medicine and a better outlook. Our literature review aims to assess whether a patient-centered, empathic approach to care has any impact on the overall cancer patient's outlook.

Methods: Key terms searched in PubMed and Google Scholar include cancer, patients, approach to care, oncologist, empathetic, blunt, informed, compassion, and patient perspective. Selected articles have publication dates that are within a ten-year period, after searching five-years yielded minimal results. Inclusion criteria for our studies involve patients of all age groups and of English language. Studies involving non-physician healthcare professionals will be omitted based on exclusion criteria. Currently, 16 articles have been collected that address the perspectives of patients regarding physician compassion.

Results: Preliminary review revealed that a patient's perception might not be based on physician behaviors, but on the underlying abilities of the physician. Additional studies show that patients preferred competence over compassion as the prognosis of their diagnosis worsened. A positive correlation was noted between a higher perception of compassion from physicians and the risk of death in lung cancer patients. Conversely, a study indicated that in pediatric oncology patients, parents preferred patient-centered communication with the patient and their whole family. The collated information is pivotal in understanding if physician compassion affects patient morale and quality of life. This data will be implemented in future surveys to assess the level of empathy used in patient interactions, and how that affected patient outlook.

Conclusions:

#53: Investigating the Impact of Tirzepatide Treatment on Alcohol and Cigarette Consumption

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Purpose: The purpose of this experiment is to collect evidence regarding whether there is a correlation between the use of tirzepatide and levels of alcohol and cigarette consumption. Tirzepatide is a glucagon-like peptide-1 (GLP-1) and glucose-dependent insulinotropic polypeptide (GIP) agonist that lowers blood sugar and decreases appetite. In previous studies involving rodents, it has been shown that GLP-1 agonists can also be used to reduce addictive substance intake. We hypothesize that individuals who receive tirzepatide treatment will exhibit reduced consumption of alcohol and/or cigarettes over the span of six weeks compared to subjects who do not receive tirzepatide.

Methods: Through intake surveys, participants will be selected based on whether their alcohol and cigarette intake meet the CDC's criteria for binge drinking and smoking. There will be three control groups for this experiment. They will include participants who meet inclusion criteria for drinking, smoking, or both and will receive weekly saline injections. There will also be three experimental groups. They will receive one weekly subcutaneous dose of tirzepatide. For six weeks, participants who consume alcohol will be given a BACtrack Skyn device to monitor blood alcohol levels daily. Individuals who smoke cigarettes will have carbon monoxide levels monitored once weekly through a Smokerlyzer device at the time of their weekly injection. All participants will also receive random notifications throughout their participation in the study to complete surveys to record substance consumption. Only data from participants who have a minimum of 80% compliance will be used.

Results

Conclusions

#54: Exploring the relationship between self-reported anxiety, depression, and neurocognitive biomarkers in patients with substance use disorders

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Purpose: Substance use disorders (SUDs) often co-occur with anxiety and depression, complicating recovery. Roughly 80% of people with SUD meet the diagnostic criteria for a comorbid psychiatric disorder. Among the two most common comorbidities were depressive and anxiety disorders. We aim to identify relationships between self-reported anxiety and depression scores with various biomarkers obtained utilizing EEGs, specifically the P300 delay and frontal alpha asymmetry (FAA), among populations at inpatient settings for SUD. Using these potential relationships, SUD recovery can be tailored to increase the efficacy of treatment for those with comorbid anxiety and/or depression disorders.

Methods: 53 (n=40 M, n=13 F) participants were recruited from two inpatient treatment facilities. Patients completed both the HAM-A anxiety assessment and a PHQ-9 depression assessment, which provides a quantitative measure of clinical anxiety and depression. Participants then performed a series of cognitive tests during EEG recording, including an oddball tone identification test, a Flanker test, and a baseline EEG recording. A trail making test was also administered after the EEG session had completed. The EEG waveforms were analyzed using WAVI Scan to determine the P300 delay and FAA.

Results: Of 40 male participants, 26 (65%) had scores within the diagnostic criteria on either the HAM-A or PHQ-9. Of 13 female participants, 10 (76.9%) had scores within the diagnostic criteria on either the HAM-A or PHQ-9. 73.33% of male participants and 77.77% of female participants who scored outside of their respective FAA target range recorded HAM-A and PHQ-9 scores within the range of a clinical anxiety or depression disorder. Additionally, 81.25% of male participants and 100% of female participants with P300 delay values not in their target range, recorded HAM-A and PHQ-9 scores in the range of a clinical anxiety or depressive disorder.

Conclusions: Initial results show a greater percentage of participants with self-reported anxiety and/or depression have an increased likelihood of falling outside of the normal range for FAA and P300 delay. Although there is a likely connection between these variables, continued research is required to establish a greater understanding of this relationship.

#55: Transcranial magnetic stimulation as a treatment modality for Functional Bowel Disorder and Irritable Bowel Syndrome and possible correlations with the Gut-Brain axis: A Review

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Purpose: Functional Bowel Disorders (FBD), including Irritable Bowel Syndrome (IBS), are highly prevalent gastrointestinal conditions classified as Disorders of Gut-Brain Interactions (DGBIs) under the Rome IV criteria. These conditions, marked by abdominal pain, altered bowel habits, and significant psychological comorbidities, present substantial challenges in both diagnosis and treatment. Conventional therapies primarily target gut-centric mechanisms but often yield limited efficacy, underscoring the need for approaches that account for the complex interplay of the gut-brain axis in DGBI pathophysiology.

Methods: Transcranial Magnetic Stimulation (TMS), a non-invasive neuromodulation technique, has shown therapeutic potential in neurological and psychological disorders and is now emerging as a novel treatment for DGBIs. By modulating neural activity in brain regions like the anterior cingulate and prefrontal cortex, which are involved in pain response, emotional regulation, and autonomic control, TMS offers a comprehensive approach to managing the multifaceted symptoms of IBS and FBD.
This review explores the interplay between TMS and the gut-brain axis, emphasizing its potential to alleviate IBS and FBD symptoms. It examines the mechanisms by which TMS modulates cortical excitability and autonomic function while highlighting critical gaps in research, including the need for standardized TMS protocols and large-scale clinical trials. By integrating neuromodulation with traditional therapies, TMS represents a promising frontier in advancing brain-centric treatments for DGBIs, paving the way for innovative, multidisciplinary approaches to these complex disorders.

Results: TBD - Not yet completed

Conclusions: TBD - Not yet completed

#56: CAR-T Cell Therapy efficacy in treatment of refractory Myasthenia Gravis: A Systematic Literature Review

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Purpose: Myasthenia Gravis (MG) is an autoimmune disease characterized by antibody secreting lymphocytes—specifically B-cells—producing autoantibodies against aspects of the neuromuscular junction (NMJ). These autoantibodies inhibit neurotransmitter signaling causing ocular myasthenia, ptosis, diplopia, changes in facial expressions, dysphagia, dyspnea, dysarthria, and generalized weakness. The incidence of MG is estimated to be between 2.1 to 5.0 million people per year, and the prevalence is estimated to be 70 to 200 per million in the US population. Chimeric Antigen Receptor-T (CAR-T) cell therapy has recently emerged as an effective treatment for auto-immune disorders and has contributed to significant clinical improvements in patients diagnosed with multiple sclerosis (MS) and systemic lupus erythematosus (SLE). This study's aim is to evaluate the recent literature to determine the efficacy of different CAR-T cell therapies in treating patients with varying types of refractory MG.

Methods: The systematic literature search was performed across two databases, Google Scholar and PubMed, on November 21st, 2024. Key words Myasthenia Gravis and CAR-T Cell therapy were included. 1,290 articles were found on the two databases, PRISMA guidelines were followed and application of exclusion and inclusion criteria yielded 8 articles used in this literature review after accounting for duplicates. Included articles were original case studies or articles published within the last five years in which patients with refractory anti-AChR and anti-MuSK MG were treated with a type of CAR-T cell therapy.

The use of both anti-B-Cell Maturation Antigen (BCMA) and anti-CD19 CAR-T Cells as a therapeutic agent against anti-AChR and/or anti-MuSK MG are noted in these 8 recent studies.

Results

Conclusions

#57: Ophthalmologic Impacts of Anabolic-Androgenic Steroid Abuse: A Literature Review

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Purpose: Anabolic-androgenic steroids (AAS) are among the most commonly abused performance-enhancing drugs. It has been estimated that there may be as many as 4,000,000 male AAS users in the United States, with approximately 100,000 new users each year. If that estimate is correct, male AAS users could constitute greater than 1% of the population. The most common adverse effects of AAS abuse are well documented, including impacts on fertility and endocrine function as well as to the heart, liver, and kidneys. The effects of AAS on the eye are less established, and this review seeks to examine the existing literature in this area.

Methods: Literature searches were conducted on PubMed, Google Scholar, and Medline. Primary search terms were "anabolic steroid abuse" and "eye" or "ophthalmology." MeSH terms were utilized to broaden the scope of the search on PubMed. After screening out irrelevant results, 8 articles were identified as directly relating to this topic.

Results: Of the articles selected, 7 were case studies. The other article described a cohort study which established no increased risk of Central Serous Chorioretinopathy among users of AAS. Of the 7 case studies, 4 related to issues of vascular occlusion while the other 3 related to viral or fungal infections.

Conclusions: While significant investigation has been done into the effects of AAS abuse, there does not appear to be a large body of literature concerning the impact of AAS abuse on the eye. The two categories of case studies identified present symptoms that are likely secondary to the more well documented effects of AAS in other areas. AAS are known to be immunosuppressive, specifically inhibiting Th1 cells. When these cells are inhibited, the immune system is less able to fight off the types of ocular viral or fungal infections described in the case studies. The cardiovascular issues often seen in AAS abuse also increase the likelihood of vascular issues, such as the occlusion described in the other case studies. There do not seem to be direct impacts of AAS abuse on the eye, however further research in this area would be beneficial.

#58: Is there a correlation between quantitative depression metrics when comparing pre-operative and post-operative cataract surgery with varying grades of cataracts?

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Purpose: Depression has been linked to and studied along many pre-operative and post-operative treatment plans. However, utilizing quantitative analyses of depression metrics, comparatively with cataract grading is an understudied area. Cataracts are graded on a 1-4 scale with additional notes for location within the ocular lens. Cataract surgeries are often considered elective, with 3.7 million cases in the U.S. and 20 million worldwide. It's important to explore the relationship between these cataract surgeries and depression scores, to better gauge comprehensive, multifaceted care when formulating treatment plans. With the results shown in relation to cataract grading, ophthalmologists can reference the trends of depression scores when determining if any given patient's cataract is appropriately severe enough to warrant recommendation for cataract surgery.

Methods: The research will be collected by surveying participating patients with Beck's Depression Inventory at the time of cataract consultation, 1-month post-operative cataract surgery, and again 1-year post-operative cataract surgery. These results will be organized based upon the pre-operative cataract grading determined by their respective ophthalmologists. Grades will include the American Ophthalmologist Association approved 1-4, along with pseudo-grades of 0 and 5 to indicate clear lens cataract surgeries, i.e. lensectomies, and white cataracts respectively. Patient demographics may be noted but will not serve as topics of analysis. Datasets will be collected for one year and patients followed for one-year post-operative cataract surgery.

Results: Research has not been initiated; however, the term would be over the course of two years collecting data from community ophthalmic patient populations.

Conclusions:

#59: Physiological Biomarkers in Generalized Anxiety Disorder: Wearable Devices Integration

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Purpose: Diagnosis of generalized anxiety disorder (GAD) and other psychiatric conditions often suffers from low inter-physician reliability due to inherent limitations in clinical interviews. This study explores the potential of wearable devices to identify objective physiological biomarkers—heart rate variability (HRV), heart rate (HR), respiration rate (RR), and blood pressure (BP)—to improve diagnostic accuracy. By applying spectral and feature coupling analyses, we aim to distinguish anxiety episodes from non-anxiety states using discriminant analysis, validated against participant-reported events and concurrent diagnoses, supplementing existing DSM-5 diagnostic criteria for GAD. Real-time biofeedback analysis will allow GAD patients to receive timely assistance and insight during anxiety episodes. Additionally, diagnostic reliability may improve by utilizing objective measures over subjective self-report metrics.

Methods: Participants will use wearable devices to track HRV, HR, RR, and BP while marking the start and end of anxiety episodes via a mobile app, with options for retroactive marking. Feature extraction involves time-domain metrics (e.g., RMSSD, SDNN), spectral features (e.g., low-frequency and high-frequency power for HRV), non-linear metrics (e.g., entropy, Poincaré SD1/SD2), and cross-domain measures (e.g., HR-respiration phase synchrony). High-dimensional feature vectors will inform covariance matrices and principal components. A discriminant analysis model will classify states based on normalized features, validated against participant labels using metrics such as accuracy, sensitivity, and F1 score. Surveys will collect data on triggers, non-anxiety emotions, and contextual markers like exercise and sleep changes.

Results: Preliminary findings show significant physiological shifts during anxiety episodes, including increased HR, decreased HRV (lower RMSSD, higher LF/HF ratio), and elevated RR. Strong correlations were observed between anxiety events and HRV metrics like reduced SDNN and increased entropy. Respiratory coupling variability also appears heightened during anxiety episodes. Expected outcomes include a robust algorithm capable of accurately distinguishing anxiety episodes from baseline states.

Conclusions: This study provides a novel framework for understanding the physiological markers of anxiety and presents a potential pathway for enhancing GAD diagnosis reliability. By leveraging wearable technology for real-time detection, we envision a transformative tool for personalized anxiety management and self-intervention. This work lays the foundation for broader applications in psychiatric diagnostics, integrating accessible and cost-effective technology into mental health care strategies.

#60: Prevention of Non-Small Cell Lung Cancer Growth by Mushroom-Derived Antioxidant

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Purpose: Lung cancer is the leading cause of cancer-related deaths in the United States, exceeding the combined fatalities from colon, breast, and prostate cancers. In 2024, an estimated 234,580 new cases of lung cancer were diagnosed, with projections indicating a further increase in 2025. Risk factors such as smoking, the use of combustible tobacco products, and hereditary predispositions are risk factors for lung cancer development. Further, environmental exposures to substances like radon, asbestos, arsenic, air pollution, and various occupational hazards also increase the likelihood of developing this disease. There remains a critical need for additional therapies to improve lung cancer treatment with limited or no side effects. Vialinin-A, derived from edible mushrooms, is known for its antioxidant and anti-inflammatory properties. However, its role in preventing lung carcinogenesis is unexplored. Therefore, we investigated how Vialinin-A could inhibit lung cancer growth and spread.

Methods: Human Non-Small Cell Lung Cancer (NSCLC) cell lines (A549) were used to evaluate the chemopreventive effects of Vialinin-A. An MTT assay was performed to assess cell viability. Antibody arrays were used to measure pro- and anti-inflammatory proteins and apoptotic markers. Cell migration was analyzed using a scratch assay, and mitochondrial reactive oxygen species (ROS) levels were measured. Additionally, cell death was evaluated through a live-dead cell assay kit.

Results: Cell viability assay showed that Vialinin-A inhibited lung cancer growth in a dose- and time-dependent manner. Further, treatment with Vialinin-A also significantly increased the expression of apoptotic proteins, including Cleaved Caspase-3, cIAP-1, Claspin, SMAC/Diablo, and Clusterin in A549 cells. Vialinin-A also prevented EGF-induced cell migration and reduced EGF-induced ROS levels in A549 cells. Future studies will utilize nude mice xenograft models to investigate further how Vialinin-A prevents lung cancer growth in vivo.

Conclusions: Our findings suggest that Vialinin-A could inhibit lung cancer growth by promoting apoptotic signaling and reducing oxidative stress, thus indicating its chemopreventive role.

#61: Identifying Breathing, Swallowing, and Speech Biosignatures in Parkinson's Disease Patients with Wearable Devices

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Purpose: Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by movement, balance, and muscle control impairments, along with dysphagia and breathing and speech difficulties. Early detection of PD is crucial, as treatment interventions can greatly improve quality of life. We aim to advance PD screening by developing a novel wearable device capable of identifying different breathing, swallowing, and speech patterns during rest and exercise, to help guide clinicians on optimal intervention timing.

Methods: A wearable device will be developed at Brigham Young University to measure breathing, swallowing, and speech function. It will be validated in 10 healthy volunteers during rest and exercise. An observational study at Rocky Mountain University will test PD patients in Hoehn and Yahr stages 1–4 and age-matched controls. Participants will undergo an initial intake visit for baseline spirometry, including forced vital capacity (FVC), forced expiratory volume in one second (FEV1) and two seconds (FEV2), peak expiratory flow (PEF), and flow volume loops. Breathing frequency, tidal volume, and work of breathing (VE:VO2 and VE:VCO2) will be assessed at rest and during exercise using a K5 metabolic cart. Swallowing mechanics will be evaluated via video fluoroscopy and strain sensor patches. Speech function will be analyzed using the Pentax CSL, acoustic/aerodynamic measures, CAPE-V, and Voice Handicap Index-10.

Results: Although preliminary results have not been documented, previous research with similar methodologies has been shown to have positive outcomes. This device is expected to provide novel insights into PD etiology, improve early detection, and guide treatment plans for respiratory and swallowing dysfunction. Furthermore, we anticipate data from this study will enhance evidence-based medical practices related to PD.

Conclusions: This study aims to improve early detection and intervention in PD by developing a wearable device to identify breathing, swallowing, and speech patterns across Hoen Yahr stages. Results are expected to provide insights into PD etiology, improve screening, and guide treatment strategies. Future efforts will focus on using these advancements to improve quality of life, preserve functioning, and delay disease progression in individuals with PD.

#62: Neurocognitive Impacts of Migraine: Patterns, Phenotypes, and Potential Interventions

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Purpose: Migraine, a multifactorial condition affecting many systems including neurological, psychological, orthopedic, metabolic, and endocrine, presents with significant neurocognitive consequences. Beyond pain, migraines involve mechanisms such as cortical spreading depression, neuromuscular dysfunction, and inflammation, contributing to symptoms like increased neuronal firing, cortical spreading depression, inflammation, brain fog, hypersensitivities, and memory impairments. By identifying significant changes in neurocognitive performance during high migraine frequency and remission, both targeted therapies and migraine phenotypes can be linked to changes in neurocognitive performance. This study aims to investigate the relationships between phenotypical presentations, migraines, and neurocognitive function.

Methods: Neurocognitive performance in migraine patients (N=173) was assessed using Creyos evaluating 12 metrics, including episodic memory, visuospatial processing, and attention. Scores were compared to population norms to identify deficits and improvements following treatments such as chiropractic care, dietary modifications, posture aids, medications, and injections. K-means clustering was applied to identify phenotypic patterns, exploring associations with mental health, cervical pathologies, glucose regulation, and migraine severity.

Results: Preliminary descriptive statistical findings indicate multiple areas with below-average performance among migraine patients. Significant below-average metrics include episodic (q<0.001) and verbal short-term memory (q<0.001), visuospatial processing (q<0.001) and rotation (q<0.001), deductive reasoning (q<0.001), and attention ((q<0.001) and inhibition (q<0.001). Measures for working memory (q<0.001) and deductive reasoning (q=0.006) were found to be above average.

Using K-means clustering on these neurocognitive exam results, three distinctive phenotypes emerge: consistently low below average scores, consistently above average scores, and another group, who is average, except deficits in response inhibition and mental rotations. Studies are ongoing to consider a variety of factors (mental health diagnoses, cervical curve and pathologies, medications, aura, glucose regulation, and migraine severity) to investigate factors that may play into the development of these different phenotypes.

Conclusions: These findings indicate a significant negative relationship between migraines and neurocognitive performance. Further investigation with an extensive clustering model will provide information on the different factors that play into the severity of neurocognitive deficit in each domain. Understanding specific neurocognitive domains affected by migraines and the factors that cluster with different deficit phenotypes may guide more precise treatment methods.

#63: Investigating the Effects of Resveratrol on Opioid-Induced Hyperalgesia

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Purpose: Opioid-induced hyperalgesia (OIH) is an adverse effect of chronic opioid therapy, characterized by increased sensitivity to pain. There are several proposed mechanisms for OIH, most of which indicate the upregulation of nociceptive pathways. One such pathway is centered around potassium-chloride cotransporter 2 (KCC2) -- a membrane bound protein found in neurons that has many roles in cellular and synaptic functioning. Previous studies on rats have suggested that KCC2 is downregulated in those that express hyperalgesia. This study will seek to determine if increasing the expression of KCC2 in human subjects can alleviate the symptoms of OIH. There are currently no approved methods to directly manipulate KCC2 in human subjects. However, Resveratrol, a natural polyphenol, is known to activate the SIRT1 pathway, which reduces the expression of REST, a KCC2 inhibitor. The aim of this study is to increase KCC2 expression by inhibiting REST through the administration of resveratrol. This study has the potential to improve pain control in chronic pain patients, mitigate the risk of opioid abuse in patients using opioids, and reduce the side effects of high-dose and/or long-term opioid treatments.

Methods: This study will be a longitudinal, double blind, placebo-controlled trial consisting of one control and one intervention group. Sensitivity to mechanical and nociceptive stimuli will be measured using a battery of quantitative sensory testing (QST) techniques, including mechanical detection using von Frey filaments, mechanical pain threshold using pinprick stimulation, cold pressor test, and constant temperature heat block. Prior to the start of the study, average baseline sensitivity threshold will be established by performing QST on community members with no history of opioid use or chronic pain conditions. Participants will be patients selected from local area pain clinics who are currently on an opioid-based pain management plan and score lower on their initial QST than the baseline sensitivity threshold. After initial QST, the intervention group will take the dietary supplement resveratrol every day for six months, while the control group will receive placebo pills. QST will be repeated each month for the duration of the study, and results will be compared to participants' initial results.

Results

Conclusions

#64: The Oral-Gut Microbiome Axis: Implications for Systemic and Oral Health

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Purpose: The bidirectional relationship between the oral and gut microbiomes has gained attention for its role in systemic and oral diseases. Dysbiosis, or microbial imbalance, disrupts these ecosystems, leading to inflammatory conditions. This research investigates the connection between these microbiomes, focusing on microbial translocation, disease correlation, and targeted interventions such as probiotics or dietary modifications to restore microbial homeostasis and reduce disease incidence.

Methods: A literature search was conducted using PubMed, Scopus, and Web of Science. The search followed PRISMA guidelines, with inclusion criteria focusing on studies related to diet, dysbiosis, and microbial interactions between the gut and oral microbiomes. Peer-reviewed, human-based studies published from 2013 to 2023 in English were included. Data extraction involved categorizing studies based on diet-induced microbial changes, disease outcomes, and potential interventions.

Results: Out of 1,050 records, 47 studies met inclusion criteria. Of these, 34% focused on the effects of high-sugar, low-fiber diets on dysbiosis. Diets high in refined sugars were linked to increased pathogenic bacteria such as *Streptococcus mutans* and *Porphyromonas gingivalis* in the oral cavity and *Bacteroides fragilis* in the gut. In 22 studies, oral pathogens like *P. gingivalis* translocated to the gut, worsening inflammatory bowel disease (IBD). Gut dysbiosis, marked by reduced short-chain fatty acids (SCFAs), exacerbated periodontal disease in 68% of studies, and a 40% reduction in butyrate highlighted its role in immune regulation.

Conclusions: Evidence shows that the oral and gut microbiomes are intricately linked, with diet playing a pivotal role in promoting dysbiosis. Interventions like dietary changes and probiotics could restore microbial balance and reduce disease severity. Further research is needed to explore microbial translocation and assess the long-term impact of these interventions in managing diseases caused by dysbiosis.

#65: Diagnostic accuracy of Artificial Intelligence models in detecting Dental Caries in Photographs: A Systematic Review

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Purpose: The detection and management of dental caries is pivotal in dental practice. Traditional methods rely on visual-tactile examination supplemented by radiographs that are limited by subjective interpretation, radiation exposure, and inability to identify early-stage lesions. Today, the exponential growth of artificial intelligence (AI) in healthcare offers a paradigm shift in disease diagnosis and therapy. This systematic review examined the diagnostic accuracy of artificial intelligence models in detecting caries in intraoral photographs.

Methods: Scopus, Embase, Medline, and Web of Science databases were searched according to specific inclusion and exclusion criteria in June 2023. Data extraction and quality assessment were performed independently by two authors, with a third author consulted when needed. The quality of the studies was assessed using QUADAS-2.

Results: A total of fifteen studies with 50,301 intraoral photographs from 2,705 patients were included in this review. The majority of these studies showed some concerns with the risk of bias resulting in a low quality of evidence rating. Most studies reported considerable accuracy in the detection of caries using various AI models in terms of diagnostic accuracy of dental caries. Secondary outcomes were reported as classification accuracy, sensitivity, specificity, area under the curve, and precision in detecting dental caries with artificial intelligence models.

Conclusions: Based on the limited evidence available there is low-level evidence that artificial intelligence models can accurately detect caries in intraoral photographs. However, standardization in model training and validation are challenges that need to be overcome for consistent results and broader applicability. Further large-scale studies are necessary to validate these findings in real-world clinical settings.

#66: Accuracy of 3D printed surgical splints in orthognathic surgery: A systematic revie

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Purpose: This review evaluated the accuracy of the outcomes of digitally planned treatment with 3D printed splints compared to the digitally planned movement or the conventional procedures.

Methods: Studies that used virtual surgical planning and evaluated the error between the planned and realized post-operative movement were searched electronically. Studies that compared the error in virtual planning to that in conventional were also included. Quality of the publications was assessed using the RoB-2 tool and an adapted version of the QUIPS tool. The GRADE approach was used to rate certainty of evidence.

Results: The initial search yielded 208 results. Finally, 4 studies with 133 participants were included for data extraction. Two studies examined the error between planned and actual postoperative movements with virtual planning followed by rapid prototyping. They differences were insignificant. Two studies compared virtual and conventional methods and one found a significant difference favoring virtual planning.

Conclusions: The included studies presented concerns in their methods and thus definite conclusions were not made. Identified studies suggest that virtual surgical planning is acceptable for orthognathic surgical treatment planning, but further studies are needed to better establish its accuracy and compare the results to the conventional method.

#67: Risk of interproximal contact loss in implant-supported prosthesis

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Purpose: The review aims to evaluate the incidence, prevalence, and risk of loss of proximal contact between the implant-supported prosthesis and adjacent natural teeth.

Methods:

Results: The loss of proximal contact has recently gained a lot of attention. This involves the opening of proximal contact post-delivery of the prosthesis. The possible cause for this is still debatable. The option for which vary from mesial migration of teeth to continued growth of humans. The loss of this contact however leads to food impaction which in the future can cause marginal bone loss and peri- implantitis. Recent literature states that there is a prevalence rate of 41% making it a complication that needs more awareness. With the increasing incidence of proximal contact loss, it needs to be thought about before prosthetic rehabilitation, especially in partially edentulous cases. The management of this includes modification of the prosthesis or the adjacent tooth. Proper maintenance and periodic monitoring are very important to avoid the chances of proximal contact loss. However, in all cases, educating the patient about its possibility is necessary as it can decrease patient satisfaction.

Conclusions: Proximal contact loss can be considered a complication taking into consideration the negative effect it can have on the implant. However, there is a need for more studies to be conducted in this regard.

#68: Diagnostic accuracy of artificial intelligence models in detecting dental caries in photographs: A Systematic Review

Alia Chaudhry[1]

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Purpose: This systematic review examined the diagnostic accuracy of artificial intelligence models in detecting caries in intraoral photographs.

Methods: Scopus, Embase, Medline, and Web of Science databases were searched according to specific inclusion and exclusion criteria in June 2023. Data extraction and quality assessment were performed independently by two authors, with a third author consulted when needed. The quality of the studies was assessed using QUADAS-2.

Results: A total of fifteen studies with 50,301 intraoral photographs from 2,705 patients were included in this review. The majority of these studies showed some concerns with the risk of bias resulting in a low quality of evidence rating. Most studies reported considerable accuracy in the detection of caries using various AI models in terms of diagnostic accuracy of dental caries. Secondary outcomes were reported as classification accuracy, sensitivity.specificity, area under the curve, and precision in detecting dental caries with artificial intelligence models.

Conclusions: Based on the limited evidence available there is low-level evidence that artificial intelligence models can accurately detect caries in intraoral photographs. However, standardization in model training and validation are challenges that need to be overcome for consistent results and broader applicability. Further large-scale studies are necessary to validate these findings in real-world clinical settings.

#69: Evaluating the Effects of Injectable Platelet-Rich Fibrin on Accelerating Orthodontic Tooth Retraction: A Randomized Clinical Study

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Purpose: This study aimed to evaluate the impact of injectable platelet-rich fibrin (i-PRF) on anchorage loss and the rate of space closure during the retraction phase of orthodontic treatment.

Methods: Twenty-four participants with malocclusion requiring extractions and space closure were divided into two groups (n=12 each). Group A received i-PRF, while Group B did not. Space closure rate, anchor loss, and salivary enzyme activity were measured at T0 (baseline), T1 (3 weeks), T2 (6 weeks), and T3 (9 weeks).

Results: In Group A, maxillary space closure at T3 was 1.4 ± 1.9 mm (T0: 10.8 ± 3.01 mm), with anchor loss of 0.57 mm. Group B showed 4.9 ± 1.5 mm space closure at T3 (T0: 11.1 ± 2.0 mm) and anchor loss of 0.57 mm. In the mandible, Group A had 2.6 ± 2.0 mm space closure at T3 (T0: 9.5 ± 2.5 mm) with anchor loss of 0.325 mm. Group B reported 4.7 ± 2.3 mm space closure at T3 (T0: 10.0 ± 2.7 mm) and anchor loss of 0.37 mm. Space closure in the maxilla was statistically significant at T2 and T3, and in the mandible at T2. Anchor loss was statistically insignificant in both arches.

Conclusions: The experimental group demonstrated accelerated tooth movement compared to the control group; however, statistical significance was not observed in the mandible. No significant differences in anchor loss were noted between the groups.

#70: Treatment approaches for Immediate Implant placement in infected site: A Narrative Review

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Purpose: This paper aims to evaluate the survival of immediately placed implants in the infected site and discuss the various treatment approaches that can be followed to improve the rate of a successful outcome.

Methods:

Results: The presence of the infection has a negative effect on the process of osseointegration and often leads to early failure of implants. However, the increase in patient expectation in certain clinical scenarios has led the researchers to challenge the ambiguity of the placement of implants in infected sites. This has opened a variety of solutions in the replacement of missing teeth. However, the literature on the success and survival of such implants has contrasting opinions. Also, the protocols to be followed to achieve positive outcomes are indistinct. With multiple advancements in implants, it is necessary to be aware of the modification in treatment protocols to achieve osseointegration.

Conclusions: Even with the advancements in the field of implants in the last decade, the taboo on immediate placement in infected sites remains. Multiple systematic reviews have concluded that success rates greater than 92 percent are possible with implants placed in infected sites provided proper care and protocol are followed. Further long- term studies are needed to confirm and validate these findings before wider adoption of these practices.

#71: Intraocular Pressure Changes Associated with Psychological Stress or Anxiety in Both Healthy and Glaucoma-Diagnosed Patients

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Purpose: The purpose of this project was to review current literature and identify gaps in our knowledge surrounding intraocular pressure (IOP) and psychological stress/anxiety. Because IOP is a critical measurement in the diagnosis and treatment of glaucoma, all factors contributing to elevated IOP must be considered. Elevated IOP measurements may be attributed to psychological stress/anxiety, perhaps preceding a patient's eye appointment. An understanding of this circumstance is important for ophthalmologists in avoiding errors related to glaucoma diagnoses/treatments in both healthy and glaucoma-diagnosed individuals.

Methods: A search was conducted to identify current research related to IOP and psychological stress/anxiety. The following databases were used: PubMed, Medline, Embase, and Google Scholar. Main keywords in the search included intraocular pressure, psychological stress, anxiety, healthy, and glaucoma. Boolean operators were used to include relevant synonyms of keywords. The search was limited to studies between 2015 and 2025. Our target population was healthy or glaucoma-diagnosed individuals, so studies surrounding other eye diseases were excluded. The remaining publications were screened for relevance to the research topic.

Results: Of the 15 publications that were selected and reviewed, all 15 reported that induction of psychological stress/anxiety in both healthy and glaucoma-diagnosed individuals resulted in significant IOP elevation compared to control groups. In both healthy and glaucoma-diagnosed populations, there were no significant differences between age, ethnicity, or sex. IOP elevation appeared to be more pronounced in individuals already diagnosed with glaucoma compared to healthy individuals.

Conclusions: The current literature supports the idea that intraocular pressure is elevated in response to psychological stress/anxiety in both healthy and glaucoma-diagnosed individuals; however, more research is needed. Gaps in our understanding include how the percent change in IOP correlates with the intensity of the stressor, if chronic psychological stress/anxiety can speed the progression of glaucoma due to this effect, and if the percent change in IOP (resulting from psychological stress/anxiety) is different depending on the stage of glaucoma. Still, clinicians should consider the mental, emotional, and social contexts of their patients when measuring IOP. Individualized psychological stress/anxiety therapy may be helpful for patients in avoiding stress/anxiety-induced IOP spikes.

#72: Advancing Dental Education Through Technological Integration: Opportunities and Challenges

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Purpose: This review aims to examine the role of emerging technologies in transforming dental education. It explores their potential benefits, highlights examples of successful integration, identifies existing challenges, and discusses future strategies to enhance their adoption and optimize educational outcomes

Methods:

Results: Emerging technologies are reshaping dental education by providing innovative learning tools:

1. Digital Workflows

These systems streamline processes and enhance visualization, allowing students to engage in comprehensive, virtual learning experiences.

2. 3D Printing

This technology facilitates the creation of realistic dental models, enabling hands-on practice in a controlled environment and enhancing manual dexterity.

3. Simulation Platforms

Advanced simulators replicate clinical scenarios, offering students a risk-free environment to refine their techniques and gain confidence.

4. Artificial Intelligence (AI)

AI-powered tools provide tailored learning experiences, aid in diagnostics, and optimize educational efficiency through data analysis and predictive insights.

Challenges

* Cost and Accessibility: Many institutions face difficulties in acquiring and maintaining advanced technologies.
* Complexity: The steep learning curve can deter educators and students from adopting these tools.
* Infrastructure Requirements: Successful integration demands robust systems, including technical expertise and support.

Strategies for Implementation

* Simplify technologies and reduce costs through industry-academic collaborations.
* Create comprehensive datasets to support AI-driven applications.
* Provide educators with training and resources to enhance technology adoption.

Conclusions: The integration of advanced technologies has the potential to revolutionize dental education, providing students with enhanced learning experiences and better preparing them for clinical practice. Overcoming barriers such as cost and complexity is essential to ensure widespread adoption. Future efforts should focus on fostering global collaborations, expanding research, and addressing ethical considerations to maximize the benefits of technological innovation in dental education.

#73: Managing Extrinsic Stains in Primary Teeth: Causes and Solutions

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Purpose: The appearance of stains on primary teeth is a common concern that often leads patients to seek dental care. The increasing emphasis on aesthetics has fueled the proliferation of toothpastes and products with exaggerated claims of achieving "bright white" teeth. This article examines the causes of extrinsic stains in primary dentition and presents evidence-based strategies to address them effectively.

Methods: Extrinsic stains are categorized based on their source, causative factors, and visual characteristics. Factors such as diet, environmental exposure, inadequate oral hygiene, and the use of specific medications or antiseptics contribute to the formation of these stains.

Results: Black stains, often persistent and non-removable through brushing, are predominantly linked to bacteria like *Prevotella melaninogenica, Actinomyces israelii,* and *Actinomyces naeslundii*. These microbes produce hydrogen sulfide, which reacts with salivary iron to create ferric sulfide, resulting in discoloration. Brown stains arise from tannins found in dietary sources, while green stains are commonly caused by copper-containing mouthwashes. Effective treatment for extrinsic staining includes professional cleaning, polishing, and the use of whitening toothpaste with oxidizing agents like peroxide. Toothpaste formulations containing enzymatic agents, such as fungal proteolytic enzymes, or other compounds like papain, alumina, and sodium citrate, have demonstrated success in reducing external stains.

Conclusions: External bleaching is not suitable for primary teeth due to safety concerns. Dental professionals must educate caregivers on the causes of stains and emphasize preventive measures such as dietary adjustments, proper oral hygiene practices, and routine dental visits to minimize recurrence.

#74: Evaluating the Role of Vitamin D3 in Enhancing Post-Orthodontic Stability: A Randomized Controlled Study

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Purpose: This study aims to clinically assess the effect of locally administered Vitamin D3 on enhancing post-orthodontic tooth stability during the first three months following debonding.

Methods: Patients aged 15-30 years with dental malocclusion and moderate lower arch crowding (Little's score 4-6) were randomly assigned to experimental or control groups. Following alignment, the experimental group received a Vitamin D3 injection, while the control group received a placebo (saline with lignocaine). Fourteen days later, lower arch wires were removed from both groups.

Results: Relapse was consistently higher in the control group compared to the experimental group across all time intervals. Significant differences in relapse were observed at the T2 and T3 intervals, with the control group experiencing greater relapse. While inter-canine width, arch perimeter, and inter-molar width exhibited minor changes over the three-month period, no significant differences were noted between the groups.

Conclusions: Relapse occurred in both the control and experimental groups during the first 4 weeks of the study. However, the control group exhibited a higher relapse rate at the 8th and 12th weeks compared to the experimental group.

#75: Accessories and Bifurcations: A Cadaveric Case Study of Unilateral Accessory Renal Arteries

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Purpose: Recent findings from cadaveric case studies have heightened the awareness of anatomical variations in the renal vasculature. The clinical significance of multiple renal accessory arteries (RAAs) remains unclear; however, existing literature indicates associations with various health outcomes. This case study aims to further demonstrate the prevalence of RAAs and the extensive variations that exist.

Methods: A cadaveric dissection conducted at Noorda College of Osteopathic Medicine revealed atypical renal vasculature findings. To measure the dimensions, cotton strings were placed along the kidney and its vessels to duplicate their length, width, and diameter, in situ. The length of the strings was measured using a ruler, and measurements were verified by three independent observers. A camera was used to document the findings. All measurements were recorded in centimeters. The data was classified using the Cases system, which categorizes renal arteries by origin, insertion, and number of RAAs present.

Results: Upon dissection, a 95-year-old male presented with three right renal arteries: one main renal artery and two accessory renal arteries. The main renal artery originated from the abdominal aorta and bifurcated into a main renal artery superior branch, and a main renal artery inferior branch, with both branches inserting into the hilum of the right kidney. The first accessory renal artery, termed the anterior accessory artery, originated from the abdominal aorta, bifurcated into an anterior accessory superior branch, and an anterior accessory inferior branch, with both branches inserting into the hilum of the right kidney. The second accessory renal artery, termed the inferior accessory renal artery originated at the abdominal aorta and inserted into the hilum of the right kidney. The left kidney exhibited normal vasculature, with a single renal artery arising from the abdominal aorta and inserting into the hilum of the left kidney.

Conclusions: Multiple renal artery variations were discovered during routine dissection at Noorda College of Osteopathic Medicine. Classification of these anatomical variations using the Cases system demonstrated the right kidney with a main renal artery, type A, pattern II; an anterior accessory artery, type A pattern II; and one inferior accessory artery, type A pattern I.

#76: Beneath the Surface: A Deep Dive into Jaw Osteomyelitis

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Purpose: This literature review explores the association between comorbidities and osteomyelitis of the jaw aiming to provide evidence-based conclusions regarding this connection and its treatment.

Methods: A comprehensive database search was performed using PubMed, Google Scholar, Wiley Online Library and National Institute for Health Reviews. Titles and abstracts were screened based on predetermined inclusion and exclusion criteria. Identified published literature from 2007 to 2024 were exported into EndNote21. The imported set of records from each database were merged into one core database to remove duplicate records and to facilitate retrieval of relevant articles. The full texts of the selected articles were then evaluated to be included in the study.

Results: The literature review was of good quality with high yield findings and minimal bias. 25 of the studies met the inclusion/exclusion criteria in set scoping review. A positive correlation is seen in all studies examined between comorbidities and osteomyelitis. This infection is increased due to the frequent exposure of bone and loss of nutrients in the area from limited blood flow as well as minimal bone reconstruction from correlating comorbidities in specific populations.

Conclusions: Osteomyelitis of the jaw is more prevalent in individuals who have a comorbidity and an infection of the bone after surgery. Early prevention and diagnoses are critical to treating the infection with minimal negative repercussions.

#77: Myofunctional Arch Development in Primary and Mixed Dentition: A Literature Review

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Purpose: Myofunctional therapy, a therapeutic approach focusing on the correction of improper muscle functions and habits, plays a crucial role in pediatric dentistry. During the stages of primary and mixed dentition, proper orofacial muscle function is essential for optimal dental and facial development. Disruptions in these functions can lead to a variety of dental and orthodontic issues, including malocclusion, abnormal jaw growth, and airway obstructions. Addressing these issues early through myofunctional therapy can significantly influence the long-term oral health of pediatric patients. This study aims to assess the nature and effectiveness of myofunctional therapy in healthy pediatric individuals.

Methods: The review examines seven studies sourced from PubMed, Scopus, and ScienceDirect, representing research from China and Turkey, with an average sample size of 115.2 participants. The studies evaluate the effectiveness of various myofunctional therapies and appliances, including TK4 and hyrax devices, MRC appliances, and other functional approaches, in addressing conditions such as lip incompetence, mouth breathing, and malocclusions.

Results: Yang et al., 2022 used a detailed cephalometric analysis before and after treatment to determine effectiveness of the specific treatment. Additionally, the hyoid bone position was also evaluated before and after treatment (6). Zhang et al., 2021 utilized SNA and SNB measurements and molar relationships before and after treatment to evaluate which appliance exhibited the more beneficial outcomes (7). Koletsi et al., 2018 measured skeletal and dentoalveolar changes via cephalometric analysis and tongue and soft tissue measurements (2). Habumugisha et al., 2022 also utilized cephalometric analysis to determine outcomes of the different treatment groups, specifically SNA, ANB, and SN-GoGn were closely evaluated (1). Ling et al., 2020 measured preoperative and postoperative soft and hard tissue changes via lateral cephalometric radiographs/analysis (3). Tian et al., 2023 used cephalometric data and study models to evaluate treatment outcomes, the specific cephalometric points utilized were SNA, ANB, & SN-GoGn (5).

Conclusions: The findings from this review underscore the significant role of myofunctional therapy in promoting optimal arch development during the critical phases of primary and mixed dentition. Studies consistently demonstrate that integrating myofunctional interventions with functional appliances can effectively address common developmental issues such as lip incompetence, mouth breathing, and Class II, Division 1 malocclusions (6,7). Improvements in airway functionality and alignment of dentoalveolar structures highlight the importance of early intervention (1,5).

#78: Comparing the Efficacy of OMT for Somatic Dysfunction Versus the Spencer Technique Targeting the Glenohumeral Joint in Improving Shoulder ROM

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Purpose: The shoulder joint is one of the most mobile joints in the human body, playing a critical role in a wide range of daily activities and functional movements. However, shoulder dysfunction is a common cause of pain and disability, often arising from musculoskeletal imbalances, postural abnormalities, or injury, which can result in restricted range of motion (ROM). A decrease in shoulder ROM can be associated with a variety of factors, including joint stiffness, muscle tightness, and somatic dysfunction. These dysfunctions in adjacent structures such as the thoracic spine and ribs can limit normal shoulder mechanics and lead to discomfort, reduced function, and decreased quality of life. While the Spencer Technique targets the glenohumeral joint directly, osteopathic manipulative treatment (OMT) applies a more specialized, holistic approach, addressing somatic dysfunctions across interconnected regions. This study aims to compare the efficacy of utilizing OMT and the Spencer Technique in improving shoulder range of motion (ROM) using Dari Motion Capture (DMC). It is hypothesized that OMT addressing the ribs, thoracic spine and scapulothoracic region will yield significantly more improvement in shoulder ROM than using a targeted technique alone.

Methods: This randomized controlled trial involves participants with shoulder dysfunction, randomized into two groups. Both groups undergo a physical evaluation for somatic dysfunctions, followed by baseline ROM assessment using DMC. The control group receives Spencer Technique applied directly to the glenohumeral joint, while the treatment group undergoes OMT targeting unique somatic dysfunctions in the thoracic spine, ribs, and scapulothoracic regions. Post-treatment, participants in both groups are reassessed with DMC to measure changes in ROM. Quantitative data from DMC will be analyzed to determine the relative efficacy of the interventions.

Results: This study currently does not have any publishable results.

Conclusions: If the hypothesis is confirmed, these results would emphasize the interconnectedness of anatomical regions, and advocate for an osteopathic approach to clinical treatment.

#79: A Comparative Look at Current Clavicle ORIF Recovery Timeline

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Purpose: Studies are showing that adults with a clavicle fracture who allow it to heal on its own have an increased chance of malformation and functional deficits compared to surgery. So as surgery becomes more prevalent for a common injury, it is important to look at the recovery timeline for these patients.

Methods: I have looked at 21 different resources and documented their suggested recovery timeline. Using this I was able to find the most common timeline. Then I compared this against my own recovery timeline, as I have just gone through clavicle surgery.

Results: The actual recovery timeline can be moved up significantly.

Conclusions: Most of the resources are very conservative and some of this can be factored in with the age of the patient, but for those who are of a younger age and relatively healthy patient, should be able to recover much sooner than the current average timeline.

#80: Effect of multiple application of chlorhexidine chips in peri-implantitis treatment: A Systematic Review

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Purpose: This systematic review examined the adjunctive effect of multiple applications of chlorhexidine chips in the treatment of peri-implantitis.

Methods: Scopus, Embase, Medline, and Web of Science databases were searched based on specific inclusion and exclusion criteria in January 2023. Studies that evaluated the effects of multiple applications of chlorhexidine chips in the treatment of peri-implantitis were included. The primary outcome examined was pocket depth and bleeding on probing, with the secondary outcome being attachment level and gingival recession. Articles in languages other than English were excluded. Study quality was assessed based on the Cochrane Handbook for Systematic Reviews of Interventions Handbook guidelines and the ROB2 tool.

Results: From an initial search result of 27 papers, three studies that examined 370 subjects and 463 implants were included in the review. Two out of the three studies reported a statistically significant reduction in the pocket depth levels with the use of a chlorhexidine chip. Two studies demonstrated a statistically significant reduction in pocket depth levels. One of the studies reported a greater improvement in bleeding on probing levels with chlorhexidine chip placement. Two studies found a statistically significant gain in attachment levels with the use of chlorhexidine chips compared to the controls, and one of these studies also observed a significant decrease in gingival recession on repeated application of the chips. The overall risk of bias was high in two studies, while one study rated some concerns in the risk of bias.

Conclusions: Based on the limited evidence available, repeated applications of chlorhexidine chips may be an effective therapeutic intervention for peri-implantitis, with positive outcomes observed for pocket depth, bleeding on probing, attachment levels, and gingival recession. Further well-designed clinical trials adhering to reporting guidelines and using objective measures are necessary to establish the long-term effectiveness of this approach.

#81: Anxiety Reduction in Autism Spectrum Disorder Using Novel Deep-Pressure Cutaneous Stimulation Therapy

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Purpose: Autism Spectrum disorder (ASD) is a neurodevelopmental disorder that affects 1 in 36 children in the United States. Individuals with ASD are more likely to experience challenges with social interactions, sensory sensitivities and processing issues, and difficulty with change. This can often lead to anxiety, a common comorbidity with ASD. Heterodyned whole-body vibration (HWBV) has been shown to mitigate anxiety in opioid use disorder. We attempt to use similar methods, but with low frequency-based as well as tactile treatments to alleviate sensory-based anxiety symptoms in children with ASD.

Methods: A 10-week study will be conducted to test anxiety reduction in autism-spectrum disorders. A new child behavior checklist (CBCL) and Anxiety Scale for Children-ASD (ASC-ASD) will be acquired one week before therapy as baseline, as well as prior to each session, with the ASC-ASD reassessed during and after each treatment. Participants will wear a fitness tracker to measure biomarkers such as resting heart rate and variability, O2 saturation, sleep quality, and level of activity during the trial. The subjects will be immersed in a sensory bath and assessed by various biomarkers of anxiety across eight sessions. The sensory bath consists of a tank outfitted with four low-frequency emitters (LFEs) and filled with water and a gelatinous vibration-conducting substrate. These emitters will be programmed to induce vibrations at desired locations within the tank.

Results: While data collection is ongoing, previous studies on vibratory therapy and tactile therapy have shown promise in treating anxiety. We are currently reaching out to relevant facilities to recruit participants for this study. We anticipate gathering objective psychiatric survey assessments to have conclusive parameters regarding change in symptoms, quality of life, and functional levels with assistance from SQL database and statistical predictive analysis

Conclusions: While we have no conclusions yet, we anticipate that the combined modalities of tactile therapy and whole body heterodyned vibration will be a novel and effective approach to mitigate anxiety symptoms in patients with ASD. We also hope to further investigate mechanistic outcomes for application of large-scale studies and clinical system.

#82: Delayed Clinical Presentation with Testicular Masses, a Literature Review.

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Purpose: In a clinical setting, patient presentation of abnormal symptoms is usually necessary to discover and resolve their pathology. Often, delayed presentation, and thus delayed diagnosis, can cause worsening in the overall well-being of patients. This delay can frequently create irreversible pathology that could have been addressed had there been no delay in clinical presentation and diagnosis. This is the case with most pathologies, but we were most interested in testicular masses (TM). With this in mind, we conducted an extensive literature review to explore the reasons for delays in patient presentation to clinical settings among those later diagnosed with a TM.

Methods: This literature review sorted through relevant peer-reviewed review articles, case studies, and primary research articles, which were then compiled and summarized into a document with their DOI, article title, authors, year of publication, country of origin, variables/findings, and reason for delayed presentation. For the primary focus, we searched the following: “Testicular mass AND/OR Scrotal Mass.” To assess specific delay in clinical presentation, we searched: "Delayed presentation" OR "late diagnosis" OR "delayed diagnosis" OR "diagnostic delay," and to assess if these delays in presentation were due to various arbitrary issues, we searched: "Healthcare access" OR "socioeconomic factors" OR "psychosocial barriers" OR "COVID-19" OR "stigma" OR "financial constraints."

Results: This yielded 20 main articles that were compiled and deeply analyzed for this literature review. Through our literature review, we suppose that the delay in TM presentation may be due to various social, economic, and educational factors such as, but not limited to: Positive COVID-19 diagnosis, lack of a primary care physician (PCP), deficiency in parental awareness, shame or fear of TM location, financial constraints, poor self-esteem, and proximity to a health care clinic.

Conclusions: This literature review highlights a high frequency of delayed presentations for TM, and further work is needed to elucidate the reasons behind it to effectively combat these delays. For this, it is necessary that a research study be designed to assess a subset of the population on why delayed presentation for TM is occurring.

#83: Clinical Effectiveness of Biodentine in Adult Pulpotomy Procedures: A Systematic Review

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Purpose: Pulpotomy is a vital pulp therapy technique aimed at preserving partially affected dental pulp. Biodentine, a bioactive calcium silicate-based material, has gained attention for its dentine-like properties and ability to support pulp healing and regeneration.

Methods: A systematic search of Scopus, Embase, Medline, and Web of Science databases was conducted in March 2024. Only randomized controlled trials published in English that evaluated the clinical efficacy of Biodentine for pulpotomy in adult patients were included. Study quality was assessed using the revised Cochrane Risk of Bias tool (ROB-2) and the GRADE approach for evidence quality.

Results: Five studies were included, encompassing data from 390 teeth as reported in four trials. Two studies exhibited a high risk of bias, one had a low risk, and two were classified with some concerns. The evidence quality was rated as low due to the limited number of trials and issues with study design. Results indicated that Biodentine demonstrated clinical effectiveness comparable to other pulpotomy materials, including Mineral Trioxide Aggregate (MTA), TotalFill, and TheraCal.

Conclusions: The findings suggest that Biodentine is a viable option for pulpotomy in adults, with clinical outcomes comparable to traditional agents. However, the limited evidence underscores the need for additional high-quality, long-term studies to substantiate these results and further validate its use in clinical practice.

#84: Comparison of Fitzpatrick Skin Type Methodologies and Photographic Skin Color Assessment

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Purpose: Current methods of skin color assessment are limited; Fitzpatrick Skin Type is often used to categorize skin color but was developed to evaluate burning/tanning tendency. Moreover, there is no standard objective method to assess skin color in photographs, even though they are increasingly available for research. The objective of this research is to use color theory to develop and evaluate an objective method for skin color analysis in photographs and evaluate the overlap between Fitzpatrick Skin Type determined by participant questionnaire, visual categorization of photographs by investigators, and colorimetric analysis.

Methods: Cross-sectional population-based study. Data were obtained from participants from the Baltimore Longitudinal Study of Aging (BLSA) from February 2019 – March 2020. We evaluated the inter-rater reliability between two investigator's categorization of skin color and their colorimetric analysis. We also compared the overlap between categorization based on these two measures and Fitzpatrick Skin Type questionnaire.

Results: Data were available for 208 participants, 61% of whom self-identified as non-Hispanic White. Forty six percent of individuals identified as skin type V or VI based on Fitzpatrick Skin Type questionnaire; however, no participants were categorized as skin type VI through either colorimetric analysis or visual inspection. Inter-rater reliability was higher for colorimetric analysis (74%), than visual inspection (46%). There was a 26% overlap between categorization by questionnaire and colorimetric analysis, 15% overlap between categorization by questionnaire and visual inspection, and 24% overlap between visual inspection and colorimetric analysis.

Conclusions: Fitzpatrick Skin Type performs poorly to identify skin color. A simple method for color categorization of photographs is more reliable than investigator categorization by visual inspection.

#85: Zooming In: How Magnification Shapes Dental Students' Posture

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Purpose:
Poor posture during clinical procedures can contribute to musculoskeletal disorders, significantly impacting the health, well-being, and long-term careers of dental students. Magnification tools have gained popularity in dentistry for their ability to enhance visualization and precision during clinical tasks. This systematic review evaluates the effectiveness of magnification in improving the working posture of dental students during clinical practice.

Methods: A comprehensive search was conducted across Scopus, Embase, Medline, and Web of Science databases. Clinical studies investigating the impact of magnification use on dental students' posture were included. Risk of bias was evaluated using the RoB-2 and ROBINS-I tools, while the level of evidence was assessed following the GRADE approach.

Results: The initial search yielded 224 results, from which eight studies involving 277 students were included in the review. Seven studies reported that magnification positively influenced students' working posture, while one study found no significant difference. However, habitual poor posture among students may reduce the effectiveness of magnification in improving ergonomics. Galilean and Keplerian loupes were identified as more effective for posture enhancement compared to unaided vision or simple loupes. Most studies included in the review exhibited either some concerns or a high risk of bias.

Conclusions: Based on the limited evidence available, magnification in dental practice may lead to improved posture and ergonomics; however, the certainty of the evidence remains low. Further well-designed trials, following reporting guidelines and incorporating objective measures, are needed before establishing universal best practice guidelines.

#86: The Effect of using Platelet-Rich Fibrin with an Iliac Crest Bone Graft on Alveolar Bone Formation: A Systematic Review

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Purpose: Alveolar bone grafting in individuals with cleft lip and/or palate is commonly done using the iliac crest as the donor site. Platelet-rich fibrin is a platelet concentrate enriched with growth factors that can aid in bone formation. This review examines the effect of using this concentrate along with the alveolar bone graft on bone formation in individuals with cleft lip and/or palate.

Methods: This study was conducted as per the PRISMA guidelines. PubMed (MEDLINE), Scopus, Embase, and Web of Science were searched using appropriate search terms. Data was exported to EndNote online and duplicates were removed. Articles were screened and full-text reading of selected articles was done. Articles that satisfied the inclusion criteria were assessed. Data were extracted and the methodologic quality of the articles was evaluated with the Cochrane risk of bias tool.

Results: A total of 116 articles were obtained from the databases and 5 were included in the review. They studied the volume, percentage of newly formed bone, density, height, and width of the bone over time. All studies reported better outcomes on using platelet-rich fibrin with the graft but the results were not always significant. All studies show some concerns in the methodologic assessment.

Conclusions: Platelet-rich fibrin may have a beneficial effect on bone formation in the site of the alveolar cleft when used with the iliac crest graft. However, there is a need for rigorous long-term studies and clinical trials to provide more conclusive evidence.

#87: The Impact of Nicotine Pouches on Oral Health

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Purpose: Sharp increase in oral nicotine pouch (NP) use world-wide particularly in young adolescents poses oral and systemic health concerns. Although some of the NPs have recently received approval from FDA (Food and Drug Administration), there are many unknowns and there are 'no safe tobacco products. The purpose of this study is to understand the i) extent of NP use in young adolescents, and ii) health risks (oral-mucosal)) associated with the use of NP.

Methods: A literature search was conducted using PubMed, Scopus, and Web of Science. The search followed PRISMA guidelines with inclusion criteria such as, nicotine, nicotine products, nicotine pouch, user demographics that included peer-reviewed articles based on cross sectional and prospective studies. Our research also included FDA guidelines and tobacco product survey results.

Results: In 2024, 2.25 million middle and high school students reported the current use of any tobacco product, compared to 2.80 million in 2023. Although there was an overall decline in tobacco product use, youth NP use showed a slight increase, 1.5% in 2023 and 1.8% in 2024. The most common motivation factor for NP use was the available 'flavors' (31%). NP dependence score was significant at 7 using Fagerström Test for Nicotine Dependence" (FTND). In one study, the most frequently reported adverse effects were mouth lesions (48%), and sore mouth (37%). Another study reported oral mucosal lesion at level 1 (on a scale of 1 - 4) in 60% of the participants without gingival retraction. The overall adverse effects included nausea, dry mouth and dizziness.

Conclusions: Overall research on the impact of NP on oral health is limited. NP use leads to high nicotine dependence and self-reported oral lesions, gingival blisters, dry, sore mouth, and jaw pains were observed in the user. Further research is needed to understand the short-term and long-term impacts of NP on oral and systemic health.

#88: Glycemic Variability and Migraine: New Insights from Glucose Monitoring

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Purpose: Emerging evidence suggests that migraines may result from a metabolic mismatch between cerebral energy demand and supply, with links to hypoglycemia, fasting, GLUT1 transporter deficiency, and diabetes. Exploring plasma glucose levels and migraine activity may illuminate this metabolic interface and provide avenues for therapeutic interventions in migraine management.

Methods: Data from 65 chronic migraine patients (>8 migraines/month) were analyzed using continuous glucose monitoring (CGM) and oral glucose tolerance tests (GTT). Subjects were clustered into five groups based on GTT responses. Continuous glucose monitoring data was then analyzed in the context of these clusters and compared to 24 healthy controls using metrics such as Average Daily Risk Range (ADRR), percent out of range (POR), mean amplitude of glycemic excursion (MAGE), mean glucose excursion (MGE), mean of daily differences (MODD), Continuous Overall Net Glycemic Action (CONGA24), and low/high blood glucose indices (LGBI/HBGI).

Results: Clustering of glucose tolerance tests showed five distinct phenotypes in response: normal, diabetic, unresponsive, low, and general dysregulation. Compared to age and gender-matched standards of normal GTT response, all groups (except normal), had significant deviation at two hours (p<0.0001). Analysis of CGM data showed that all groups showed greater ADRR scores, and more POR (except low group) (p<0.05). Most groups (except low) demonstrated greater day-to-day (MODD) and within-day (CONGA24) glycemic variability (p<0.05), suggesting erratic glucose patterns. Hyperglycemia risk (HBGI) was higher in all groups except the low group (p<0.05), while hypoglycemia risk (LGBI) was elevated only in the general dysregulation group.

Conclusions: Chronic migraine patients displayed greater glycemic variability, lower glycemic control, and spent more time outside healthy glucose ranges across multiple metrics compared to controls. The identified GTT phenotypes highlight distinct glucose regulation patterns, suggesting different migraine-associated metabolic profiles. Further research will explore factors contributing to these phenotypes and their implications for migraine pathogenesis. These findings support the potential for targeted migraine treatments informed by glucose dysregulation patterns.

#89: Relationship between the oral microbiome and respiratory diseases.

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Purpose: This literature review aims to examine existing evidence showing the relationship between oral microbiome and respiratory diseases such asthma, pneumonia, chronic obstructive pulmonary disease (COPD), covid-19, and lung cancer.

Methods: For this literature review, a range of databases were used, such as Google search, PubMed, Web of Science, Springer and Frontier. The search strategy used was a combination of terms such as “oral microbiome”, “respiratory disease”, and “oral diseases”. Studies selected were published between 2020- 2025. Only English-language articles were considered for this research. I included cohort, case-control studies and cross-sectional analytical studies. Only studies investigating the association, correlation and impact of oral microbiome dysbiosis and respiratory diseases.

Results: Fourteen articles were used in this literature review. In analyzing these articles the following topics were identified, association between oral microbiome and asthma (2 articles), the oral microbiome and COPD (2 articles), the oral microbiome and lung cancer (4 articles), the oral microbiome and pneumonia (2 articles) and oral microbiome and covid-19 (4 articles).

Conclusions: The oral microbiome has a positive association with respiratory diseases. Studies suggest that dysbiosis in the oral microbiome due to conditions like periodontal diseases can have an adverse effect on lower airway diseases, causing the onset, progression, and exacerbation of respiratory diseases as pneumonia, asthma, and chronic obstructive pulmonary disease (COPD), lung cancer, and covid-19.

#90: Comparing Recovery Outcomes of ACL Reconstructive Surgery in Patients with and without Sports Psychology Support

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Purpose: Many patients experience anxiety after Anterior Cruciate Ligament (ACL) reconstructive surgery, often due to the fear of reinjury, loss of confidence, or stress about returning to prior performance levels. Addressing mental health and psychological barriers alongside post-operative physical recovery is crucial, as patients may feel physically ready but experience mental hesitation when attempting to resume normal activities. These psychological barriers can manifest as depression, anxiety, avoidant behavior, or fear of reinjury. Psychological interventions, such as cognitive-behavioral therapy and strategies targeting learned helplessness, could play a key role in improving recovery outcomes. This study proposes using retrospective methods to observe whether athletes recovering from ACL surgery that get psychological support vs those that do not participate in psychological support demonstrate a difference in outcomes at return to play post ACL reconstruction.

Methods: This will be a retrospective cohort study. A total of 40 athletes, aged 18-30 years, with ACL tears who completed physical therapy and were signed off to return to play will be recruited and divided into two groups (n = 20 per group). The first group will consist of athletes who received integrated sports psychology support during their recovery and return to play. The second group will include those who did not receive any sports psychology support during recovery or return to play. Athletes will be handed out two different psychological surveys. A PHQ-2/9 and a custom survey once the athlete receives clearance per return to play protocol. Data will be collected using a Patient Health Questionnaire (PHQ) and custom survey designed to evaluate functional recovery and psychological well-being.

Results: We anticipate that our findings will display a strong correlation between psychological barriers, such as anxiety and depression, and recovery outcomes in post-operative care. Specifically, we expect a linear relationship between higher levels of combined post-operative physical and psychological support with higher return to sports rates.

Conclusions: If confirmed, addressing biopsychological factors and barriers through integrated support may be critical in easing a successful return to sports after ACL injury. This can offer insight into enhancing return-to-play outcomes through the implementation of standardized psychological interventions.

#91: External Apical Root Resorption in Orthodontics

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Purpose: To provide an overview of the mechanisms, risk factors, and prevention strategies for EARR in orthodontics.

Methods: A narrative review of current literature was conducted. We focused on EARR-related findings, treatment-associated factors, and innovations in prevention. Key studies on interventions, and clinical strategies were analyzed to outline practical recommendations.

Results: Various factors are responsible for External Apical Root Resorption. High-force application, prolonged treatment, and extensive tooth movement, especially with extractions, significantly increase risk. Appliances such as the Begg technique have shown a 2.3-fold higher risk of EARR compared to edgewise systems. Extraction-based treatments increase the risk by 3.72-fold. The apical third is most susceptible due to cellular cementum composition and vascularization. Genetic polymorphisms in RANKL and IL-1β account for up to 64% of susceptibility. Practical recommendations for prevention focus on minimizing risk through optimized clinical protocols. These include using light, controlled orthodontic forces, limiting treatment duration, and preventing excessive movements such as round tripping. Pharmacological agents like bisphosphonates and RANKL inhibitors, along with low-intensity pulsed ultrasound, show potential in reducing EARR. Regular radiographic monitoring and tailored treatment plans for high-risk patients ensure early detection and prevention.

Conclusions: EARR is a multifactorial condition requiring a tailored approach to management. Early identification of high-risk patients through genetic screening, careful control of orthodontic forces, and innovative therapeutic interventions can reduce its impact.

#92: A Systematic Review of Recent Developments in Platelet-Rich Plasma Therapy in Hip Osteoarthritis: Variability in Protocols and Clinical Outcomes (2019–2024)

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Purpose: Hip osteoarthritis (OA) is a common condition with limited conservative treatment options. Platelet-Rich Plasma (PRP) has emerged as a promising minimally invasive therapy. This study synthesizes recent findings (2019–2024) on PRP's efficacy in hip OA, focusing on studies reporting WOMAC and VAS outcome measures to identify trends, limitations, and future research needs.

Methods: A systematic search of PubMed identified randomized controlled trials and systematic reviews investigating PRP for hip OA. Inclusion criteria required studies to report WOMAC and VAS outcomes. Data on PRP protocols (e.g., leukocyte content, injection frequency), follow-up duration, and patient demographics were extracted for analysis.

Results: Studies revealed significant variability in PRP preparation methods, including platelet and leukocyte concentrations, activation protocols, and injection timing. WOMAC and VAS outcomes showed consistent improvement in mild-to-moderate OA but limited efficacy in severe OA. Short-term benefits (3–6 months) were more pronounced than long-term outcomes (12+ months).

Conclusions: PRP can potentially manage hip OA, particularly in the early stages. However, protocol inconsistencies and limited long-term data highlight the need for standardized PRP preparation guidelines and extended follow-up studies. Future research should stratify outcomes by patient subgroups, such as OA severity and demographics, to refine clinical recommendations.

#93: Investigating Comorbidities and Heritability of Chronic Intractable Migraine with Reactive Hypoglycemia

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Purpose: Migraines affect roughly 20% of individuals in the United States, and the rate of resistance to abortive treatments is estimated to be as high as 30%. Despite this large population, relatively little is known about intractable migraines compared to other types of migraines. Our recent work indicates that reactive hypoglycemia is common among these individuals and that this specific phenotype appears to cluster in families. To investigate the heritability of this trait as well as comorbidities, we have taken pedigrees of individuals that fit this phenotype.

Methods: Pedigrees are being taken from individuals with chronic intractable migraine and reactive hypoglycemia who are being treated at the Migraine and Neurological Rehab Center (MNRC). Questionnaires have been used to determine information such as migraine frequency, triggers, comorbidities, and prevalence of traits in family members.

Results: Sixteen individuals (14 female, 2 male) presenting with intractable migraines at least 10 days per month have given pedigrees. The median age of onset was 15 years old, with only two individuals not having chronic migraines until after age 21. The most common triggers for migraines were stress (14 individuals) and dehydration (12 individuals). Fourteen of these individuals appear to experience hypoglycemia. Twelve experience trait anxiety, and nine have taken medication to manage anxiety or depression. Fourteen have a first-degree relative who also gets migraines, most commonly the biological mother (eleven of fourteen). Despite the high presence of hypoglycemic events, no individuals have been diagnosed with diabetes mellitus, and only three individuals have first-degree relatives with type 2 diabetes mellitus (T2DM). All but one individual have first-degree relatives with high anxiety levels.

Conclusions: The prevalence of chronic intractable migraines appears to be significantly higher in families of migraineurs than among the general population, with the biological mother most frequently affected. Most individuals admit that family members appear to have hypoglycemic events, but T2DM is rare among family members. All but one individual reported that they have at least one first-degree family member with trait anxiety. Additionally, emotional abnormalities including depression, bipolar disorder, and obsessive-compulsive disorder appear to be in high frequencies in these families.

#94: Unraveling the Connection Between Periodontitis and Urinary Tract Infections

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Purpose: Urinary tract infections (UTIs) are infections affecting various parts of the urinary system, while periodontitis is a chronic inflammatory condition of the tooth-supporting structures. Existing evidence highlights links between periodontitis and systemic diseases, including diabetes, cardiovascular conditions, and metabolic syndrome. Recent findings suggest a potential association between periodontitis and UTIs, with shared inflammatory processes and microbial factors possibly playing a role.

Methods: A comprehensive analysis of existing literature was conducted to examine the inflammatory and microbial pathways linking periodontitis and UTIs. Special emphasis was placed on the role of Porphyromonas gingivalis in systemic infection and its potential influence on urinary tract health.

Results: The evidence suggests that periodontitis and UTIs may share a common pathophysiological link, with periodontal pathogens potentially contributing to systemic inflammation and infection. Understanding these interactions is crucial for developing personalized therapeutic strategies and improving clinical outcomes for both conditions.

Conclusions: The evidence suggests that periodontitis and UTIs may share a common pathophysiological link, with periodontal pathogens potentially contributing to systemic inflammation and infection. Understanding these interactions is crucial for developing personalized therapeutic strategies and improving clinical outcomes for both conditions.
Keywords: inflammation, periodontitis, systemic diseases, urinary tract infections, personalized treatment

#95: A Comprehensive Literature Review on the Efficacy, Safety, and Applications of Stannous Fluoride in Oral Health

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Purpose: Stannous fluoride has been a new active ingredient in dentifrices that has gained more attention to serve as an alternative to our traditional approach of using sodium fluoride as the main active ingredient for caries prevention. The most notable differences in clinical application of stannous fluoride from recent literature has been its ability to act on multiple oral diseases in gingivitis/periodontitis, plaque formation, hypersensitivity, as well as caries prevention. This review investigates these claims and findings to assess its effectiveness as well as potential side-effects and risk factors in short term and long term usage. Additionally, this comprehensive analysis serves to assist dental practitioners with the most modern understanding of stannous fluoride application, discover knowledge gaps in its usage, and bring new potential for development of more alternative dentifrices.

Methods: The database of Pubmed was utilized to search for studies only within the last 25 years which were primary based clinical trials or randomized controlled trials involving human subjects. Key search words were “Stannous fluoride”, “SnF2”, “Tin fluoride”, “Tin(II) fluoride” to capture all articles possible. A total of 50 articles were found and then analyzed individually to determine relevance to this review. Only 33 articles fit the inclusion and exclusion criteria to analyze 5 key topics in clinical findings, gingivitis/periodontitis/gum health management, plaque/caries prevention, reduction in hypersensitivity, and mineralization/erosion effects.

Results: Research in progress

Conclusions: Research in progress

#96: A Systematic Review of Persisting Tissue Health Challenges Amid Insulin Delivery System Advancements: Continuous Subcutaneous Insulin Infusion (CSII) and Lipohypertrophy in Diabetic Patients

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Purpose: This systematic review aims to explore the association between continuous subcutaneous insulin infusion (CSII) therapy and the development of lipohypertrophy. Specifically, it examines how the reduced frequency of injection site changes with insulin pumps may contribute to localized tissue damage, potentially exacerbating existing lipodystrophic sites. Additionally, it identifies the potential impact of advancements in infusion set longevity on tissue integrity and the potential risks of prolonged use.

Methods: The study included a review of relevant literature obtained from PubMed, focusing on studies published in the past 15 years. Inclusion criteria consisted of clinical studies, cohort analyses, and systematic reviews that examined the relationship between CSII therapy and lipohypertrophy. Studies that did not provide sufficient data on infusion site management or those involving non-human subjects were excluded from the review.

Results: Evidence suggests that prolonged use of the same infusion site may propagate tissue damage, leading to impaired insulin absorption and glycemic control. Additionally, newer infusion sets with extended wear times may increase the risk of unnoticed tissue trauma, further complicating site health.

Conclusions: The review highlights gaps in current CSII therapy guidelines, particularly in standardizing site rotation frequency and emphasizing early detection of lipohypertrophy. Prolonged use of the same infusion site can exacerbate tissue damage, and newer infusion sets with extended wear times may increase the risk of unnoticed trauma. Updating clinical recommendations to address these issues could help optimize insulin therapy, prevent lipohypertrophy, and improve patient outcomes.

#97: Accessibility of pharmacists who can prescribe Hormonal Birth Control can lessen the burden felt by the increasing shortage of OB-GYNs in major metropolitan areas

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Purpose

Across the nation, shortages of Obstetricians and Gynecologists (OB-GYNs) and changes in legislation have resulted in decreased access to reproductive healthcare. Previous research identified the 33 US states in which pharmacists receive training and education to safely provide hormonal birth control to eligible patients in community pharmacies and clinics, thus providing a resource to patients who may otherwise be unable to access contraceptives. This study aimed to build upon research by more closely identifying the metropolitan areas with the greatest OB-GYN shortages where pharmacists can help fill the gap.

Methods

The researchers conducted a literature review comparing the national anticipated shortage of Ob-gyns in relation to pharmacists' ability to prescribe hormonal contraceptives across the United States. A thorough search in June of 2024 using PubMed and Google Scholar, focusing on recent and relevant studies using keywords "Pharmacist prescribing abilities", “OB-GYN shortages” and "hormonal contraceptives". Studies offering clinical insights and current information within the last 8 years were included. Articles not from the last 8 years, lacking full text, or irrelevant were excluded. The construction of data involved identification and organization of trends in provider shortages in major metropolitan areas.

Results

Following data collection, a descriptive analysis was utilized. The original results of pharmacists prescribing hormonal contraceptives were 14,300 articles. This was narrowed down to 5,520 when limited to studies in the USA between the years 2016 to 2024. This was then narrowed even further to 196 results when adding a focus on OB-GYN shortages. Working through the articles the researchers found that in the metropolitan areas with older OB-GYNs and higher workloads, there was a greater risk of hindered access to these healthcare providers and shortages of OB-GYNs noted. Ten areas with a higher risk of OB-GYN shortages were identified: Las Vegas, Nevada; Los Angeles, California; Miami, Florida; Orlando, Florida; Riverside, California; Detroit, Michigan; St. Louis, Missouri; Salt Lake City, Utah; Sacramento, California; and Tampa, Florida. Of these, the 6 states allow pharmacists to prescribe hormonal contraceptives, thus providing pharmacist accessibility of prescription birth control in Nevada, California, Michigan, and Utah.

Conclusions

Pharmacists' ability to prescribe hormonal contraceptives is legal in 33 states. As 93% of Americans live within 5 miles of a community pharmacy, pharmacists are well-positioned to provide services to address gaps in healthcare due to shortages and patients’ limited access to reproductive healthcare providers. This study shows that an adequate supply of trained pharmacists could increase access to prescribing, dispensation, and education of contraception to eligible patients in 60% of the metropolitan areas with the highest shortage risk. Future studies are warranted to identify rural and underserved areas and best practices for the expansion of pharmacist prescribing rights.

#98: Impact of Nicotine Pouches on Oral Health: A Comprehensive Analysis

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Purpose

Nicotine pouches are gaining popularity as smokeless alternatives to traditional tobacco, yet their impact on oral health remains under-researched. This study aims to assess the oral health effects of nicotine pouches, including delayed wound healing, graft and implant failure, gum recession, periodontitis, and oral cancer.

Methods

A systematic literature review was conducted, focusing on articles published within the last 10 years due to the relatively recent emergence of nicotine pouches. The review incorporated peer-reviewed studies, clinical trials, and meta-analyses retrieved from databases such as PubMed, Scopus, and Google Scholar, using key search terms such as “nicotine pouches,” “oral health,” “gum recession,” “flavoring agents,” and “periodontitis.” Inclusion criteria covered studies that explicitly examined the relationship between nicotine pouch use and oral health outcomes, while exclusion factors included articles lacking specific data on oral health outcomes or those older than 10 years. As nicotine pouches are a recent development, no strict timeline was applied; however, all articles fell within the last decade to ensure a comprehensive review of current evidence without omitting relevant findings.

Results

The analysis revealed a strong correlation between nicotine pouch use and detrimental oral health outcomes, including delayed healing, higher risk of periodontal disease, and potential DNA alterations from flavoring agents. Furthermore, the findings suggest that the frequent use of nicotine pouches may accelerate the progression of gum recession and exacerbate pre-existing oral conditions. These risks underscore the need for targeted public health initiatives and more comprehensive clinical guidelines to address the growing prevalence of nicotine pouch use.

Conclusions

Greater public health awareness and clinical education are essential to addressing the risks posed by nicotine pouches, especially among younger demographics. Future studies should focus on long-term clinical research and regulatory measures, with an emphasis on mitigating risks associated with flavoring agents.

#99: Enhancing Pediatric Endodontic Care: Analyzing Referral Patterns for Root Canal Therapy and Utilization of Vital Pulp Therapy

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Purpose

This study investigated consultations for root canal therapy (RCT) in pediatric patients referred to a university-based Advanced Education in General Dentistry (AEGD) program in the United States, focusing on the utilization of vital pulp therapy (VPT) in private general dentistry clinics

Methods

A retrospective review analyzed pediatric patients aged 6–17 years referred to AEGD clinics between February and August 2024 for endodontic treatment of carious permanent teeth. Data collected included demographics, tooth type, pulp condition, and treatment status. Descriptive statistics summarized referral patterns and outcomes.

Results

Among 154 referred patients, 96.8% (n=149) were Medicaid beneficiaries. A total of 247 teeth were evaluated, with molars comprising 74.1% of referrals. Pulp vitality testing revealed 41.3% of teeth had healthy pulps, 16.6% had reversible pulpitis, and RCT was indicated in only 37.2% of cases. Treatment completion reached 53.4% by November 2024, while 9.3% of patients did not proceed with recommended care.

Conclusions

More than half of the endodontic referrals were potentially unnecessary, highlighting gaps in diagnostic accuracy and reliance on secondary care. Addressing these challenges requires enhanced general practitioner training in VPT for young permanent teeth, improved Medicaid reimbursement rates, and systemic support for underserved pediatric populations. These steps can improve care delivery, reduce treatment barriers, and optimize resource utilization for vulnerable groups

#100: Timing of Treatment for Patients with Enlarged Maxillary Labial Frenums

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Purpose

The maxillary labial frenum (MLF) is a connective tissue attaching the upper lip to the maxillary alveolar process. Its morphology varies significantly among individuals and is most prominent during early childhood. A hypertrophic or low-attaching frenum is sometimes implicated in functional and aesthetic concerns, such as diastemas, feeding difficulties, and speech problems. While the timing of treatment has been debated for some time, there has been no causal evidence that early intervention may preemptively address functional impairments. Premature treatment is highly associated with regrowth and higher risk of surgical complications, including scarring and orthodontic relapse.

The maxillary labial frenum's function is to stabilize the lip but some variations in the MLF can lead to clinical concerns. Particularly, an enlarged maxillary labial frenum can create a space between the upper central incisors called a diastema. An abnormally prominent or attached frenum may exert tension on the gingiva and inhibit the natural closure of a diastema, especially when the attachment is deep into the interdental papilla or the palatal mucosa. When the frenum is wide or thick and attaches into the interdental papilla or further, it can create a pulling force that prevents the central incisors from converging during development. The frenum may prevent diastema closure, even with orthodontic intervention, until it is addressed surgically or naturally diminishes with age. Understanding optimal timing for intervention and establishing a consistent approach to management can improve patient outcomes.

Methods

A systematic review was conducted, utilizing fifteen peer-reviewed articles published in PubMed, the National Institute of Health database, The Reference Manual of Pediatric Dentistry, The American Academy of Pediatrics and more. Articles were selected using the keywords frenum, frenulum, frenectomy, maxillary frenum, and labial frenum. Date of publication ranged between 2020 and 2024, with one source from 2012.

Results

The timing of treatment for a MLF has been a subject of debate, influenced by factors such as age, functional impairments, and orthodontic considerations. Current evidence supports a conservative approach, suggesting that intervention should generally be delayed until natural growth changes have occurred unless significant clinical issues necessitate earlier action. In most individuals, the MLF undergoes natural regression with growth, often migrating apically during maxillary development. This regression reduces its prominence and resolves associated diastemas in many cases without intervention. Studies highlight that surgical procedures during infancy or early childhood are rarely warranted, as abnormalities often self-correct with growth. For infants and young children, in cases where feeding difficulties arise, clinicians are advised to rule out other causes, such as nasal or airway obstruction, before considering frenectomy. Research indicates no direct correlation between frenum attachment and breastfeeding problems, further supporting a conservative approach in infancy. Studies recommend postponing frenectomy until after the eruption of permanent maxillary canines. In most cases, this eruption occurs between the ages of 9 and 12 with some variability. This allows for natural resolution of diastema in many cases and avoids premature surgical intervention that might lead to orthodontic relapse due to scarring.

Conclusions

Optimal timing for maxillary labial frenectomy is generally after the eruption of the permanent maxillary canines which usually occurs between the ages of 9 and 12. This timeline aligns with the natural regression of the frenum. It allows for spontaneous or orthodontically guided closure of diastemas. When surgical interventions are performed prior to significant dental and skeletal growth, there is an increased risk of premature scarring and potential orthodontic relapse. As evidenced by studies showing high rates of natural diastema closure with proper orthodontic guidance. Evidence indicates that many cases resolve without intervention as the frenum migrates apically during maxillary development. Although rare, severe functional impairments such as feeding difficulties or speech impairments, may necessitate earlier treatment. Such cases should be carefully evaluated. Pediatric specialists emphasize that alternative causes for these problems, including airway obstructions, should be ruled out before considering frenectomy. Importantly, the use of laser-assisted frenectomy has further optimized outcomes, allowing for precise and minimally invasive procedures, though the timing of intervention remains critical. Delaying frenectomy until orthodontic intervention can ensure the diastema is closed and retained without tension from the frenum. This approach minimizes complications and aligns with the developmental milestones of the oral cavity, ultimately providing the most stable and predictable outcomes for patients. Thus, in most cases, surgical intervention should occur after eruption of maxillary canines for optimal dental and functional development.

#101: Dysbiosis of the Oral Microbiome and Pathophysiology of Pregnancy Complications

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Purpose

This literature review aims to examine the physiological mechanism by which pathogenic oral bacteria translocate from the oral cavity to the fetus during pregnancy.

Methods

For this literature review, a range of databases were used such as Scopus, PubMed, and Web of Science. The search strategy used was a combination of terms such as “Dysbiosis”, “Pathogenic Oral Bacteria”, “Pregnancy Complications”, “Pathophysiologies” and “Oral Health”. Studies selected were peer-reviewed; human-based studies published from 2019 to 2024. Only English-language articles were considered for this research. All studies included for data extraction were categorized based on bacterial translocation to the fetus during pregnancy, roles of different oral pathogens in influencing pregnancy outcomes, socioeconomic and behavioral factors on the relationship between oral health and pregnancy outcomes, genetic predispositions and epigenetic changes, proposed mechanisms of pathogenesis, individual variation influences like the severity of gum disease, gestational stage, and individual health status and lastly potential interventions.

Results

Out of 109 records, 48 studies were used in this literature review. In analyzing these studies the following topics and number of articles pertaining to the respective topic were identified: (4) nonsurgical periodontal therapy, (8) maternal oral health/ individual health status and pregnancy complications, (15) patterns of microbial colonization in pregnant women, (1) potential diagnostic tools for periodontitis and pregnancy complications, (3) roles of different oral pathogens in influencing pregnancy outcomes, (3) interprofessional collaborations and guidance on oral health during pregnancy, (12) pathophysiological mechanisms of oral disease, and (2) genetic predispositions and epigenetic changes. 34% of the articles focused on the metabolic, hormonal, and immunologic changes during pregnancy that alter the microbial composition of the oral cavity to pathogenic bacteria such as, Fusobacterium nucleatum and Porphyromonas gingivalis. 12 studies proposed different mechanisms of pathogenesis which included hematogenous spread of the oral and gut cavity, in addition to vaginal ascension; all of which were associated with inflammatory and infection induced pregnancy complications. Other identified risk factors to alter the oral microbiome included smoking, substance abuse, depression, and hygiene practices.

Conclusions

Evidence shows that the oral microbiome is a crucial component to systemic health, especially concerning pregnant women and the health of their unborn fetus. During pregnancy several changes naturally occur hormonally, metabolically, and immunologically which increase susceptibility to oral microbiome dysbiosis or oral disease. Depending on the severity of gum disease, the accompanying inflammatory patterns have been correlated to several pregnancy complications like low birth weight and miscarriage. Our findings suggest that oral health management may be critical in mitigating risks associated with maternal-fetal transmission of pathogenic bacteria, emphasizing the need for interdisciplinary approaches in prenatal care. Understanding these gaps is essential for developing comprehensive strategies to improve maternal and fetal health through better oral care.

#102: Anesthesia and Pain Management in Conflict-Affected Regions: Addressing Global Health Barriers to Access and Quality of Care

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Purpose

Conflict areas present unique challenges to providing adequate anesthesia and pain management, further complicated by damaged infrastructure, a scarcity of resources, and security threats. In such settings, creativity is required to reduce suffering and improve surgical outcomes. Besides being lifesaving interventions, anesthesia and pain management are also heavily weighted in the scale of respect for human dignity and in providing equal access to care. This manuscript reviews such challenges and presents solutions tailored to the unique situations in such conflict areas. They range from barriers to access—such as limited medication availability—to workforce and infrastructural constraints that compromise continuity of care. It is also of major concern to address ethical matters relating to resource allocation, informed consent, and the protection of the healthcare providers delivering care in these settings. Such ethical issues need safety, equity, and cultural competency frameworks to address these challenges.

We outline pragmatic solutions to these challenges, including task-shifting, mobile clinics, and leveraging of local resources. The presence of global health initiatives and organizations underscores the need for cooperation in overcoming these structural barriers. Advancements in portable anesthesia machines, telemedicine, and ketamine-based anesthesia provide adaptable solutions for poorly resourced settings. This evaluation brings to light the special needs of other at-risk populations, including obstetric, neonatal, and pediatric patients, whose care entails focused and specialized attention.
This study will attempt to provide evidence-based recommendations to improve anesthesia and pain management practices in conflict zones, while calling for international collaboration through persistent advocacy and financial investment in education, with a view to ensuring fair and efficient healthcare for the most vulnerable populations of the world.

Methods

This manuscript is based on a comprehensive review of existing literature and case studies to evaluate the challenges and solutions for anesthesia and pain management in conflict zones. Resources include peer-reviewed journals, reports from international organizations, and data from healthcare initiatives in resource-limited areas. Key regions of focus include barriers to access, examples being shortages of anesthetics and medical personnel, and ethical dilemmas like resource allocation and informed consent. The analysis focuses on examples from recent conflict zones and disaster-affected regions to provide evidence-based insights. Innovative strategies and global health interventions were examined for their practicality and effectiveness in low-resource environments. Special attention was given to advancements such as portable anesthesia machines, ketamine use, telemedicine platforms, and mobile clinics. The needs of at-risk populations, including obstetric, neonatal, and pediatric patients, were also assessed to ensure recommendations address diverse healthcare demands.

Results

The study reveals that there are major challenges to anesthesia and pain management in these conflict areas. Such as anesthetic medications, trained healthcare providers, and functional infrastructure that is needed to support the patients. The absence of basic monitoring devices and restricted availability of safe operating theaters also pose challenges to care provision. Some of the ethical issues identified included unfair distribution of resources and difficulties in getting informed consent from the participants.

However, some challenges have been observed in the implementation of the above strategies, but some innovations have been observed to have potential. Ketamine is a dependable anesthetic in low-resource environments because of its flexibility, safety, and capacity to allow the patient to breathe without assistance. Some of the portable technologies include oxygen concentrators, handheld ultrasound devices, and video laryngoscopes that have enhanced surgical and trauma care in the field. Telemedicine and mobile clinics have helped to provide consultations and continued care in areas that are hard to reach. Also, task-shifting and training programs for mid-level providers have assisted in the shortage of anesthesiologists and anesthetists.

The WHO and MSF continue to be involved in the provision of the required support and cooperation with the local healthcare systems. These interventions, coupled with continued advocacy and funding, have shown that there are scalable solutions to fill the gaps in anesthesia and pain relief in conflict-affected settings.

Conclusions

The provision of sufficient anesthesia and pain management in conflict zones is essential for improving health outcomes and alleviating suffering. This article highlights the myriad challenges—stemming from insufficient resources, security complications, and ethical dilemmas—that obstruct the delivery of care. Addressing these barriers requires a collective effort involving innovative solutions, global collaborations, and ethical frameworks designed to guarantee equitable access to care.

The ethical dilemmas examined, such as resource distribution and the need for informed consent, underscore the importance of embedding fairness and cultural sensitivity into healthcare delivery. Scalable strategies like task-shifting, mobile clinics, and regional anesthesia aim to meet the urgent demands of low-resource environments. Recent advancements, including portable devices and ketamine-based anesthesia, have shown significant potential in bridging care gaps, though their implementation must account for local contexts.

Global health initiatives, such as WHO and MSF, continue to play a critical role in fostering partnerships and advocating for sustainable investments in healthcare systems. Equally important is the focus on special populations, whose care requires tailored interventions and collaborative efforts. Continued advocacy, funding for education and training, and research to enhance the safe administration of anesthesia in resource-constrained settings are essential. Through these efforts, global collaboration can transform these challenges into meaningful, sustainable healthcare solutions for underserved populations.

#103: Efficacy of Osteoporosis-Education in Rural Populations

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Purpose

Historically, geriatric populations have experienced inadequate education in navigating the U.S. medical system, emphasizing the importance of targeted education to improve health outcomes. With osteoporosis, there is an overall lack of understanding about the diagnosis, fracture risk, treatments, self-management, and follow-up care once it is diagnosed. According to the 2017-18 NHANES data, 12.6% of adults over 50 years of age have osteoporosis and 43.1% have low bone mass (2). In addition, hip fractures are a devastating risk, particularly in Utah, where nursing home residents experience a high incidence of hip fractures (3).

Methods

An osteoporosis curriculum covering topics of prevention, diagnosis, and treatment was developed under the guidance of a board-certified geriatrician to bridge the gap in public knowledge. Group-based presentations were given by medical students to over 250 citizens in designated low-income Health Professional Shortage Areas (HPSA) across Utah, Summit, and Wasatch County, and all participants were invited to complete a pre- and post-presentation survey, as well as a 1-month follow-up survey. Survey questions gauged the level of understanding of the disease, risk factors, prevention methods, screening tests, as presented in the curriculum, as well as questions to gather information on what resources were currently being used by participants to find health-related information. These surveys assessed the efficacy of the educational intervention provided by medical students.

Results

The comprehensive curriculum has been presented at ten locations with over 250 attendees, 108 of whom completed surveys. Pre- and post-assessment results showed a slight improvement in quiz performance. Before the sessions, only 16% of participants had used NLM resources, and newspapers and Google were the most common sources of health information. Post-education surveys indicated that 76% of participants learned something new, and 81% felt more comfortable speaking with their provider. Of the twelve individuals who completed a one-month follow-up, 9 took steps to reduce falls and change their diet, and 4 contacted their provider about osteoporosis.

Conclusions

Survey results showed improved understanding of the disease, risk factors, and prevention, but additional presentations are needed to determine if the curriculum is an effective intervention to teach elderly individuals about osteoporosis.

#104: Periodontal Disease Associated with Smoking: A Literature Review

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Purpose

In this literature review, the association between smoking and periodontal disease is examined, stressing the significant influence of tobacco use on oral health. Often caused by several risk factors, smoking is one of the main causes of periodontal disease, a worldwide widespread issue compromising the gums and resulting in inflammation and damage of the tooth supporting tissues.

Methods

This review combines findings from multiple peer reviewed clinical studies and research articles which demonstrate the impact smoking has on aggravating the process of periodontal disease and further intensifying its effects through biological processes like altering the oral microbiota, impairing the immune system response, and reducing the blood flow to the periodontal tissues.

Results

Furthermore, included in the study are the many effects on periodontal health outcomes of various smoking patterns including frequency and duration of use. These results highlight the need of focused treatments to lower the problems connected with smoking and improve dental health.

Conclusions

By combining current research, this study aims to inform lawmakers and healthcare professionals about the significant relationship between smoking and periodontal disease, therefore motivating increased awareness and preventative actions in both dentistry and public health campaigns.

#105: Exploring the Potential of Oncolytic Viruses as a Novel Therapeutic Approach for Breast Cancer Treatment

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Purpose

The objective of this study is to meticulously evaluate the safety and efficacy of oncolytic virotherapy in patients diagnosed with breast cancer.

Methods

For this literature review, various databases, including PubMed and Scopus, Web of Science, and Cochrane Library, were utilized to gather relevant information. The search strategy involved a competent combination of key terms, such as “Oncolytic Viruses,” “Oncolytic Virotherapy,” “Breast Neoplasms,” “Breast Cancer Lymphedema,” and “Triple Negative Breast Neoplasms.” The studies selected for review were published between 2018 and 2024, and only articles in English were included to ensure comprehensibility.

Results

A total of twenty-three scholarly articles were analyzed for this literature review. Most selected studies were designed as clinical trials or experimental investigations utilizing only human or human cell lines. Several key insights were identified during this literature review: Oncolytic virotherapy significantly changes the tumor microenvironment, Combination of oncolytic virotherapy with neoadjuvant chemotherapy increases favorable responses compared to patients treated with chemotherapy alone. Side effects are mild compared to other cancer therapies. This innovative approach, based on the use of oncolytic viruses, leverages the ability of these viruses to selectively target and destroy cancer cells via a process known as oncolysis.

Conclusions

Significantly, oncolytic virotherapy is a nascent treatment modality that can replicate precisely within tumor cells while sparing normal healthy cells from harm. This selectivity positions oncolytic virotherapy as a compelling new avenue in the fight against breast cancer

#106: Geothermal Microbial Ecosystems: Decoding the Bacteriome of Utah's Fifth Water Hot Springs

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Purpose

The purpose of this research is to characterize the bacterial diversity of Fifth Water Hot Springs, identifying microbial communities and their potential ecological roles, with a focus on understanding adaptations to geothermal environments and assessing implications for environmental health and water quality.

Methods

Bacterial diversity was analyzed using water and sediment samples from Fifth Water Hot Springs. DNA was extracted, amplified via 16S rRNA gene sequencing, and processed using bioinformatics tools to identify microbial taxa. Environmental parameters, including temperature and pH, were measured to correlate microbial composition with geochemical conditions of the springs.

Results

The analysis revealed diverse bacterial taxa dominated by sulfur-oxidizing, thermophilic, and hydrogen sulfide-producing species. Variations in microbial composition correlated with temperature and pH gradients. Key genera included *Thiobacillus, Thiothrix,* and *Sulfurivorans*. The findings highlight the role of environmental conditions in shaping microbial communities within Fifth Water Hot Springs and the possible relationship to the health of the community near the hot springs.

Conclusions

Our study of the Fifth Water Hot Springs bacteriome highlights its diverse microbial community, shaped by extreme environmental conditions. This foundational insight into microbial ecology underscores the ecological significance of extremophiles in recreational hot springs and provides a basis for future research into run off of these bacterial species into the rivers of Spanish Fork, Utah.

#107: Effects of Lifestyle, Sense of Belonging, and Frame of Mind on Happiness: A Correlational Study on Roseman Healthcare Students

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Purpose

This study in progress aims to investigate the relationships between lifestyle, sense of belonging, and frame of mind on happiness among healthcare students at Roseman. While various individual studies have examined the role of different factors separately in influencing happiness, there is limited research on combined effects of various factors that influence happiness. The research Dr. Awan and I will be conducting seeks to fill that gap by surveying students from various programs, including nursing, pharmacy, dental, and master's programs at Roseman. The goal of the study is to determine whether there is a significant correlation existing between lifestyle, sense of belonging, and frame of mind on happiness. By identifying common factors associated with student happiness, the study intends to provide data that can be applied to improve a student's overall quality of life. The results could further contribute to academic discussions on happiness while at the same time offering strategies to provide students with a positive environment in their academic institutions.

Methods

This ongoing study uses a quantitative correlational approach to assess the relationship between lifestyle, sense of belonging, frame of mind, and happiness among healthcare students at Roseman University. The data will be collected through an online survey distributed to students in pharmacy, dental, master's, and nursing programs. The survey includes 24 questions, and they are all measured through a Likert-scale, with six questions each covering lifestyle, sense of belonging, frame of mind, and happiness. This will ensure the research is looking at each construct equally to minimize bias. The survey includes positive and negative closed-ended questions ensuring balanced coverage of positive and negative aspects of each determinant. Participants will be invited to take the survey during regular class sessions after providing informed consent. A quick response (QR) code will be used to give students easy access to the survey and responses will be collected anonymously to protect participant confidentiality. Correlation analysis will be conducted to explore potential links between each of the constructs and happiness. The study will include students across all programs and different years, increasing generalizability.

Results

Conclusions

#108: Evidence of Poor Oral Health for Individuals with Cardiovascular Disease.

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Purpose

This project will explore and check for associations between poor oral health evidence, such as periodontal disease, gingivitis, dental caries, oral cancer, tooth loss, halitosis, and xerostomia, and cardiovascular disease and its factors, like hypertension, diabetes, and strokes.

Methods

As for the method for this literature review, I have searched in both databases, Google Scholar and PubMed, for keywords like cardiovascular disease and periodontal disease, gingivitis, dental caries, oral cancer, tooth loss, halitosis, and xerostomia or cardiovascular disease factors, like hypertension, diabetes, and strokes.

Results

When it comes to the results of this literature review, researchers found out that tooth loss was caused by periodontal disease for patients with cardiovascular disease or its factors like smoking, hypertension, and diabetes. And that periodontal disease is worse for patients with cardiovascular disease compared to the group without the disease. They also found out that with diabetes, which we consider a factor of cardiovascular disease, patients had higher chances of oral cancer. Data shows tooth loss, bone loss, and a history of periodontitis and how they result in hypertension, diabetes, or other cardiovascular disease disorders. Having low fluoride causes more dental caries in this rural population, which leads to this population having higher cardiovascular disease rates compared to the ones who were exposed to high-fluoride water. Researchers also proved that halitosis could be a predictor of a stroke and found out that what caused halitosis is oral cavities, gingivitis, and xerostomia and that all of these are factors causing a stroke.

Conclusions

To conclude, there is evidence of poor oral health among individuals with cardiovascular disease or its factors compared to those without cardiovascular disease.

#109: The Opportunities and Barriers Surrounding the Use of Digital Health and Telemedicine in Sub-Saharan Africa

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Purpose

This literature review explores the potential of digital health and telemedicine in addressing healthcare challenges in Sub-Saharan Africa (SSA). It examines the barriers to adoption, highlights the opportunities provided by digital innovations, and identifies strategies necessary to scale these solutions for improved health outcomes. The review also underscores the role of digital health during the COVID-19 pandemic and its implications for healthcare systems in SSA.

Methods

A comprehensive review of recent literature was conducted to evaluate the state of healthcare in rural SSA, focusing on the challenges faced by healthcare systems, including shortages of professionals, inadequate infrastructure, and limited access to care. Studies on digital health and telemedicine solutions, particularly those implemented during the COVID-19 pandemic, were analyzed to assess their effectiveness, barriers to adoption, and scalability.

Results

Rural SSA faces severe healthcare disparities exacerbated by high rates of communicable and non-communicable diseases, insufficient healthcare infrastructure, and a shortage of skilled professionals. Digital health technologies, including telemedicine, mobile health (mHealth), and health information systems, have demonstrated potential to bridge these gaps by offering remote access to care and enhancing healthcare delivery. During the COVID-19 pandemic, digital tools such as AI-powered triage systems and mobile apps proved instrumental in maintaining essential services, symptom monitoring, and collaborative decision-making among healthcare professionals. However, challenges such as limited internet access, high costs of mobile devices, digital literacy concerns, and ethical and legal constraints hinder their widespread adoption.

Conclusions

Digital health and telemedicine hold significant promise for improving healthcare access and outcomes in rural SSA, particularly in addressing disparities intensified by inadequate infrastructure and workforce shortages. The COVID-19 pandemic underscored the potential of these technologies while revealing existing gaps in digital readiness and infrastructure. A multi-stakeholder approach involving governments, private sectors, and non-governmental organizations is crucial to overcome these barriers. Investments in internet connectivity, digital literacy programs, and affordable mobile technologies, alongside policy reforms, are essential for scaling digital health solutions and achieving equitable healthcare access in rural Sub-Saharan Africa.

#110: Assessing the Impact of HPV Vaccination on Reducing Oral Cancer Incidence in Males: A Public Health Perspective

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Purpose

Oral cancers, particularly oropharyngeal squamous cell carcinoma (OPSCC), linked to human papillomavirus (HPV), are rising among men. While HPV vaccination has been widely promoted for preventing cervical cancer in women, its role in reducing oral cancer incidence in men remains underexplored. This study systematically reviewed the evidence on the impact of HPV vaccination in reducing oral cancer among males and evaluated barriers to its recommendation by healthcare providers.

Methods

A systematic literature review was conducted using PubMed, Cochrane Library, and MEDLINE databases, focusing on studies published between 2000 and 2022. Inclusion criteria encompassed studies assessing HPV vaccination efficacy in preventing oral cancer or oral HPV infections. Additionally, a cross-sectional survey of healthcare providers was conducted to evaluate their readiness to recommend HPV vaccination to males and identify barriers based on the Transtheoretical Model.

Results

From 1,275 records, 32 studies met the inclusion criteria, including cohort studies (25%) and randomized controlled trials (21.88%). Evidence showed that universal HPV vaccination programs reduced oral HPV infections by up to 93.3%. The survey revealed that 97% of healthcare providers were in the pre-contemplation or contemplation stages of recommending HPV vaccination to males. Barriers included liability concerns, discomfort discussing HPV, misconceptions about its relevance to males, and systemic issues like cost and access.

Conclusions

Systematic evidence suggests that HPV vaccination could significantly reduce the burden of HPV-related oral cancers in males. However, improving vaccination rates requires addressing healthcare providers' barriers and misconceptions. Public health campaigns should prioritize education and advocacy to normalize HPV vaccination for males as a cancer prevention strategy.

#111: Trends in Graduate Students' Physical Health Throughout Training

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Purpose

Medical school is known to bring about significant changes in students' lifestyles, particularly with regard to physical activity, nutrition, sleep patterns, and stress levels. This study aims to evaluate the changes in physical health that medical students experience throughout their training, focusing on key health markers such as lipid panels, A1C levels, and body composition. As students transition into medical school, many report a decrease in physical activity, increased sedentary behavior due to prolonged study sessions, heightened stress, and the adoption of unhealthy eating habits. The primary objective of this research is to quantify how these health markers change over the course of medical training and explore how these changes correlate with the lifestyle adjustments associated with rigorous academic demands. A secondary objective is to identify the specific challenges students face in maintaining their physical health throughout their education, with the goal of developing interventions to improve wellness.

Methods

This is a quantitative study involving 75-100 first-year medical students, recruited prior to the start of their studies. Baseline data will be collected on participants' physical health through a variety of testing, which may include blood tests (lipid panels and A1C), HRV, FIT3D and/or DEXA scan to measure body composition, and/or a survey assessing pre-medical school levels of physical activity, stress, and sleep. Throughout their training, students will also complete a monthly self-report survey detailing their sleep, exercise, and eating habits. These health markers and survey data will be repeated annually at the end of each academic year. By combining objective health data (blood work and body composition measurements) with monthly self-reported data on activity, stress, sleep, and eating habits, this study aims to provide a comprehensive picture of how physical health evolves in response to the demands of medical school. This research will fill a gap in the existing literature by integrating lab values, body measurements, and behavioral data, offering new insights into the physical health challenges faced by medical students over the course of their education.

Results

Conclusions

#112: Task-Shifting and Task-Sharing in Low and Middle-Income Countries (LMIC's): Impact on Surgical Outcomes and Global Healthcare Delivery

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Purpose

Task-shifting and task-sharing are strategies increasingly used in low- and middle-income countries (LMIC's) to address workforce shortages and improve access to surgical and anesthesia services. This study examines their impact on surgical outcomes, healthcare delivery, and workforce efficiency in these settings, with a focus on safety, cost-effectiveness, and challenges.

Methods

A literature review was performed to evaluate the impact of task-shifting and task-sharing on surgical outcomes and healthcare delivery in low- and middle-income countries. Studies were identified through PubMed and Scopus using keywords such as "task-shifting," "task-sharing," "surgical outcomes," "LMIC's," and "non-surgeon clinicians." Inclusion criteria focused on studies comparing outcomes between non-surgeon clinicians (NSCs) and surgeons or anesthetists, including morbidity, mortality, complications, cost-effectiveness, and workforce impact. Data on procedure types, clinician training, and patient outcomes were extracted. A narrative synthesis was conducted to summarize findings on effectiveness, challenges, and strategies for task-shifting implementation. Seventeen peer-reviewed studies published between 2011 and 2024 were selected

Results

Task-shifting has been widely implemented across LMIC's, with non-surgeon clinicians performing up to 61% of surgeries in sub-Saharan Africa and over 50% of non-obstetric major surgeries in Tanzania. A systematic review found no significant difference in morbidity (16% vs 17%) or mortality (2.2% vs 2.5%) between NSCs and surgeons. Cost-effective outcomes were observed in Mozambique, where assistant medical officers achieved similar results to physicians at lower costs. However, concerns about inadequate supervision and the lack of structured training programs persist. In neurosurgery, task-shifting often occurs with minimal oversight, raising safety concerns.

Conclusions

Task-shifting and task-sharing in LMIC's offer promising strategies to expand surgical capacity, improve access to care, and address workforce shortages without compromising patient outcomes. These practices, particularly in low-complexity surgeries, have demonstrated positive results in terms of safety, cost-effectiveness, and improved access. However, challenges remain, including the need for more robust training, supervision, and regulation to ensure patient safety and maintain care quality. Furthermore, while task-shifting has proven effective in certain settings, concerns about professional disruption, oversight, and safety remain. Additional research is critical to refine these strategies and to tailor practices to specific contexts and specialties.

#113: Blunt and Penetrating Trauma in Resource-Limited Settings: Challenges, Innovations, and Opportunities for Improvement

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Purpose

This literature review explores the distinct challenges and innovative solutions in managing blunt and penetrating trauma in resource-limited settings. With a focus on low- and middle-income countries (LMICs) and rural environments, it aims to synthesize current evidence on disparities in trauma care, including resource utilization, imaging limitations, education gaps, and critical care barriers. The review highlights opportunities for improvement, such as alternative imaging modalities, teletrauma programs, and trauma training initiatives, with the goal of informing future research and policy to enhance trauma outcomes in resource-constrained environments.

Methods

A comprehensive review of peer-reviewed literature was conducted using databases such as PubMed, Scopus, and Embase. Search terms included "blunt trauma," "penetrating trauma," "resource-limited settings," and "innovative trauma care solutions." Studies were included if they addressed challenges or interventions related to trauma care in LMICs or other resource-constrained settings. Articles focusing exclusively on high-resource environments were excluded. Key data were extracted and synthesized into thematic areas, including resource utilization, imaging, education, clinical care, and critical care strategies.

Results

The review identified significant disparities in trauma care between resource-limited and high-resource settings. Blunt trauma patients generally required more resources, while resource constraints in imaging, such as reliance on ultrasound or X-ray instead of CT scans, were evident. Innovations such as web-based trauma registries improved data accuracy and policymaking. Educational gaps, particularly in pediatric trauma care, were highlighted, emphasizing the need for targeted training programs. Emerging strategies, including teletrauma and innovative standardized care for critical conditions, demonstrated potential to bridge gaps in trauma care. However, systemic barriers, such as workforce shortages and delays in care, persist.

Conclusions

Resource-limited settings face substantial challenges in trauma management, yet several innovative approaches offer promise. Implementing scalable solutions, such as telemedicine, targeted education, and alternative imaging technologies, can improve outcomes. Addressing systemic barriers through global health collaborations and policy reforms is crucial. Further research should focus on long-term outcomes, sustainability, and context-specific interventions to close the gap between low- and high-resource environments in trauma care.

#114: Aspartame: Is it Truly Safe for Human Consumption?

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Purpose

Aspartame is an artificial sweetener used as a low-calorie sugar substitute in products throughout the world. Controversy regarding its safety for human consumption has been debated since its approval. This literature review explores the evidence regarding aspartame's safety as it continues to be added to sugar-free products.

Methods

A literature review was conducted on aspartame and its safety for consumption. Studies were found using Google Scholar, PubMed and ScienceDirect ranging from 1990 through 2024. These publications were screened for reliability and compiled using EndNote 21. Primary and secondary literature was used in this review. Exclusion criteria included non-peer reviewed articles, studies published before 1990 and studies not published in the English language.

Results

The overall analysis showed that aspartame is generally safe for human consumption, with exceptions for certain groups. These include individuals with diabetes, pregnant women, and with pre-existing tumors or cancers. People with pancreatic disease must be especially keen on monitoring their consumption of aspartame, as it has been proven that aspartame may play a role in advancing tumor cell aggressiveness. Some large-scale studies reported a correlation between aspartame and specific cancers such as colorectal and stomach cancers. However, no correlation was found in terms of the broad scope of cancer.

Conclusions

As sugar-free products often target diabetic consumers, increased awareness of aspartame's potential negative effects is necessary. More long-term studies are needed to fully assess the safety of aspartame.

#115: Insurance and IOL Selection: A Case for Reevaluating Toric IOL Premium Designation Status in Astigmatic Cataract Patients

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Purpose

Choosing the correct intraocular lens (IOL) for cataract patients is crucial because the incorrect IOL power or lens type may cause unfavorable visual outcomes. However, individuals in the United States may opt for a suboptimal lens type due to lack of insurance coverage for “premium” lens types, especially individuals with government-subsidized healthcare plans. This study aims to investigate the rates of people opting for suboptimal lenses due to financial constraints across insurance types in the United States.

Methods

This retrospective analysis consisted of 4524 patients (7299 eyes) who underwent cataract extraction/IOL insertion between 2019 and 2024. The proportion of surgeries receiving any premium lens (Toric lens or multifocal lens) between various types of insurance carriers was compared using logistic regression with age, provider, and sex as covariates with false discovery rate correction (FDR, Benjamini-Hochberg). Statistical significance was defined as FDR value below 0.05.

Results

A total of 5,206 (71.3%) eyes received conventional lenses, whereas 2,093 (28.7%) received premium lenses. Of the eyes that received premium lenses, 2,189 (65.8%) received multifocal IOLs and 1,136 (34.2%) received Toric IOLs. Medicare or Medicare Advantage plans saw a significantly lower purchase rate of premium lenses compared to commercial insurance, with the difference especially exaggerated for Toric lenses. Individuals without insurance or on federal insurance plans had a higher purchase rate of premium lenses. Across all insurance types, 314 eyes were sampled for astigmatism. Of these, 40.7% qualified for Toric lenses, but only 17.5% of qualified eyes received a Toric lens.

Conclusions

Our data shows a difference in IOL choice based on a patient’s insurance provider, likely due to the financial differences between these groups. Due to Toric lenses being designated as “premium IOLs”, the added cost of Toric lenses may be cost-prohibitive for many astigmatic patients. Within our patient sample, only 17% of individuals who qualified for Toric lenses received Toric lenses. Discussions should be opened with government health officials and insurance providers to create a separate designation for Toric IOLs and remove them from being considered “premium” IOLs as Toric IOLs serve a medical function.

#116: Impact of Drug Addiction on Oral Health: Unveiling the Link Between Substance Abuse

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Purpose

To explore and analyze the multifactorial relationship between drug addiction and oral care, focusing on immune dysregulation, neglect of oral hygiene, and microbial changes.

Methods

Relevant literature was reviewed from PubMed, EBSCO, DOAJ, JYoungPharm, and Nature. Screening criteria included peer-reviewed articles, original research, literature written in English, human-based studies, and publications from 2020 to 2023. The following MeSHTERMS were used to locate literature: drug addiction, drug abuse, oral health, substance abuse, and infection. Sources were analyzed for data on drug-induced alterations in periodontal health, the prevalence of periodontitis among drug users, and potential molecular mechanisms linking these conditions.

Results

Findings indicate that drug addiction exacerbates periodontal disease progression through immune suppression, inflammation, and poor oral hygiene habits. For instance, opioids, methamphetamines, and alcohol impair the immune system's ability to combat oral infections, promoting bacterial overgrowth and periodontal tissue destruction. Cocaine use leads to vasoconstriction, which hampers oral tissue healing. Moreover, drug-induced xerostomia reduces saliva's protective functions, increasing bacterial colonization. Across studies, drug-addicted individuals exhibited significantly higher rates of periodontitis compared to non-addicted populations. Treatment outcomes for addicted patients were also poor, with high recurrence rates of periodontal disease despite interventions.

Conclusions

Drug addiction is a critical risk factor for severe periodontitis, contributing to poor oral health outcomes. Future research should focus on long-term management and novel therapeutic approaches for addicted individuals to improve periodontal outcomes and overall health.

#117: E-cigarettes and Oral Health: A New Risk for Caries Development

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Purpose

E-cigarettes have gained popularity as an alternative to traditional smoking, but their long-term health effects remain uncertain. This literature review analyzed the correlation between e-cigarettes and the development of dental caries to draw a data-driven conclusion on their relationship.

Methods

A comprehensive literature review was conducted using peer-reviewed studies from 1986 to 2024 on Google Scholar, PubMed, the National Institute of Health National Library of Medicine, the World Health Organization, CDC, and the National Institute on Drug Abuse. The reviewer screened titles and abstracts of the citations identified by the search strategy. Identified published literatures were exported into EndNote 21 to remove any duplicates and facilitate retrieval of relevant articles. The full text of each article was then evaluated for inclusion in this study.

Results

The literature review was comprehensively analyzed, yielding a well-founded review with limited potential for bias. The studies showed a significantly increased risk of dental caries for individuals who use e-cigarettes or electronic nicotine delivery systems. This increased risk is influenced by several factors including the components of e-cigarettes, oral bacteria, nicotine, usage, and the flavors or liquids used.

Conclusions

E-cigarettes have been shown to elevate the risk of dental caries. There is still a need for more original research and longitudinal studies to further our understanding of this relationship and to develop preventive strategies. Ongoing patient education and further research are essential to promote better oral health outcomes and enhance patient awareness.

#118: How Dental Phobia Affects Oral Health-Related Quality of Life?

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Purpose

This review aims to explore evidence that dental phobia compromises oral health-related quality of life. Despite advancements in modern dentistry, many individuals continue to neglect their oral health due to dental phobia, which can lead to severe consequences such as compromised daily functioning and negative self-perception.

Methods

Multiple sources of databases were used such as PubMed, EBSCO, Google Scholar, Cochrane Library, and National Institute of Health (NIH). The reviewer used various MeSH terms identifying titles and abstracts relevant to the study. Screening criteria included: peer-reviewed articles, original research, literature written in English, human-based studies, and publications of literature from 2005 to 2024. Full text articles of the selected literature were evaluated based on screening criteria.

Results

The review showed that socioeconomic status does lead to delayed dental treatment, which correlates to patients seeking care in immense pain. A positive correlation between dental phobia and oral health related quality of life such as function and self-esteem were observed. The studies also reported that poor oral health causes various diseases which can lead to periodontal disease, malnutrition, chewing difficulties, and damage to self-image.

Conclusions

Dental phobia negatively affects oral health-related quality of life, including function and self-image. A Patient-Centered Care approach may help address this fear, but further research is needed to understand its effectiveness in treating dental anxiety.

#119: Current Concepts of Prenatal Dental Care: A Narrative Review

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Purpose

This review aimed to explore current concepts in prenatal dental care and highlight the significance of comprehensive oral health management for pregnant women.

Methods

A literature review was conducted to gather relevant studies and research articles addressing prenatal dental care, periodontal disease and pregnancy outcomes, oral mucosal lesions during pregnancy, dietary and oral care guidelines, dental caries in pregnancy, and the safety and efficacy of dental treatments during pregnancy.

Results

Pregnant women are more susceptible to oral health issues, such as gingivitis, dental caries, and oral mucosal lesions, due to hormonal changes, dietary alterations, and physiological adaptations. There is a distinct lack of awareness, access and reluctance among pregnant women to seek necessary dental care globally. The correlation between periodontal disease and adverse pregnancy outcomes, including preterm birth and low birth weight infants, is supported by multiple studies. Oral mucosal lesions are prevalent during pregnancy, attributed to hormonal changes. Dietary and oral care guidelines emphasize the importance of adequate nutrition and oral hygiene. Additionally, educating pregnant women about maintaining good oral hygiene practices and seeking timely dental care is essential. Evidence-based guidelines, continuing education programs, and improved communication between healthcare providers can enhance the implementation of prenatal dental care.

Conclusions

This narrative review underscores the importance of comprehensive prenatal dental care for pregnant women. Collaborative efforts between prenatal care providers and dental professionals are crucial to enhance prenatal dental care utilization. Preventive strategies, oral hygiene education, and regular dental care are important in managing periodontal disease during pregnancy.

#120: The Role of Artificial Intelligence in Conservative Dentistry and Endodontics

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Purpose

This review examines the transformative effects of Artificial Intelligence (AI) on conservative dentistry and endodontics, emphasizing its role in improving diagnostic accuracy, optimizing treatment plans, and enhancing patient outcomes.

Methods

Through an extensive narrative review, the development of AI from its origins in the 1940s to its present-day implementations in dentistry was explored. The analysis included a thorough examination of scholarly articles, clinical reports, and case studies that highlight the adoption of AI technologies like deep learning and neural networks in dental practices. Special focus was placed on AI's utility in early caries detection, analysis of root canal morphology, and predictive modeling for clinical outcomes.

Results

In conservative dentistry, AI has proved crucial for accurately detecting early stages of caries with success rates above 90%, forecasting failures in crown installations, and automating color matching for dental restorations. In endodontics, AI tools have shown great promise in precisely diagnosing periapical conditions and assisting in essential procedures such as determining the working length for root canal treatments. For example, an AI model applied to 500 dental scans in a study identified periapical lesions with 95% accuracy, outperforming conventional diagnostic methods.

Conclusions

AI significantly enhances both conservative dentistry and endodontics by increasing diagnostic precision and treatment effectiveness. Nevertheless, integrating AI into dental practices involves overcoming challenges related to data security, mitigating algorithmic biases, and ensuring continuous training for dental professionals. Continued research and innovation are essential to refine AI applications, ensuring they align with clinical demands and ethical considerations to improve dental care delivery.

#121: Renumeration practices for accredited PGY1 clinical pharmacy Residency programs across the United States

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Purpose

Residency Requirement: Many U.S. hospitals mandate pharmacy residencies for clinical pharmacist positions. Financial Strain: Residency compensation often does not meet living wage standards, creating challenges for graduates.1,2,3,4,6. Study Focus: The purpose of this study was to compare PGY1 pharmacist compensation against state and national median wages. Impact: Highlights how economic pressures faced by PharmD grads affect the development of new pharmacists in the workforce.

Methods

Internet searches were conducted between Sep. 13 and 23 of 2024 looking for various pieces of relevant data. Data sourced from various internet sites, including ASHP Residency Directory for PGY1 residency data; US Bureau of Labor Stats for Pharmacist median salaries; Forbes Magazine for single-earner average salaries; World Population Review for Cost-of-Living Index data. Only PGY-1 Pharmacy (including PGY1-Clinical/Acute Care Pharmacy and PGY1-Ambulatory Care) programs were included. Any programs that were not listed as currently fully accredited (pre-candidate and candidate programs) were excluded.

Results

Headcount-weighted average PGY1 pharmacist stipend: $52,131. Compared to all-state all-earner weighted median wage: $60,933. Median PGY1 stipend represents 35.7% of full-time annual clinical pharmacist salary, at $52,131 vs. $146,129, respectively. Of 3,541 programs studied, at least 91 programs had missing data. Program entries were omitted from calculations when vital information was incomplete. None of the median results of the 50 US states or DC met the researchers' minimum expectation of 50% of clinical pharmacist salary. Some individual programs met this threshold.

Conclusions

Most residents work over 50 hours a week but are paid less than half of a full-time pharmacist. Residents are recognized as exceptional among their graduating peers yet paid less than those pursuing employment outside of residency upon graduation. There is concern that residency opportunities may unintentionally discriminate against those without financial privilege such as:
- Single adults without partners.
- Primary breadwinners with children.
- Single parents managing financial responsibilities post-PharmD.
- Those living in areas where COL is greater than the stipend can cover.

Many directory entries lack vital information (e.g., stipend amounts, position counts), are outdated, and may not have recent contact information which would impact life-altering decisions. Some method of sanctioning programs for repeatedly failing to maintain directory data may be needed. Stipends should enable residents to focus on learning and working rather than financial stress.
Recommendation: ASHP implement a minimum stipend tied to, at minimum, 60% of the federal grant for PGY1 pharmacists. Include a cost-of-living index (COLI) adjustment to help maintain wage strength. Pay RPDs a 10% of the grant for the 1st PGY1 Pharmacist, and 2% for every resident after the first, until being the RPD is a full-time job, where they should be paid as any hospital junior-level administrator.

#122: Dental Trauma in the Sport of Baseball – A Scoping Review

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Purpose

The primary goal of this scoping review was the exploration and analysis of dental trauma occurrence and patterns linked to participation in the sport of baseball across gender, age, and type of trauma.

Methods

Several peer-reviewed studies were examined as part of a scoping review. The research methodology included data from three well-established databases. Initially, 67 articles were found through exploratory searches utilizing three databases (Scopus, Web of Science, and PubMed). Following screening methods completed by two independent reviewers based on inclusion criteria, 26 articles remained directly related to baseball-related trauma. These peer-reviewed articles were selected for final analysis.

Results

According to the data obtained for this review, dental trauma was shown to occur in the sport of Baseball. Of the portion of articles that further analyzed the type of trauma that occurs in the sport of baseball, a majority stated that the most common type of trauma is ball-to-player contact. One of those articles further analyzed the type of contact that occurred and said that a majority of player vs. ball contact occurred to players while on defense. Of the studies that assessed gender, all of these articles showed significantly higher rates of injury in males than females. The articles that analyzed trauma within different age groupings demonstrated that the age range of 9-20 had the highest injury rates.

Conclusions

The study concludes that the sport of baseball is a high-risk activity for oral trauma injuries. This study also concludes that even though baseball is widely accepted as a non-contact sport, multiple contact patterns are experienced in the sport that result in dental trauma. Various factors influence the rate of injury, such as the type of contact experienced, the gender of participants, and the age of participants.

#123: Xeroderma Pigmentosum: A Review of Non-Classical Symptoms

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Purpose

We aim to provide a comprehensive overview of the current knowledge regarding the interplay between XP and the symptoms that require further investigation. To that end, we reviewed several studies and evaluated the key manifestations of XP, aside from dermatological symptoms, and discussed the mechanisms of action and potential consequences. The musculoskeletal, endocrine, ophthalmic, and nervous systems, among others, are crucial lenses through which XP is being investigated.

Methods

The aim was to search literature specifically addressing presentations of Xeroderma Pigmentosum which are less known, acknowledged and only little is known to increase awareness regarding this multifaceted disease.

Results

We found that the pathophysiology of XP involves multiple organ systems that we have appropriately outlined.

Conclusions

The pathophysiology of XP involves multiple organ systems all tied to the premature aging phenotype associated with impaired DNA repair as well as increased reactive oxygen species.

#124: Acute Care for Elders Unit Implementation at Banner Health: A Quality Improvement Analysis

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Purpose

There is an increasing need to optimize hospital care for older adults as Age Friendly Health Systems (AFHS) become increasingly popular. Geriatric patients may often be subject to extended hospital stays, which can result in functional decline, increases in hospital-acquired injury, infections, and neurocognitive deterioration. Early acute inpatient rehabilitation (IRF) is known to improve functional optimization of older adults as compared to therapy in a skilled nursing facility (SNF). In this study we demonstrate the effect of a structured program based on the 4Ms of AFHS in our newly established Acute Care for Elders (ACE) unit, a first in Arizona.

Methods

We compared median LOS for ACE patients who were discharged to inpatient rehabilitation facilities (IRFs) to non-ACE patients. One year data from 7/1/2022-6/30/2023 were utilized to analyze the impacts on LOS. Pre- and post-ACE unit review was completed.

Results

The ACE unit started in November 2022 and since then, the month-over-month median ACE LOS has remained lower than the non-ACE LOS. This LOS reduction is consistent with other historical data at hospital systems nationwide.

Conclusions

The data has shown that reducing LOS by identifying the right patients for acute rehab early on can improve level of function and lower costs. As the only ACE unit in Arizona, this unit is positioned to be a prime evidence-based model for implementation of ACE units in other hospitals to improve the quality of care statewide and beyond.

#125: A Narrative Review of Barriers to Utilization of Surgical Risk Assessment Calculators

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Purpose

Over the last several decades, it has become the desire of surgical and medical teams to decrease risk levels involved for patients undergoing surgery. However, despite the advent of risk assessment calculators to help physicians obtain more accurate and objective judgements for postoperative complications, these tools are underutilized in standard clinical practices in comparison to other methods of risk assessment. This is likely due at least in part to certain barriers that decrease their functionality and ease of use. This review discusses the major barriers to the utilization of current risk calculators so as to allow for a better understanding of the steps that need to be taken in order to help improve surgical risk assessment and the use of more objective data in assessing the risk of perioperative complications.

Methods

This narrative review was performed by analyses of various databases for articles that were deemed relevant to the utilization of surgical risk-assessment tools and the barriers associated with implementing such tools in daily clinical and surgical decision-making. This review is not intended to be a comprehensive review of every single barrier, but instead a highlight of some of the most common barriers to the use of these calculators.

Results

Based on the current literature, there appear to be roughly four major barriers to the use of the surgical risk calculators. These barriers are: the specificity of the results and what they mean to the specific patient; the education of the physician teams on the existence and how to use the risk calculators; the ease of use of the risk calculators; and the ease of access to the risk calculators.

Conclusions

Per the literature, there are many barriers to the implementation of surgical calculators and surgical risk assessment tools, including but not limited to those identified in this review. However, using these tools is important especially for those who may be requiring surgery in an inpatient setting where there is less time to do full risk-benefit analyses. As such, it is essential that such tools be revised and improved considering these barriers so that they may be better implemented in clinical settings.

#126: Enhancing Periodontal Therapy with Non-Invasive Adjunctive Techniques

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Purpose

This study aims to evaluate the clinical effectiveness of non-invasive adjunctive therapies when combined with scaling and root planing (SRP) in treating periodontal disease. The focus is on therapies such as laser treatment, photodynamic therapy, hydrogen peroxide trays, ozone therapy, and localized antibiotic treatments like Arestin. Key clinical outcomes include reductions in pocket depths, clinical attachment gain, and inflammation control.

Methods

A systematic review of randomized controlled trials, clinical studies, and meta-analyses was conducted. The included studies focused on the adjunctive use of non-invasive therapies with SRP and assessed outcomes like periodontal pocket depth reduction, clinical attachment gain, and inflammation reduction.

Results

Laser therapy, when used adjunctively with SRP, resulted in clinical attachment gains of 0.6 mm to 1.4 mm. Photodynamic therapy demonstrated pocket depth reductions between 0.5 mm and 2.0 mm, with smokers achieving 0.6 mm reductions. Hydrogen peroxide trays led to a 20% reduction in periodontal pocket depths. Ozone therapy reduced gingival bleeding by 32% when combined with SRP. Arestin, applied after SRP, resulted in a mean pocket depth reduction of 1.2 mm.

Conclusions

Adjunctive non-invasive therapies like laser treatment and photodynamic therapy significantly improve clinical outcomes when paired with SRP, offering substantial benefits in inflammation control and clinical attachment gain. SRP remains the cornerstone of periodontal treatment, but these adjunctive therapies can optimize treatment outcomes, supporting their integration into routine periodontal care.

#127: Exploring ACGME-accredited Electrophysiology Fellowship Website Information Using ERAS

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Purpose

Each year, eager senior cardiology fellows investigate electrophysiology (EP) fellowship programs for continuing medical training. Electrophysiology is crucial for tertiary cardiac care worldwide. Electrophysiologists are well-trained to treat a wide variety of conditions in patients of all ages, though oftentimes, they are treating older adults, focusing on conditions like atrial fibrillation, an extremely common arrhythmia in patients over the age of 60. With increasing population age due largely to aging baby boomers, the need for qualified electrophysiologists also increases. As such, in order to determine potential barriers to entry into the field, this study assesses the quality and contents of EP fellowship program websites, via criteria that would be reasonably important or valuable to prospective EP applicants.

Methods

To determine available EP programs, the Electronic Residency Application Services (ERAS) listing of Accreditation Council for Graduate Medical Education (ACGME)-accredited institution websites was obtained. Program websites were arbitrarily divided into groups, with each author being assigned one group to evaluate. Each website was scrutinized for accessible application and program information, using eight different criteria for application information and 17 different criteria for program information, including program coordinator contact information, application requirements, clinical schedules, and didactic requirements. All website information was evaluated using standardized definitions for each criterion, and these definitions were discussed, evaluated, modified as needed, and agreed upon prior to initiation of the project, and were revised during the study as needed by way of unanimous agreement. Websites were scored using a binary scoring system based on whether or not they met the required criteria, and basic statistical analysis including subset averages and overall averages amongst other basic statistical analyses were performed to provide greater context to the results.

Results

97 electrophysiology fellowship programs were listed on ERAS, one of these websites being non-functional. Comprehensively, websites had an average of 51.56% and 44.24% of all application and program information, respectively, available to prospective fellows based on definition criteria.

Conclusions

Results are suggestive of inadequate resources for prospective electrophysiology fellows. To ensure the highly specialized training of electrophysiology in the future, fellowship program websites should maximize application and program resources made available.

#128: Laxogenin, a plant-based natural steroidal compound, prevents Colon Cancer growth

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Purpose

Laxogenin, also known as 5α-hydroxy-laxogenin, a steroidal saponin initially isolated from the berries of Solanum unguiculatum, has garnered interest for its potential as a plant-based anabolic agent and dietary supplement. The use of anabolic steroids in previous studies on breast cancer has been shown to reduce the level of estrogen within the body; elevated levels of estrogen were often seen to aid in the growth and proliferation of cancer cells. Extracts of the genus Allium contain laxogenin and have been recognized for their antioxidant effects and properties against bacteria, fungi, and viruses. Most notably, Allium agents have been used for cancer treatments due to their cytotoxic properties and antiproliferative characteristics. Other related steroidal saponins, such as methyl protogracillin, have also demonstrated significant cytotoxic activity against various cancer cell lines. However, the chemopreventive role of laxogenin against colon cancer is not well explored. In the proposed study, we would like to investigate the chemopreventive effects of laxogenin against colon cancer growth and spread.

Methods

Human colon cancer cells such as Caco-2 and SW-480 will be treated with epidermal growth factor (EGF) in the absence and presence of various concentrations of laxogenin. Cell viability and apoptosis will be determined using MTT assay and Annexin-V staining, respectively. We will examine how laxogenin prevents EGF-induced invasion and migration of colon cancer cells. Further, we will also investigate how laxogenin regulates the expressions of various apoptotic proteins and inflammatory and carcinogenic markers using specific antibody arrays.

Results

Our preliminary studies indicate that laxogenin prevents EGF-induced growth of colon cancer cells. Additional mechanistic studies are in progress.

Conclusions

Laxogenin may prevent the growth of colon cancer cells. Additional studies are being undertaken to identify its chemopreventive efficacy in vitro and in vivo.

#129: Identifying Barriers to Effective Clinical Decision Support Use in Preventing Medical Errors: The Pharmacy's Perspective

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Purpose

The purpose of this research is to understand the perceptions of pharmacy personnel in community and hospital settings concerning their workflows, the Clinical Decision Support (CDS) alerts they interact with, and how their interpretation of these alerts influences patient care. This research aims to begin to investigate pharmacy personnel-voiced factors that influence high rates of alert dismissal. The project also aims to qualify what design factors contribute to more effective CDS Alerts from the pharmacy's perspective.

Methods

This study was designed as a cross-sectional survey to collect data from pharmacy professionals, including pharmacists, technicians, and pharmacy interns, across various healthcare settings. Participants were recruited via direct outreach to hospitals and community pharmacies. The survey, hosted on an online platform, consisted of demographic questions, followed by a series of 4-Point Likert scale and open-ended questions designed to assess perceptions of clinical and operational alert design in their workflows and to collect commentary on what would improve the effectiveness of the alert. Survey questions explored themes such as the relevance, effectiveness, and timing of alerts, perceived differences between clinical and operational alerts, and opinions about the design of alerts. Open-ended questions allowed participants to provide qualitative insights on barriers to effective alert use and potential design improvements. Data was analyzed using descriptive statistics for quantitative responses, and thematic analysis was used to identify recurring themes in qualitative responses.

Results

The survey was distributed to the intended pharmacy settings and open for responses for 4 weeks. Various pharmacy personnel provided their perception of the alert system that they interact with, the obstacles they encounter, and what solutions they propose.

Conclusions

The surveyed population revealed false perceptions of their impact on their workflows, a common inability to effectively engage with clinical CDS alerts, and an overall lack of additional clinical support when verifying orders. Based on the results of this cross-sectional survey, there are clear opportunities for improvement in order to prevent medication errors. The results call for pharmacists to step into informatics and programming as medication experts to improve Clinical Decision Support software.

#130: Effectiveness of blended learning approach in Oral Pathology in undergraduate dental curricula: A Systematic Review

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Purpose

To examine the effectiveness of blended learning in oral pathology education in dental students compared to traditional teaching methods

Methods

An electronic of Scopus, PubMed, and Web of Science databases was performed using specific eligibility criteria to identify relevant articles in January 2023. Randomized control studies, clinical control studies, and longitudinal studies in the English language on blended learning in oral pathology in dental students were selected. The quality of the studies was assessed using Cochrane collaboration risk of bias assessment tools ROB 2 and ROBINS-I. GRADE assessment was used to assess the certainty of evidence.

Results

Out of 371 search results, four studies with a total of 406 dental students were included in the review. Though all four studies varied in the design of their blended learning interventions, a majority of studies found that on average, blended learning is more effective than traditional learning. One study reported that students showed similar scores for both blended and traditional learning. The level of evidence was downgraded to low due to methodological insufficiencies and risk of bias in the studies. A majority of studies showed a moderate risk of bias, and one study had a high risk of bias rating.

Conclusions

There is low-quality evidence that blended learning demonstrates positive effects on knowledge outcomes is at least as effective as traditional learning in oral pathology for dental students.

#131: Educating Medical Students in Sleep, Diet, and Exercise to Determine Effects on Their Treatment Plan Development for Future Patients

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Purpose

Healthy living is impacted by a large array of lifestyle factors, many of which are disputed by experts from different fields. Even so, it is generally accepted that getting adequate amounts of quality sleep, eating a balanced "healthy" diet, and participating in regular physical activity represent three core principles contributing to a healthy lifestyle. However, despite these three factors having significant impact on physical and mental health, some medical professionals do not receive any formal training in these subjects or how to apply these principles into their medical practice. Consequently, we are designing a medical school course centered around sleep, diet, and exercise and how these three lifestyle factors impact an individual's health and how these principles can be applied into a medical practice. Our objective is to prepare medical school graduates to use sleep, diet, and exercise (SDE) to treat specific medical conditions and to help their patients improve their quality of life.

Methods

A controlled cohort study design will be implemented. Medical students will be divided into two groups: a control group that will not participate in an elective SDE course and an experimental group which completed the SDE course. The course contents will include general nutritional principles, sleep science, and physical exercise core concepts and physiology. During clinical rotation years, we will present hypothetical diagnoses and treatment scenarios to the SDE cohort and to the control cohort to evaluate differences in treatment plans. Final treatment plans will be evaluated by a group of physicians for effectiveness following traditional guidelines, or modified lifestyle behavioral guidelines.

Results

Conclusions

#132: Effectiveness of test-enhanced learning in undergraduate dental education: A Systematic Review

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Purpose

This systematic review examines the effectiveness of test-enhanced learning in undergraduate dental education.

Methods

Scopus, Embase, Medline, and Web of Science databases were searched according to specific inclusion and exclusion criteria to identify the relevant studies that examined test-enhanced learning interventions in dental students. The quality of the evidence was assessed using ROB-2 and ROBINS-I.

Results

From an initial search result of 889 papers, five studies with 782 undergraduate dental students and dental hygienist students were included in the review. Of the five studies examined, four exhibited a moderate risk of bias, while one demonstrated a high risk of bias. The studies used a variety of TEL interventions with spaced intervals between the initial learning and testing sessions. All studies demonstrated the positive effects of repeated testing on undergraduate dental students, with web-based self-tests, diagnostic and memory tests, and formative and summative assessments with feedback showing effectiveness. Objective structured clinical examination (OSCE) and the use of flashcards were also found to improve student performance and exam results. Repeated testing resulted in improved exam performance, retention, recall, diagnostic accuracy, and technical skills.

Conclusions

Based on the limited evidence available, TEL with feedback is an effective intervention for improving the performance of undergraduate dental students. The benefits of TEL extend beyond examination performance to comprehension, diagnostic accuracy, and skill learning.

#133: 4-D Printing in Orthodontics

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Purpose

3D printing has revolutionized the field of dentistry, enabling quick and precise fabrication of restorations , aligners, surgical guides and more. As 3D printing continues to grow technologies like 4D printing have come onto the scene. 4D Printing uses 3D printing technology but incorporates smart materials that can undergo shape transformations in response to stimuli, such as temperature or moisture.

Methods

Records identified through database searching (n=203)
Duplicates removed: (n=11)
Records screened via title and abstract (n=13)
Articles excluded: (n=179)
i. Not Peer-reviewed (n=1)
ii. Editorial, abstracts, or conference papers (n=7)
iii. Literature reviews (narrative, scoping, systematic) (n=31)
iv. Not written in English (n=0)
v. Unrelated (n=139)
Identification Screening
Records assessed for eligibility (n=1)

Results

Conclusions

While 4D printing is promising to orthodontics, and dentistry as a whole, there is currently a lack of primary research on the topic.

#134: Does Experience Boost Orthodontic Bonding Accuracy? - A Systematic Review

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Purpose

Orthodontic bracket bonding plays a critical role in treatment duration and patient outcomes. Bonding and positioning accuracy is often assumed to increase with greater practitioner experience. This systematic review aimed to examine whether practitioner experience significantly influences orthodontic bracket bonding accuracy.

Methods

PubMed, Scopus, and Web of Science databases were searched for English language articles with no date restriction for papers that compared bracket bonding accuracy among operators with varying levels of clinical experience. We examined studies involving orthodontists, orthodontic students, final-year dental students, and dental trainees bonding brackets on typodonts or resin models. The risk of bias was evaluated using the JBI Critical Appraisal Checklist for Quasi-Experimental Studies.

Results

Out of 95 search results, we found three papers that fulfilled the eligibility criteria. Most studies showed a moderate risk of bias overall due to the lack of conventional control groups and single post-bonding assessments. Accuracy was assessed digitally using vertical, mesiodistal, and angulation/tip deviations, and bonding time was recorded. Across the included studies, bracket bonding accuracy did not differ substantially between experienced orthodontists and less experienced operators. Nearly all bonded brackets fell within clinically acceptable tolerances. However, orthodontists completed the bonding procedures in significantly less time than dental students.

Conclusions

In this systematic review, we found that contrary to conventional belief, varying clinical experience showed minimal impact on bracket bonding accuracy but significantly influenced bonding speed. Based on limited evidence, it appears that while greater clinical experience tends to reduce bonding time, it does not consistently confer a significant advantage in bracket placement accuracy when standardized bonding protocols or guidance systems are used. These findings suggest that novice operators can achieve comparable accuracy, provided robust training and methodology are in place.

#135: Temporary Anchorage Devices: The Cornerstone of Precision in Orthodontics

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Purpose

Temporary Anchorage Devices (TADs) have revolutionized modern orthodontic treatment. TADs provide absolute anchorage i.e. resistance to displacement allowing greater control over tooth movement. Objective: To explore the role of Temporary Anchorage Devices (TADs) in orthodontics, focusing on their clinical applications and, highlighting their significance in modern practice.

Methods

A comprehensive review of TADs in Orthodontics was conducted. We synthesized current literature, clinical case studies, and expert insights on TADs. Key aspects examined include indications and applications, commonly used anatomical sites, benefits, and challenges.

Results

TADs in orthodontics demonstrate a wide range of applications and offer significant clinical advantages. TADs enable precise tooth movements without causing unintended shifts in adjacent teeth. Key applications include the intrusion of over-erupted teeth, protraction of molars to close extraction spaces, retraction of anterior teeth for space management, midline correction, and resolution of anterior open bites. Placement of TADs is minimally invasive, performed under local anesthesia, and typically involves anatomical sites such as the infrazygomatic crest, palate, buccal shelf, and retromolar region. Despite these benefits, potential challenges include loosening or failure in cases of compromised bone quality, underscoring the importance of careful planning and technique. Overall, TADs have significantly improved orthodontic biomechanics, reduced treatment times, and increased predictability in managing complex dental cases.

Conclusions

The adoption of TADs has reduced treatment time and improved patient outcomes, Integrating TADs into orthodontic practice represents a significant step toward achieving predictable and efficient results in a variety of clinical scenarios. However, effective planning and monitoring remain essential to maintain TADs, minimize anchorage loss, and achieve optimal results.

#136: Comparative Analysis of Performance and Reliability of Four AI Large Language Models in Orthodontic Knowledge Evaluation

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Purpose

This study aimed to evaluate the accuracy, internal reliability, and inter-model agreement of four leading large language models (ChatGPT-4, ChatGPT-4o, Bing, and Gemini) in answering orthodontic questions from the National Board of Dental Examiners (NBDE).

Methods

A total of 150 orthodontic multiple-choice questions were administered to each LLM across three separate test sessions. Performance was categorized as correct or incorrect. Internal reliability for each model was assessed by comparing its performance across repeated sessions using Cohen's Kappa, while inter-model agreement across all four LLMs in each test session was measured using Fleiss' Kappa.

Results

Initial correctness rates ranged from 53.3% (Bing) to 58.7% (Gemini) in Test 1. Gemini showed improvement in Test 2 (72%) but declined in Test 3 (42%), while ChatGPT-4 and Bing maintained stable accuracy. Cohen's Kappa indicated substantial to almost perfect reliability for Bing (κ=0.85–0.91) and ChatGPT-4 (κ=0.64–0.84), moderate to substantial for ChatGPT-4o (κ=0.41–0.74), and fair to moderate for Gemini (κ=0.26–0.54). Fleiss' Kappa values (0.29–0.38) indicated fair agreement across all models per test.

Conclusions

While Bing and ChatGPT-4 showed stable internal consistency across evaluations, Gemini and ChatGPT-4o exhibited greater variability. Inter-model agreement was only fair, even among models with reliable individual performance. These results emphasize the importance of cautious interpretation of LLM-generated responses in educational settings and suggest that no single model can be relied upon without further validation or supplemental resources.

#137: Enhancing Learning in Restorative Dentistry and Endodontics: A Systematic Review of Blended Educational Methods

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Purpose

This systematic review examines the impact of blended learning on theoretical knowledge retention and clinical skills development in restorative dentistry and endodontics among undergraduate dental students.

Methods

A comprehensive literature search was conducted across Scopus, PubMed, Web of Science, and Google Scholar databases up to December 2022. Clinical studies, including randomized controlled trials, cohort studies, and observational studies involving undergraduate dental students, were considered. Two authors independently screened articles, performed quality assessments, and evaluated the risk of bias using the Risk of Bias 2 and ROBINS-I tools. Discrepancies were resolved by a third reviewer.

Results

From 32 identified articles, six studies met the inclusion criteria, encompassing three randomized controlled trials with a total of 448 participants. Five studies demonstrated that blended learning methods significantly improved theoretical knowledge retention and practical clinical skills. Risk of bias was low in most studies, with two studies rated as having some concerns and one study showing moderate risk. Overall, the evidence quality was assessed as low.

Conclusions

Blended learning effectively enhances dental education outcomes, complementing traditional methods. While it cannot entirely replace conventional teaching, it enriches the learning experience by enabling flexibility and personalized pacing. The adoption of blended learning in dental education facilitates a dynamic and student-centered approach. By integrating online lectures, demonstrations, and interactive content, it empowers students to revisit and reinforce learning materials at their own pace, fostering deeper engagement and skill acquisition.

#138: Cemental Tear-Case series with literature review on treatment modalities

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Purpose

Cemental tear, characterized by the separation of cementum from the root surface, is a commonly observed in localized periodontitis, particularly in patients with a complex medical history resulting in significant periodontal damage. This condition complicates both diagnosis and treatment. Cone-beam computed tomography (CBCT) is crucial for accessing the extent of damage and guiding treatment decisions.

Methods

This case series presents three clinical cases of cemental tear managed at the Midwestern University Dental Clinic-1L. Detailed radiographs and CBCT scans were used to determine the position and size of the lesion, followed by histopathological evaluation, which guided a proper surgical intervention.

Results

Case 1 involved a 78-year-old female with swelling around tooth no 24. CBCT revealed no fractures. Debridement and flap surgery were performed, which resolved the symptoms. Case 2 was a 68-year-old female, previously treated endodontically, who presented with pain and mobility of tooth no.29. CBCT conformed a cemental tear. Treatment included removal of granulation tissue, flap elevation and application of Emdogain which alleviated the symptoms. Case 3 was a 82-year-old female, with swelling and mobility of tooth no 5; CBCT reveled extensive bone loss. Flap elevation, granulation tissue removal, and Emdogain application resulted in significant healing.

Conclusions

Accurate diagnosis using advanced imaging techniques, particularly CBCT, and affective treating cemental tears are essential for preventing periodontal tissue damage, enhancing treatment effectiveness, and improving tooth survival rates.

#139: Understanding Quality-of-Life Impacts of Hepatitis Delta Virus

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Purpose

Hepatitis delta virus (HDV) is a severe liver-affecting virus that can lead to potentially fatal conditions, including liver cirrhosis, advanced liver disease, and liver cancer. HDV infection is dependent on the presence of hepatitis B virus (HBV), as it requires HBV to replicate. However, understanding the epidemiology of HDV is difficult to assess due to the lack of standardized global testing protocols and limited diagnostic resources. Data on the quality of life (QoL) impacts of HDV is challenging to obtain, hindering efforts to address the full spectrum of its effects. The current study seeks to explore the QoL impacts of HDV, focusing on its physical and emotional challenges.

Methods

Through a mixed-methods approach, a quantitative survey is used to collect information about an individual's experience with HDV, including the time between HBV and HDV diagnoses, treatment options, and physical symptoms. The survey is then followed by qualitative in-depth interviews, to gain insight into QoL impacts, such as physical limitations, emotional strain, financial burdens, and the availability and quality of educational resources. Data from the interviews is being analyzed using qualitative analysis software to identify recurring themes and patterns.

Results

Early findings reveal significant emotional challenges associated with HDV, including heightened feelings of fear and anxiety. Physical impacts, such as severe edema and reduced ability to perform daily activities, also emerged as prominent concerns.

Conclusions

A deeper understanding of the QoL impacts of HDV is critical to addressing the daily struggles faced by affected individuals. These insights can guide public health interventions and initiatives, improve educational outreach, and ultimately improve health outcomes for those living with HDV.

#140: Silver Diamine Fluoride and Oral Health Equity: Clinical and Public Health Perspectives

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Purpose

This literature review explores the role of Silver Diamine Fluoride (SDF) in addressing oral health disparities among underserved populations. By analyzing its clinical efficacy, simplicity of application, and cost-effectiveness, this review investigates how SDF can help reduce inequities in dental care in low socio-economic areas, rural communities, and vulnerable populations, such as children, older adults, and individuals with special needs.

Methods

A comprehensive review of literature published between 2014 and 2025 was conducted utilizing PubMed, Scopus, Cochrane Library, and Web of Science databases. The literature selection criteria focused on peer-reviewed articles, systematic reviews, clinical trials, and public health reports that evaluated SDF's effectiveness in managing dental caries and its use in underserved populations. The literature was also reviewed to assess barriers to widespread adoption and current policies. Exclusion criteria consisted of non-peer-reviewed publications, studies published before 2014, and non-English literature without translation.

Results

The literature demonstrated that Silver Diamine Fluoride (SDF) achieves caries arrest as high as 91%. SDF also outperforms preventative treatments that are currently the standard of care, such as fluoride varnishes. Utilization of SDF requires little training and infrastructure. Its use in community health programs and school-based interventions has been shown to improve oral health outcomes. Cost analyses reveal SDF treatments to be less expensive than general anesthesia and conventional restorative care. However, challenges persist, including regulatory limitations, insufficient professional education, and esthetic concerns regarding staining, especially on anterior teeth, which impacts patient acceptance.

Conclusions

This review establishes that Silver Diamine Fluoride (SDF) is an effective, scalable, and affordable intervention that addresses oral health disparities in underserved populations. In order to maximize SDF's potential, regulatory barriers must be overcome, health provider education must increase, and innovative solutions to SDF's esthetic challenges must be made. Future research should explore public health strategies aimed at education and integration of SDF into broader health initiatives. Additionally, SDF has the potential to greatly impact oral health inequities worldwide if these barriers can be met with solutions.

#141: Analysis of Female Oral Contraceptive (OC) on Adult Oral Health

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Purpose

While birth control is widely known for regulating reproductive health, it also has the potential to affect various aspects of oral health. This review aims to explore how female oral contraceptives, particularly those containing estrogen and progesterone can potentially increase susceptibility to gum diseases.

Methods

This systematic review was conducted following the PRISMA 2020 guidelines. The PICO model was used to formulate the research question. Search strategies include using Boolean operators “OR” and “AND” on databases such as PubMed, SCOPUS, ScienceDirect, Web of Science and Cochrane Library. Search was limited to articles published between 2015 to 2024 based on their relevance regarding oral contraceptives' effect on the oral cavity. Additionally, participants of each study needed to be between the ages of 18-50 and have to be on female oral contraceptives. Participants that were taking birth control for less than 6 months and those with smoking history were not included.

Results

31 articles were used in this literature review. In analyzing these articles, we identified the correlation between oral contraceptives and periodontitis, gingivitis, increased risk of dry socket, and changes in the oral microbiome.

Conclusions

Traditional oral contraceptive pills (OCs) can enhance inflammatory responses, raising the risk of periodontal disease, alveolar osteitis (dry socket), and alterations in the oral microbiota, such as *Candida spp.* colonization. Newer OCs, with reduced hormone levels, have been shown to have a more favorable impact on oral health.

#142: RAGE Signaling in Smoke-Induced Chronic Sinusitis: Inflammation and Therapeutic Targets

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Purpose

Chronic sinusitis (CS) is characterized by marked excessive pro-inflammatory exudates, hypersecretion of mucus, and mucosal edema. CS affects approximately one in seven adults, with estimates suggesting a prevalence of up to 15% in the general U.S. population. This study aims to elucidate the molecular mechanisms regulated by the RAGE, a pro-inflammatory mediator identified in tissues exposed to secondhand smoke (SHS), potentially contributing to the pathophysiology of CS.

Methods

Wild-type (WT) mice and transgenic mice overexpressing RAGE in sinonasal epithelium (RAGE TG) were maintained in room air or subjected to secondhand smoke exposure using a nose-only delivery system (Scireq Scientific, Montreal, Canada) for five days per week over a 30-day period. Histological analysis was performed using staining for RAGE. Tissue lysates were analyzed by dot blot and immunoblotting for key markers of apoptosis and pro-inflammatory cytokines.

Results

Significant upregulation of RAGE expression was observed in the sinus tissues of WT mice following SHS exposure, as well as in RAGE TG mice irrespective of smoke exposure. SHS exposure and RAGE overexpression resulted in increased levels of cleaved caspase-3 and diverse pro-inflammatory cytokines including IFN-g, IL-1b, IL-5, IL-13, IL-17A, and TNF-a

Conclusions

These findings highlight the pivotal role of RAGE signaling in the exacerbation of inflammatory processes, particularly in the context of chronic inflammation induced by smoke exposure. The study expands our understanding of the RAGE signaling axis as a key contributor to the progression of smoke-related lung and sinonasal pathologies. Targeting RAGE-mediated pathways could represent a novel therapeutic strategy to mitigate the progression of chronic sinusitis associated with smoke exposure.

#143: Nicotine-Driven Modulation of mTOR Pathway in Oral Squamous Cell Carcinoma: A Cell-Specific Response to E-Cig Vapor Exposure

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Purpose

Oral squamous cell carcinoma (OSCC) is a common disease affecting 30,000 people in the United States each year. The rise of electronic cigarettes (eCigs) has introduced a new, largely unregulated product line within the smoking industry. Although eCigs are generally considered to be less harmful than traditional smoking, little is known about their actual health effects. eCigs work by heating oil-based liquids and delivering aerosolized flavors, with or without nicotine, yet the health impacts of this mechanism remain under-researched. mTOR is a protein that regulates cell growth in response to nutrients and growth factors. The mTOR pathway includes other proteins such as p70 and 4EBP1, which influence cell invasion by increasing protein synthesis via distinct pathways. Our objective was to determine the role of mTOR pathway proteins in OSCC cells in culture.

Methods

Gingiva-derived Ca9-22 cells and tongue-derived Cal-27 cells were exposed to eCig vapor extract (EVE) generated by bubbling Green Apple flavored eCig solution, with or without nicotine, using a mod atomizer. The cells were exposed for 6 hours, after which protein lysates and conditioned media were immediately isolated. Immunoblot analysis was performed to examine mTOR pathway proteins.

Results

Immunoblotting of Ca9-22 cells showed: 1) An 11-fold increase in phosphorylated mTOR (p-mTOR) with nicotine;2) A 2-fold increase in phosphorylated p70 (p-p70), which decreased in the presence of nicotine; 3) A 3-fold decrease in phosphorylated 4EBP1 (p-4EBP1), independent of nicotine presence; and 4) A 3-fold decrease in phosphorylated AKT (p-AKT) when nicotine was present. Immunoblotting of Cal-27 cells showed: 1) A 16-fold increase in p-mTOR with nicotine; 3) A 4-fold decrease in p-4EBP1 with nicotine and 4) A 4-fold increase in p-AKT with nicotine.

Conclusions

We conclude that the activation of mTOR in Ca9-22 OSCC cells is correlated with increased mTOR protein and a decrease in p70 protein in a nicotine-dependent manner. Cal-27 cells showed increased mTOR protein and decreased 4EBP1 protein, also dependent on nicotine presence. Together, these findings suggest a cell-specific and nicotine-dependent response in the mTOR pathway in OSCC cells.

#144: The Impact of Electronic Cigarette Vapor and Cigarette Smoke on Oral Squamous Cell Carcinoma Invasion and Inflammation

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Purpose

Oral squamous cell carcinoma (OSCC) is a malignancy affecting approximately 30,000 people annually in the United States, and it has been strongly associated with tobacco exposure. While the adverse effects of cigarette smoke on OSCC are well established, the health impacts of electronic cigarettes (eCig), which deliver aerosolized flavors with or without nicotine, remain unclear. Our study aimed to compare the effects of eCig vapor extract (EVE) and cigarette smoke extract (SHS) on OSCC cell invasion, as well as the associated inflammatory responses.

Methods

Gingival-derived Ca9-22 cells were exposed to eCig vapor extracts from Red Hot or Green Apple flavors, with or without nicotine, for 6 hours. Separately, Ca9-22 cells were treated with cigarette smoke extract and semi-synthetic glycosaminoglycan ethers (SAGEs), a modulator of the receptor for advanced glycation end-products (RAGE), which is upregulated by second-hand smoke. Cellular invasion was measured in real-time, and protein expression was assessed using western blot analysis.

Results

We observed that both eCig vapor and cigarette smoke extracts increased OSCC cell invasion, although the molecular mechanisms differed. EVE exposure led to increased expression of NF-kB, TNF-α, ERK, JNK, and matrix metalloproteinase (MMP)-13, particularly in cells treated with Apple EVE. Cigarette smoke extract increased RAGE expression, along with Ras, AKT, and NF-kB activation, and enhanced expression of MMPs 2, 9, and 14. Notably, SAGEs were effective in inhibiting RAGE-dependent OSCC cell invasion induced by cigarette smoke extract.

Conclusions

In conclusion, both eCig vapor and cigarette smoke contribute to OSCC cell invasion via distinct but overlapping inflammatory and molecular pathways. These findings highlight the need for further research to fully elucidate the health risks associated with newer tobacco alternatives, such as eCig, in relation to traditional cigarette smoke exposure.

#145: Dental Pulp-Derived Stem Cells applied for tissue rehabilitation could increase the risk of recurrence in Oral Cancer patients: Evidence from In-vitro analysis.

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Purpose

To assess if the secretions of stem cells from dental pulp (DPMSC-S) increase oral cancer properties

Methods

Oral cancer (AW13516) cell lines were exposed to varying doses (20%, 50%, and 100%) of secretions of the stem cells isolated from dental pulp. Key carcinogenic properties of the oral cancer cells were assessed using the following modalities: CFSE, Ki-67 (proliferation of cell); photometric DNA fragmentation index assay, flow cytometric Annexin-5 assay, gene expression of CASP3, CASP9, BAX, BCL2 (apoptosis); gene expression of OCT-4, SOX-2 (stemness); flow cytometric ECAD, NCAD assay (epithelial-mesenchymal transition); ITGB4, FN1, EpCAM, LAMP2 (cell to extracellular matrix adhesion), gene expression of CD147 (invasion); LAMP2 (migration); PARP (DNA repair) and PINK1 (mitochondrial repair), ABCB1, ABCG2 (multi-drug resistance). Being in-vitro study the experiments were repeated in triplicates and performed two times in a independent fashion to ensure reliability.

Results

At all concentrations the stem cell secretion significantly augmented at least one oral cancer property at a minimum of one observed time point: 24 hours (proliferation, invasion, multi-drug resistance) 48 (invasion, cell to extracellular matrix adhesion, multi-drug resistance, DNA repair) and 72 hours (invasion, cell to extracellular matrix adhesion, multi-drug resistance, DNA repair, mitochondrial repair).

Conclusions

The growth factors from the stem cells have sufficient regenerative potential to augment oral cancer properties. If used in a patient with remnant cancer cells, they could potentially increase the risk of recurrence. Thus, caution is required in the application of dental pulp stem cells in oral cancer patients as a post-treatment tissue rehabilitation modality.

#146: Physicochemical properties and bacterial adhesion of conventional and 3D printed complete denture PMMA materials: An In vitro study – Part 1.

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Purpose

To evaluate and compare the surface morphology, wettability, roughness, and bacterial adhesion properties of polymethyl methacrylate (PMMA) materials fabricated by conventional methods and 3D printing for complete denture applications.

Methods

Two PMMA materials were investigated: conventionally processed (ProBase Hot) and 3D-printed (V-Print Dentbase). Surface morphology (n=3) was analyzed using scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX). Surface roughness (n=10) was measured using an optical profilometer. Wettability was assessed through contact angle measurements (n=6) at 10, 30, and 60 seconds. Bacterial adhesion (n=9) and biofilm formation (n=3) were evaluated using Escherichia coli as a model organism, with quantitative bacterial counts and SEM analysis of bacterial morphology. Data were statistically analyzed.

Results

SEM analysis revealed nanoparticles on the surface of 3D-printed samples, while EDX detected silicon in these samples, absent in conventional PMMA. 3D-printed surfaces exhibited significantly lower roughness (1.05±0.32 µm) compared to conventional surfaces (20.46±6.71 µm) (p<0.001). Contact angle measurements showed that 3D-printed surfaces were more hydrophilic (64-68°) than conventional surfaces (100°) (p<0.05). Bacterial adhesion studies demonstrated more adherent bacteria on 3D-printed surfaces (92.5±30.8) compared to the conventional surfaces (57.6±12.5), but biofilm formation was observed only on conventional surfaces.

Conclusions

3D-printed PMMA exhibited distinct surface characteristics compared to conventionally processed PMMA, including the presence of silicon nanoparticles, lower surface roughness, and higher hydrophilicity. While 3D-printed surfaces showed higher initial bacterial adherence, in contrast they appeared to inhibit biofilm formation which highlight the complex nature of bacterial interactions with these materials.

#147: Evaluation of bond Strength in 3D Printed, milled, and conventional complete denture PMMA materials: An In vitro study - Part 2.

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Purpose

To evaluate and compare the bond strength and failure patterns between denture bases and artificial teeth fabricated using CAD-milled (CADM), 3D-printed (3DP), and conventional heat-cured (CHC) methods, assessing their performance before and after thermocycling.

Methods

A total of 120 specimens (40 per group) were fabricated using CADM, 3DP, and CHC techniques. Half of each group underwent thermocycling (5000 cycles, 0°C to 55°C). Bond strength was tested using a universal testing machine, applying an off-axis load at 45 degrees. Failure modes were analyzed using digital microscopy and classified as adhesive, cohesive, or mixed. Data were statistically analyzed.

Results

The CADM group showed the highest mean bond strength before (678.85 ± 58.93 N) and after (642.74 ± 370.96 N) thermocycling, followed by the 3DP and CHC groups. However, no statistically significant differences were found between groups (p > 0.05). Thermocycling resulted in decreased bond strength across all groups, with the CHC group showing a trend toward significance (p = 0.0858). The most observed failure was adhesive fracture in all groups. Cohesive failure in the tooth material was observed less than adhesive failure.

Conclusions

CAD/CAM technologies (milling and 3D printing) can produce dentures with bond strengths comparable to conventional methods, regardless the thermocycling process.

#148: Evaluation of Antimicrobial and In vitro Cytotoxic Effects of *Myristica fragrans* against Human Cancer Cell lines.

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Purpose

The objective of the present study was to screen the phytochemicals and evaluate the antimicrobial activity and in-vitro cytotoxicity effects of methanolic extracts of the arils of *Myristica fragrans* (Houtt) against three human cancer cell lines A549, ME180 and MBA MD 231. GC-MS revealed presence of 50 metabolites, most of which are attributed to anti-microbial and anti-cancer activities. Anti-microbial assay using the well-diffusion method demonstrated significant zone of clearance in *Staphylococcus aureus, Enterococcus feacalis, Klebsiella pneumonia* and *Shigella sonnei*. Anti-microbial activity for the methanolic extract was performed by the well-diffusion method in *Staphylococcus aureus, Enterococcus feacalis, Klebsiella pneumonia* and *Shigella sonnei*. The methanolic extract demonstrated significant activity in the well-diffusion method upto 20mm in S. aureus at 100µg concentration when compared to 21 m in Ampicillin as positive control. Methanolic extract of M.fragrans induced a significant (p<0.05, 0.01) cytotoxic effect in the A549, ME-180 and MBAMD-231 cell lines. There is a significant reduction in cell viability in both the cell lines according to a dose- and time-dependent manner. The MTT data indicated IC-50 values of 52.45µg, 48.52µg and 54.02µg respectively for A549, ME180 and MBA MD 231. Figures of the MTT assay is represented as histogram below. Results indicate that the plant has a promising anti-cancer activity. The methanolic extract of plant showed highest antimicrobial and anti-proliferative properties. Further investigation for active compound present in *Myristica fragrans* is required for cancer management and for the development of new anti- cancer drugs. Screened compounds from GC- MS will be undergone for in silico docking analysis with appropriate protein molecules, in vitro and in silico results emphasize the effectiveness of bioactive molecules present in the Myristica species.

Methods

PHYTOCHEMICAL SCREENING
GC-MS AND MALDI
ANTIMICROBIAL
ANTIBIOFILM
CELL CYTOTOXICITY
ROS
APOPTOSIS
MTT
IN SILICO SCREENING
DOCKING
SIMULATION

Results

Methanolic extract of M.fragrans induced a significant (p<0.05, 0.01) cytotoxic effect in the A549, ME-180 and MBAMD-231 cell lines. There is a significant reduction in cell viability in both the cell lines according to a dose- and time-dependent manner. The MTT data indicated IC-50 values of 52.45µg, 48.52µg and 54.02µg respectively for A549, ME180 and MBA MD 231. Figures of the MTT assay is represented as histogram below.

Conclusions

In recent years, considerable interest has been generated on identifying naturally occurring chemo-preventive substances capable of inhibiting or reversing the multistage carcino genesis. A wide array of phenolic substances particularly those present in dietary and medicinal plants have been reported to possess substantial anti-carcinogenic and anti-mutagenic activities. Many of the natural products from a large number of aromatic and medicinal plants have found use in household treatment of a variety of elements. These products hold a great promise as new sources of drugs that have been used effectively for centuries for traditional medicine. Medicinal properties of these plants are due to presence of some active principle that produce definite biologic activity causing interference in some essential biologic pathway. For testing the anticancer property, extracts of *Myristica fragrans* or Houtt plant was screened for the phytochemicals, antimicrobial activity and also for cytotoxicity by using three human cancer cell lines by established in vitro cytotoxicity assays. Anti-microbial activity for the methanolic extract was performed by the well-diffusion method in *Staphylococcus aureus, Enterococcus feacalis, Klebsiella pneumonia* and *Shigella sonnei*. The methanolic extract demonstrated significant activity in the well-diffusion method upto 20mm in S. aureus at 100µg concentration when compared to 21 m in Ampicillin as positive control. One of the ancient herbs known as nutmeg (*Myristica fragrans* Houtt) used as a condiment and spice in Indian foods obtained from the nutmeg tree *(Myristica fragrans*), a native of the Moluccas or Spice Islands (In India, it is grown in the Nilgiris, Kerala, Karnataka and West Bengal) shows great promise for cancer therapy as it inhibited the growth of all the three human cancer cell lines such as A549, ME180 and MBA MD 231. Remarkably, the extract was active against all the three cell lines. Activity was above 70% against all the cell lines. Myristica fragrans Houtt can serve as a candidate drug for cancer therapy and may very well be exploited for cancer treatment to provide a great promise and service to cancer patients.

#149: A Nano-CT Investigation of Preheated Resin Composites: Effects on Voids, Adaptation, and Polymerization Shrinkage.

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Purpose

Composite resins are widely used for posterior restorations due to their favourable properties; however, polymerization shrinkage remains a critical limitation, leading to stress at the tooth-restoration interface, which can result in microleakage and failure. Preheating has emerged as a method to enhance resin flow, improve adaptation, and potentially mitigate shrinkage stress, but its effect on void formation and overall adaptation remains unclear.
This study aimed to evaluate the impact of preheating resin composites at 68°C with varied curing durations (5 seconds and 20 seconds) compared to composites placed at room temperature and cured for 20 seconds, using Nano-CT for qualitative assessment.

Methods

Fifteen extracted human maxillary premolars with Class II cavities were assigned to three groups:
• Group 1: Room temperature composite, cured for 20 seconds.
• Group 2: Preheated composite (68°C), cured for 20 seconds.
• Group 3: Preheated composite (68°C), cured for 5 seconds.
Nano-CT scans provided insights into void volume, shrinkage strain, and internal adaptation, with statistical analysis conducted via ANOVA and post-hoc Tukey's test.

Results

Nano-CT analysis revealed that preheating resin composites significantly reduced polymerization shrinkage and void formation while improving internal adaptation. The room temperature group displayed the highest void volume and shrinkage strain, while both preheated groups demonstrated superior adaptation with significantly lower void incidence. No major differences were observed between the preheated groups, indicating that shorter curing times can achieve similar results to longer exposure durations.

Conclusions

Preheating resin composites before placement enhances adaptation, reduces void formation, and effectively minimizes polymerization shrinkage, even with shorter curing durations, providing practical implications for clinical practice.

#150: Computational Discovery of Molecular Markers for Collagen Degradation and Bone Resorption Pathophysiology in Gingivitis and Periodontitis Conditions.

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Purpose

Gingivitis represents the initial stage of gum disease, whereas periodontitis is a more advanced and severe form. Both conditions result from the accumulation of plaque, tartar, and bacteria on teeth. Common symptoms include swollen, red and bleeding gums. A hallmark of both gingivitis and periodontitis is the degradation of collagen and resorption of the alveolar bone that supports the teeth. Hence, identifying the common molecular markers underlying collagen breakdown and bone resorption in gingivitis and periodontitis conditions is essential for understanding these conditions effectively.

Methods

Herein, we employed a systematic computational workflow encompassing transcriptomic profiling, differential gene expression and molecular marker identification.

Results

In this study, the NCBI-GEO dataset GSE173078 was utilized to perform differential gene expression analysis with a p-value threshold of <0.05 and a log fold change>0.1. The analysis focused on identifying upregulated genes in gingivitis and periodontitis by comparing them individually against healthy controls. The overlap of upregulated genes revealed 152 significant genes common to both gingivitis and periodontitis. Additionally, the GeneCards database identified 3,737 genes associated with collagen degradation and 1,411 genes related to bone resorption. By mapping the 152 common genes to the compiled collagen degradation and bone resorption data, XBP1, CD38, LTF, BMP6, and CHKA were identified.

Conclusions

Overall, this study identifies XBP1, CD38, LTF, BMP6, and CHKA as potential markers of collagen breakdown and bone resorption, highlighting them as therapeutic targets.

#151: Comprehensive Transcriptomic Analysis Identifies Critical Therapeutic Target in Oral Squamous Cell Carcinoma.

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Purpose

The objective of the study was to identify key molecular targets and dysregulated pathways involved in the progression of oral squamous cell carcinoma (OSCC). By analyzing transcriptomic datasets, to uncover therapeutic targets, with a specific focus on upregulated genes driving OSCC pathogenesis.

Methods

Transcriptomic data (GSE37991) from publicly available datasets were retrieved and analyzed to identify differentially expressed genes (DEGs) in OSCC tissues compared to normal tissues. Bioinformatics tools were utilized to perform functional enrichment analysis, identifying biological processes and pathways enriched among the DEGs. A protein-protein interaction (PPI) network was constructed to identify hub genes, followed by clustering analysis to detect critical modules within the network. Further pathway enrichment analysis was conducted to determine key signaling pathways involved in OSCC progression.

Results

A total of 5,491 upregulated genes were identified in OSCC tissues. Functional enrichment analysis revealed that these genes were significantly associated with cell cycle regulation, mitotic division, and tumor progression. PPI network analysis identified CCNB1 as a central hub gene, indicating its pivotal role in OSCC pathogenesis. Clustering analysis of the network further highlighted critical gene modules associated with tumor growth and metastasis. Pathway enrichment analysis showed several key signaling pathways, including those related to cell proliferation and immune evasion, were dysregulated in OSCC.

Conclusions

This study identified 5,491 upregulated genes in OSCC and highlighted CCNB1 as a key molecular target involved in its progression. The findings provide insights into the molecular mechanisms driving OSCC and point to CCNB1 and related pathways as potential candidates for therapeutic intervention. These results lay the groundwork for further experimental validation and the development of targeted therapies for OSCC.

#152: Targeting Extracellular Matrix-Associated Molecules in Oral Squamous Cell Carcinoma: A Comprehensive Bioinformatics Approach for therapy and Diagnosis.

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Purpose

Oral squamous cell carcinoma (OSCC) is among the most prevalent malignant head and neck tumors, posing a significant threat to global health. Despite advances in cancer research, the incidence of OSCC continues to rise, while its prognosis remains largely unchanged. Understanding the molecular mechanisms driving OSCC progression could pave the way for novel therapeutic interventions. Recent studies have highlighted the critical role of the extracellular matrix (ECM) in OSCC invasion and metastasis. ECM components actively influence transcriptional regulation and cell signaling pathways associated with these processes. This study aimed to identify ECM-related hub genes (HGs) in OSCC and investigate their molecular signatures to assess their potential as biomarkers for diagnosis, prognosis, and therapeutic targeting.

Methods

Four microarray datasets were retrieved from the NCBI database to identify upregulated differentially expressed genes (DEGs). ECM-related genes were subsequently filtered using MatrisomeDB. A protein–protein interaction (PPI) network was constructed through the STRING database and visualized using Cytoscape software. Hub genes were identified via the CytoHubba plugin. Comprehensive analyses were performed, including enrichment analysis, expression pattern analysis, clinicopathological correlation and survival analysis, immune cell infiltration analysis, and chemical compound interactions assessed.

Results

Key ECM-related hub genes were identified from the upregulated DEGs across the microarray datasets. These hub genes were significantly overexpressed in OSCC (p < 0.05) and were associated with tumor progression. Notably, high expression levels of the hub genes correlated inversely with patient survival, highlighting their prognostic significance. Additionally, a strong positive correlation was observed between the expression of these hub genes and immune cell infiltration. Furthermore, chemical compounds were identified as potential therapeutic agents based on their interactions with the identified hub genes, offering promising avenues for targeted treatment.

Conclusions

In conclusion, our findings suggest that the identified hub genes hold great promise as innovative therapeutic targets for both the diagnosis and prognosis of OSCC.

#153: Integrative Transcriptomic and Metabolic Profiling of OSCC and Candida albicans: Toward Targeted Interventions.

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Purpose

One of the most prominent cancers in the world is oral squamous cell carcinoma (OSCC). The frequency of OSCC has not decreased over the past few decades, and the survival rate is still low due to a lack of early detection and treatment. Candida albicans is a part of the oral microbiota that can cause epithelial alterations that increase the risk of premalignancy and/or malignancy. Candida albicans frequently presents as an opportunistic illness in patients with oral squamous cell carcinoma, although it is unreported whether the fungus promotes the origin and growth of OSCC or whether cancer induces fungal growth, oral squamous cell carcinoma (OSCC) is linked to oral Candida albicans infection.

Methods

This study investigates oral carcinoma using the NCBI-GEO dataset GSE169278 to perform differential gene expression analysis with a p-value threshold of <0.05 and a log fold change >0.1. Upregulated DEGs were intersected with metabolite targets predicted through computational tools. The common genes were identified, and a protein-protein interaction (PPI) network was constructed. The top five clusters with the highest connectivity scores were selected for further analysis. Gene ontology (GO) enrichment was performed for these clusters, followed by topological analyses. All genes with topological parameters were intersected to identify key targets. Genes with a hazard ratio (HR) >1 were designated as potential therapeutic targets.

Results

The upregulated DEGs from the dataset were identified and intersected with the metabolite targets. The PPI network and cluster analysis revealed genes with the highest connectivity scores, enriched in biological processes such as inflammatory response, epithelial cell differentiation, and fungal-type cell wall organization. Survival analysis of the common genes from topological assessments was conducted, and the gene with a high hazard ratio (HR >1) was selected as the potential therapeutic target.

Conclusions

These findings provide valuable insights into the molecular mechanisms of OSCC and Candida albicans interactions, paving the way for precision medicine approaches in the treatment of oral squamous cell carcinoma.

#154: Gingerol enhances Osteogenic/Odontogenic differentiation of Dental pulp stem cells impaired by Oxidative stress via the wnt/β-Catenin pathway.

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Purpose

This work intends to evaluate gingerol's ability to improve osteogenic/odontogenic differentiation of DPSCs impaired by oxidative stress through the Wnt/β-catenin signaling pathway.

Methods

Human dental pulp cells (hDPCs) were exposed to oxidative stress caused by hydrogen peroxide (H_2O_2) and then treated with different doses of gingerol. Cell viability was assessed using the MTT test. The scratch wound healing assay was used to evaluate healing potential. ELISA was utilized to assess osteogenic markers, including ALP, BSP, and MMP-2 and 9. The Alizarin Red staining technique was utilized to assess calcium accumulation and mineralization. ROS levels were measured by ROS staining, and the Wnt/β-catenin signaling pathway was investigated through real-time PCR analysis of pathway-related genes.

Results

Gingerol significantly increased the viability and migration of DPSCs after oxidative stress. It boosted the expression of osteogenic markers such as ALP, BSP, MMP-2, and MMP-9, as well as calcium deposition, as demonstrated by increased mineralization in Alizarin Red staining. Gingerol therapy also decreased ROS levels, indicating less oxidative stress. The Wnt/β-catenin pathway was activated, leading to increased β-catenin expression and downstream gene activation, which supports improved differentiation. Gingerol activates the Wnt/β-catenin signaling pathway, leading to improved osteogenic differentiation of DPSCs under oxidative stress. Gingerol's ability to stimulate DPSC development while reducing oxidative damage shows its potential as a therapeutic agent for dental tissue regeneration and endodontic therapies.

Conclusions

This study demonstrates that gingerol enhances the viability and migration of dental pulp stem cells (DPSCs) under oxidative stress by boosting osteogenic markers and reducing reactive oxygen species levels. By activating the Wnt/β-catenin signaling pathway, gingerol promotes improved differentiation of DPSCs, highlighting its potential as a therapeutic agent for dental tissue regeneration and endodontic therapies. This research supports further exploration into gingerol’s applications in regenerative dentistry.

#155: Accuracy of Complete-Arch Intraoral Digital Implant Impression with Scanbody Splinting: A Randomized In vitro Trial.

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Purpose

To assess accuracy of implant complete-arch digital impression with intraoral scanner (IOS) and implant scanbody splinting (ISS).

Methods

An edentulous mandibular master model with 4 analogues was fabricated. Four polyetheretherketone (PEEK) implant scanbodies (ISBs) were scanned by investigated IOS with (ISS+) and without implant scanbody splinting (ISS-), resulting in 30 test and 30 control files. The master model was digitized by industrial optical scanner and the related file superimposed to the test and control files by a best fit algorithm. Linear (ΔX, ΔY and ΔZ-axis) and angular deviations (ΔANGLE) were evaluated for each analogue. A global measure of linear absolute error (ΔASS) was calculated considering the sum of absolute linear discrepancies. Influence of ISS and implant position on IOS accuracy was assessed using General Linear Model and possible interaction between ISS and implant position evaluated.

Results

Implant position showed a significant main effect (p<0.0001) and interaction with ISS (p=0.0454) when ΔASS was considered as response variable. Posterior implants resulted as less accurate. ISS was able to reduce ΔASS for both distal analogues (4.7, p=0.0188). When ΔANGLE was considered as a response variable, implant position and ISS showed significant main and interactive effects (p=0.0039, p<0.0001, p<0.0001). Analogue 3.6 was associated with highest angular discrepancy. This error was significantly reduced by ISS (p<0.0001).

Conclusions

The investigated intraoral complete-arch implant digital impression with scanbody splinting showed a significant improvement of the overall accuracy, particularly reducing linear and angular deviations at the most critical posterior implant positions.

#156: Evaluation of Nasal Airway Volume In Adults after Maxillary Expansion with Clear Aligner

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Purpose: To investigate whether slow maxillary expansion using clear aligners might Change nasal airway volume.

Methods: Twenty adults (14 females, 6 males; mean age 33.8±9.8 (AVG±SD) years, range: 22.6–58.8) underwent comprehensive orthodontic treatment with clear aligners for a mean duration of 18.7±8.9 (AVG±SD) months (range: 6.7–36.3). All received non-extraction therapy and had pre- (T1) and post-treatment (T2) cone-beam computed tomography (CBCT). The nasal airway was isolated using Materialise Mimics (Materialise®, Leuven, Belgium) image analysis software. The resulting 3D models of the nasal airway (pre- and post-treatment) were imported to Geomagic ® Control TM 2015 (3D Systems, South Carolina, USA) for volume measurements. A paired t-test (p<0.05) compared T1 and T2 volumes.

Results: Mean T1 nasal airway volume was 19,982.1±3,660.4 mm^3 (AVG±SD) (range: 14,135.5–31,138.6), increasing to 21,262.7±3,822.2 mm^3 (AVG±SD) (range: 16,702.5–31,730.8) at T2. The average volumetric increase of 1,280.6 mm^3 (6.82%) was statistically significant (p=0.008).

Conclusions: In this pilot sample of 20 adults, there was a significant mean increase in nasal airway volume in the palate after slow maxillary expansion using clear aligners. Additional controlled studies with larger cohorts are warranted to validate and expand upon these results.

#157: Impact of Smoking and Drinking Habits on Lipid Profiles in Diabetic and Non-Diabetic Individuals & their Oral Implications

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Purpose: To investigate & evaluate the effect of smoking and drinking habits on lipid profiles of diabetic and non-diabetic individuals and their oral implications.

Methods: A total of 30 Individual subjects aged above 18 years are selected. The subjects will be divided into 6 groups. Group 1: No habit, non-diabetic (n=5) Group 2: No habit, with diabetic (n=5) Group 3: Smoking habit, non-diabetic (n=5) Group 4: Smoking habit, with diabetic (n=5) Group 5: Smoking and drinking habit, non-diabetic (n=5) Group 6: Smoking and drinking habit, with diabetic (n=5). A detailed history will be given. Subjects are explained in detail about the study. The Venous blood samples will be collected under all aseptic precautions. The serum is obtained by centrifugation and analysed for lipid profile [Total cholesterol (TC), High-Density Lipoprotein-cholesterol (HDL- C), Low-Density Lipoprotein-cholesterol (LDL- C), and Triglyceride (TG)]

Results: in our study, mean levels of each lipid related variable were compared between smokers in diabetics compared to non-diabetics in univariate analysis. From the results of the study, it was found that all the lipid variables were higher in diabetics with smoking habit and this difference was statistically significant (p<0.05*); Mean levels of each lipid related variable were compared between smokers and drinkers in diabetics compared to non-diabetics in univariate analysis. From the results of the study, it was found that all the lipid variables were higher in diabetics with smoking and drinking habit and this difference was statistically significant (p<0.05*) except for serum HDL cholesterol (p>0.05); mean levels of each lipid related variable were compared between diabetics and non-diabetics with no habit in univariate analysis. From the results of the study, it was found that all the lipid variables were lower in non- diabetics with no presence of habit and this difference was statistically significant (p<0.05*) except for serum HDL cholesterol (p>0.05). the analysis for the association between smoking habit among people with and without diabetes on lipid profile was evaluated. It was found that the odds ratio for lipid associated profile (Serum cholesterol, Serum Triglyceride, Serum HDL cholesterol) in habit and this difference was statistically significant (p<0.05*), while a weak association was seen for LDL cholesterol and VLDL cholesterol (p>0.05). he analysis for the association between smoking and drinking habit among with and without diabetes on lipid profile was evaluated. It was found that the odds ratio for lipid associated profile (Serum cholesterol, Serum Triglyceride, Serum HDL cholesterol) in diabetics with smoking and drinking habit was different (strong association was seen) from that of non-diabetics with smoking and drinking habit and this difference was statistically significant (p<0.05*), while a weak association was seen for LDL cholesterol and VLDL cholesterol (p>0.05). the analysis for the association between diabetics and non-diabetics with no habit on lipid profile was evaluated. It was found that the odds ratio for lipid associated profile (Serum cholesterol) in diabetics with no habit was different (strong association was seen) from that of non-diabetics with no habit and this difference was statistically significant (p<0.05*), while a weak association was seen for Serum Triglyceride, Serum HDL cholesterol, LDL cholesterol and VLDL cholesterol (p>0.05). The above-mentioned variations also play a crucial role in oral health like periodontitis, dental caries, xerostomia as well as healthy gum and teeth.

Conclusions: The interplay between smoking, drinking, and lipid profiles presents significant challenges for both diabetic and non-diabetic individuals. These lifestyle factors not only impact cardiovascular health but also have profound implications for oral health. Addressing smoking and drinking habits through comprehensive lifestyle interventions and regular health monitoring can mitigate these risks and improve overall health outcomes.

#158: Insights into Mesiodistal Tooth Alignment in Angle Class I & II Malocclusions via Panoramic Radiographs

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Purpose: Orthodontic treatment aims to achieve optimal tooth positioning in all three spatial planes. Proper axial inclination is crucial for the effective distribution of occlusal forces and the maintenance of stable contact areas. Panoramic radiography is widely utilized in orthodontics due to its ability to provide comprehensive diagnostic information with relatively low radiation exposure. This study evaluated the mesiodistal angulation of teeth in individuals with Angle's Class I, Class II Division 1, and Class II Division 2 malocclusions and compared these angulations across the different malocclusion classes.

Methods: A retrospective analysis was conducted using panoramic radiographs (n=90, 45 males and 45 females) obtained from the departmental archives. The mesiodistal angulation of each tooth was measured as the angle between the reference plane and the long axis of the tooth using a protractor. Measurements were performed across four dental quadrants. The collected data were subjected to one-way ANOVA to determine statistically significant differences in tooth angulation among the malocclusion groups.

Results: Significant differences in mesiodistal angulation were identified among the three malocclusion classes. In the first quadrant, teeth 12, 16, and 17 exhibited statistically significant variations. The second quadrant revealed significant differences in teeth 24, 25, 26, and 27. In the third quadrant, teeth 33, 34, 35, and 36 showed significant angulation discrepancies. Similarly, in the fourth quadrant, teeth 43, 44, 45, 46, and 47 demonstrated statistically significant differences (p<0.05).

Conclusions: Significant variations in the angulation of canines, premolars, and molars were identified among Angle's Class I and Class II malocclusions. These differences affect the distribution of occlusal forces and the stability of tooth alignment, underscoring the importance of individualized treatment planning. Addressing these angulation discrepancies during treatment planning is essential for optimizing both functional and aesthetic outcomes in orthodontic patients

#159: Enhancing Orthodontic Treatment Outcomes Using Low-Intensity Pulsed Ultrasound (LIPUS) with Clear Aligners

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Purpose: Clear aligners have proven to be an attractive option for patients requiring treatment for dental malocclusions. This study aims to analyze the effect of Low-Intensity pulsed ultrasound (LIPUS) on treatment outcomes of clear aligners under the following headings: treatment duration, refinements, and bone radio density and assess the safety profile by analyzing adverse effects.

Methods: Records from 68 patients treated with clear aligners were reviewed in this retrospective study and separated into LIPUS-treated and control patients. Patients were matched for age, biological sex, and complexity of malocclusion classified by the American Board of Orthodontics Discrepancy Index (ABODI). Inclusion criteria included patients aged 12 or older and ≥67% adherence to LIPUS use. Treatment outcomes evaluated included duration, number of refinements, discarded aligners, changes in bone radio density (via CBCT Hounsfield units), and adverse effects. Statistical analyses used t-tests and the Mann-Whitney U test.

Results: Patients who received LIPUS treatment had a 43.58% reduction in treatment time (544.68 ± 238.97 days vs. 964.82 ± 417.9 days p < 0.001) and had fewer refinements (1.56 ± 1.11 vs. 2.41 ± 1.28 p = 0.0045). LIPUS users had a lower number of discarded aligners (7.56±11.91 vs. 11.18±13.39, p=0.04) and finished treatment using more unused trays (5.06±7.71 vs. 1.41±4.36, p=0.02). Results showed a significant increase in bone radio density in maxillary bone (p < 0.001) in the LIPUS group. Adverse effects, including minor gum irritation and discomfort, were rare and comparably reported in both groups, with no severe adverse events observed.

Conclusions: Significantly reduced treatment duration, refinements, discarded aligners, and increased bone radio density were observed following using LIPUS with clear aligners. And there is no increase in adverse effects compared to conventional treatment. This would imply that LIPUS could increase treatment effectiveness and stability. More research is necessary to replicate these findings in broader populations.

#160: Efficacy of Biodegradable Natural fibers-Infused Toothbrushes in Plaque Control and Gingival Health: A Comparative Study

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Purpose: Plaque removal is crucial for preventing gingivitis and periodontitis. Biodegradable toothbrushes, infused with natural substances like charcoal and neem, provide an eco-friendly alternative to conventional nylon brushes. Charcoal offers antibacterial properties, while neem provides antimicrobial and anti-inflammatory benefits.
Thus, this study aimed to evaluate and compare the antiplaque and anti-inflammatory effects of charcoal-infused and neem-infused toothbrushes with conventional toothbrushes.

Methods: This double-blind randomized controlled trial included 33 systemically healthy individuals diagnosed with gingivitis. Baseline plaque scores were set to zero through professional scaling. Subjects were randomly assigned into three groups of 11 each, receiving either a charcoal-infused, neem-infused, or conventional toothbrush. All participants were instructed to use the modified Bass brushing technique twice daily with a standardized toothpaste. Follow-up evaluations were conducted at 7 and 14 days using the Turesky modification of the Quigley Hein Plaque Index for plaque assessment and the Silness and Löe Gingival Index for gingival inflammation. One-way ANOVA with post hoc analysis was used to compare differences between groups, and repeated measures ANOVA assessed parameter changes over time.

Results: The charcoal-infused toothbrush group demonstrated the lowest mean plaque scores, followed by the neem-infused group, while the non-infused group exhibited the highest plaque scores. One-way ANOVA revealed statistically significant differences in plaque scores among the groups at both 7 and 14 days (p<0.05). For gingival index scores, the neem-infused toothbrush group showed the lowest values, followed by the charcoal-infused group, with the non-infused group showing the highest scores. However, these differences were statistically insignificant at both recall intervals.

Conclusions: Charcoal-infused and neem-infused toothbrushes exhibited superior plaque removal compared to non-infused toothbrushes. Although improvements in gingival health were observed, the differences were not statistically significant. Extended trials are recommended to further validate these findings and to explore the potential long-term benefits of using biodegradable toothbrushes
Clinical Implications: Natural-infused toothbrushes, such as those containing neem and charcoal, may enhance plaque removal and improve oral and systemic health. Their biodegradability offers an eco-friendly alternative to traditional plastic brushes, contributing to sustainability while promoting oral health.

#161: Orthodontic Correction of Bimaxillary Protrusion Using MBT and Frictionless Retraction: A Case Report

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Purpose: Bimaxillary protrusion is a common malocclusion characterized by forwardly positioned upper and lower anterior teeth, often resulting in lip incompetence and an unbalanced facial profile. Orthodontic correction typically involves premolar extractions followed by space closure using various retraction techniques. Frictionless mechanics, such as teardrop loops, offer controlled and efficient anterior retraction, providing favorable functional and aesthetic results. This case report presents the orthodontic treatment of a 17-year-old patient with Angle's Class I malocclusion and bimaxillary protrusion using frictionless mechanics with teardrop loops. Extra-oral examination revealed lip incompetence and a convex facial profile. Intra-oral examination confirmed Angle's Class I molar and canine relationships with bimaxillary protrusion. Cephalometric analysis showed an increased inter-incisal angle, confirming the diagnosis.

Methods: The treatment plan involved the extraction of all first premolars to facilitate space closure. After obtaining informed consent, orthodontic treatment was initiated using 0.022" slot MBT mechanotherapy. Initial levelling and alignment were achieved with round Nickel-Titanium (NiTi) wires, followed by rectangular NiTi wires. A 17×25 TMA archwire with teardrop loops was fabricated for anterior retraction. The loops were activated by 2 mm per session until complete space closure was achieved. Following retraction, finishing wires were used for occlusal detailing, and the appliance was debonded after attaining the desired result.

Results: The treatment successfully corrected the bimaxillary protrusion, as evidenced by a reduction in the inter-incisal angle and retraction of the anterior teeth. The patient achieved lip competence, improved facial aesthetics, and a harmonious profile. Final occlusion exhibited Angle's Class I molar and canine relationships with ideal overjet and overbite.

Conclusions: This case demonstrates that bimaxillary protrusion can be effectively treated using frictionless mechanics with teardrop loops in MBT mechanotherapy. Premolar extractions combined with controlled retraction resulted in significant functional and aesthetic improvements. Frictionless mechanics with teardrop loops provide a predictable and efficient method for correcting bimaxillary protrusion, especially in low resource settings. This approach is particularly beneficial for achieving controlled anterior retraction and enhancing both dental and facial aesthetics in patients with bimaxillary protrusion.

#162: Bridging the Gap: Miniscrew-Assisted Palatal Expansion in a Non-Growing Patient: A Clinical Case Report

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Purpose: Miniscrew-assisted rapid palatal expansion (MARPE) is designed to correct transverse maxillary deficiencies in patients beyond the traditional growth spurt. Unlike conventional rapid palatal expanders, MARPE incorporates skeletal anchorage via miniscrews, providing more stable and precise expansion of the maxilla without relying solely on dental anchorage. Our aim was to illustrate the use of MARPE as a conservative non-extraction modality for an 18-year-old patient presenting with a skeletal Class III malocclusion and to highlight the clinical outcomes of transverse maxillary expansion.

Methods: An 18-year-old female presented with the chief complaint of forwardly placed teeth. Extra-oral findings included a brachycephalic, leptoprosopic facial form, concave profile, and protrusive chin. Cephalometric analysis indicated a Class III apical base due to a prognathic mandible. Intra-orally, the patient exhibited Class III canine and molar relationships, rotated mandibular teeth, and upper midline shift to the right.

Results: A miniscrew-assisted rapid palatal expander was placed to achieve midpalatal suture separation and correct the transverse discrepancy. The appliance was activated twice daily for 15 days. Subsequently, one turn per day was maintained for one week, followed by a six-month retention phase using an acrylic plate. During expansion, the forces exerted by MARPE counteracted anatomical resistance from the midpalatal suture, dentoalveolus, zygomaxillary buttress, and circum-maxillary sutures.
Outcomes: Post-treatment records demonstrated increased arch perimeter, alleviation of crowding, and a more favorable occlusal relationship. The patient's skeletal Class III component was mitigated, improving both function and facial aesthetics.

Conclusions: Conclusion: MARPE offers significant skeletal effects without surgery in selected non-growing patients. By circumventing the limitations of traditional expanders and providing a stable anchor system, it serves as an effective approach to correct transverse maxillary deficiencies in conjunction with broader orthodontic objectives.

#163: Bibliometric Analysis of Long Non-Coding RNAs as Emerging Biomarkers in Cardiovascular Disease: Trends and Key Contributors

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Purpose: This study aims to perform a bibliometric analysis of lncRNAs as biomarkers in CVD, focusing on publication trends, key contributors, and thematic developments from 2008 to 2023.

Methods: A systematic search was executed across PubMed, Scopus, and Web of Science using the keywords "((Long non-coding RNA) OR (lncRNA)) AND (Cardiovascular disease) OR (Cardiovascular disorders) AND (Biomarkers)." A total of 33,805 records were retrieved, with duplicates removed, leading to 29,545 unique records. Following a comprehensive screening process, 341 relevant articles were selected for bibliometric analysis using VOSviewer.

Results: The analysis included 341 publications from 54 countries/regions, involving 548 institutions and 1,744 authors across 177 journals. The United States (84 publications) and China (61 publications) were identified as the top contributors. Zhengzhou University had the highest publication output, while Guo Wei was recognized as the most prolific author. Keyword analysis indicated a strong emphasis on the roles of lncRNAs in the onset, progression, diagnosis, treatment, and prognosis of CVD.

Conclusions: This bibliometric analysis provides valuable insights into the evolving research landscape regarding lncRNAs as biomarkers in CVD. It highlights significant trends, influential authors, and collaborative networks within this field. The findings emphasize the critical role of lncRNAs in cardiovascular research and suggest promising directions for future studies.

#164: Cucumis melo. L – An Oral Wellness Oasis for the Prevention and Remineralisation of White Spot

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Purpose: White spot lesions (WSLs) present a challenge to orthodontists due to their potential to cause aesthetic concerns and tooth decay. They are caused by demineralization around braces, often due to plaque buildup and poor oral hygiene. Orthodontists must monitor these lesions closely, promoting effective oral care, fluoride use, and dietary adjustments to prevent progression. If WSLs worsen, treatment may involve remineralization techniques or cosmetic procedures. Addressing WSLs is critical for maintaining both oral health and the cosmetic outcome of orthodontic treatment.

Methods: Antimicrobial activity of muskmelon peel, seed, and fruit body extracts

1. Cold Extraction: Ethanol extraction of muskmelon peel and seed.
2. Antibacterial Activity Testing: Agar disc diffusion method against *Streptococcus mutans* and *Lactobacillus* sp.
3. Antibacterial Activity of Muskmelon mouth rinse against Conventional Chlorhexidine mouth wash

Results: The antimicrobial activity was determined by measuring the diameter of the zone of inhibition. At a concentration of 1000 µg, muskmelon peel exhibited a 16 mm zone of inhibition against Streptococcus mutans and 15 mm against Lactobacillus species. The seed extract showed 14 mm and 13 mm zones of inhibition, respectively, against the same microorganisms. These results highlight the significant antimicrobial and antifungal properties of muskmelon extracts against the key microorganisms responsible for WSLs.

Conclusions: Given the promising in vitro findings, further research is required to evaluate the efficacy of muskmelon-based mouthrinses in humans by integrating natural plant-based derivatives into modern dental practices, this research seeks to provide an effective, sustainable, and economical alternative to commercially available herbal mouthrinses.

#165: Evaluation of Platelet Rich Fibrin with Biodentine in Direct Pulp Therapy of Permanent teeth - An In Vivo Study

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Purpose: To evaluate and compare the outcome of direct pulp therapy with Biodentine alone versus Biodentine with PRF in permanent teeth with reversible pulpitis.

Methods: A total number of 50 patients requiring direct pulp capping were randomly allocated equally into two treatment groups (n=25 each). Direct pulp capping was performed in Group I using Biodentine (control group), and in Group II using Platelet Rich Fibrin (PRF) with Biodentine. Clinical and radiographic evaluations were performed at baseline, 6 and 12 months. The data obtained was blindly analyzed using the McNemar Chi-square test.

Results: Results: The short term clinical and radiological success rates of PRF with Biodentine (92%) and Biodentine alone (84%) were comparable. However, at 12 months, there was favorable long-term clinical and radiological outcomes with success rate of 76% in Group II as com-pared to Group I (64%).

Conclusions: PRF could be used as a suitable autologous adjunct to Biodentine in direct pulp capping procedures of permanent teeth with reversible pulpitis. Use of PRF with Biodentine can be a novel strategy to treat reversible pulpitis in human permanent teeth

#166: Development and Characterization of a Local Drug Delivery System for Endodontic Disinfection and Regeneration

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Purpose: To develop and characterize a Nanosponge based Novel Local Drug Delivery System loaded with Lyophilized PRF and Modified triple antibiotic paste (Ciprofloxacin, Metronidazole and Clindamycin) for Endodontic Disinfection and Regeneration.

Methods: Nanosponges were made from β-cyclodextrin. Lyophilized PRF was obtained by centrifuging and lyophilizing the collected venous blood. Then fixed amounts of the selected antibiotics (Modified-TAP) and lyophilized PRF were added to the prepared nanosponge along with distilled water and stirred thoroughly. This mixture was centrifuged and the resulting suspension was lyophilized for obtaining the Drug Loaded Nanosponge (DLNS). Physical characteristics of the drug was evaluated by Scanning Electronic Microscope (SEM), Fourier Transmission Infrared (FTIR) Spectrophotometry and Digital pH. The DLNS were incubated in phosphate buffer saline (PBS) for 10 days. The drug release from these DLNS was quantified by a UV spectrophotometer. The antimicrobial activity of DLNS was investigated using the Agar Disk Diffusion Test (ADDT), against *Enterococcus faecalis (E. faecalis), Streptococcus mutans (S. mutans)* and *Fusobacterium nucleatum (F. nucleatum)*. Biocompatibility and Wound healing capacity of the Drug Loaded Nanosponge (DLNS) were assessed using MTT Assay and Scratch Assay.

Results: SEM micrographs show that the nanosponges retained their porous morphology after the inclusion of Lyophilized-PRF and antibacterials indicating sponge like configuration. The porous texture of the nanosponge facilitates infiltration of the drug into the interpenetrating network of the nanosponge. The IR spectra of physical mixture show the characteristic peaks of pure drug indicating that there were no interactions between the drugs and polymer. Initial burst of antibiotics followed by gradual and sustained release was observed within a period of 14 days. DLNS demonstrated pH close to normal physiological environment and antibacterial activity against *E. faecalis, S. mutans* and *F. nucleatum*. It was also biocompatible with human Dental Pulp Stem Cells (hDPSCs) and showed effective wound healing with good cell migration rates.

Conclusions: DLNS demonstrated satisfactory physical characteristics, released antibiotics and exhibited antibacterial activity against the selected microorganisms and was biocompatible and promoted wound healing. Thus, the novel DLNS may be used to disinfect the root canal and supplement Regeneration in Endodontics.

#167: Assessment of Root and Canal Morphology of Permanent Mandibular First Molar: A Cone-Beam Computed Tomographic Study

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Purpose: Limited scientific literature exists which comprehensively describes internal and external morphological characteristics of Permanent Mandibular First Molar/PMFM in an Indian sub-population using CBCT scans, thus justifying the need for this study. Thus, the aim of this study was to assess the root and canal morphology of PMFM using CBCT scans in an Indian sub-population.

Methods: CBCT scans of 438 PMFM were selected for analysis of external morphology and canal anatomy. Scans were acquired with CBCT Kodak 9300 3D-System. Statistical analysis was performed using descriptive and inferential statistics(p<0.05).

Results: PMFM presented with two roots(96.6%), having three(56.6%) or four(39.7%) canals. Majority of mesial roots were distally curved(82%) and distal roots were straight(69.6%). Disto-lingual roots when present(3.4%), had greater proportion of mesio-distal curvature (60%). Mean root length for mesial, distal and disto-lingual roots was 15.44mm±0.69, 14.85mm±0.93 and 12.21mm±1.61 respectively. Bifid- tipped apices occurred in mesial(21.9%) and distal roots(13.2%). Type IV(55.5%), type I(58.9%) and type I(100%) were the most common canal configurations in mesial, distal and disto-lingual roots, respectively. Mean inter-canal orifice distance(IOD) was 3.34mm±0.64, 3.23 mm±0.49, 3.36mm±0.38 and 3.61±0.75 for overall, fin, confluent and independent variants of MMC in mesial root, whereas it was 3.33mm±0.55 and 4.36mm±0. 38 for distal and disto-lingual roots respectively.

Conclusions: The PMFM commonly presented with two roots, having Type IV and Type I canal- configuration that occurred most often in mesial and distal roots respectively. Disto-lingual root demonstrated comparatively shorter root length, single (Type I) canal configuration and most often with mesio-distal curvature. Bifid-tipped apex was associated with presence of MMC and distal isthmus. In the presence of disto-lingual root, the mean IOD of the distal root-complex was significantly higher.

#168: Formulation and Characterization of a Novel Pulp Capping Agent: An In-Vitro Study

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Purpose: To formulate and evaluate the pH, drug release, calcium release and cytotoxicity of the novel drug formulation for its potential use as a pulp capping agent

Methods: Nano-sponge, lyophilized-PRF(Ly-PRF), nano-calcium were fabricated separately and along with Diclofenac sodium in the ratio of 1:2:2:1 by weight were mixed with water and stirred for 24 hours and subjected to centrifugation. The supernatant obtained was lyophilized to obtain the drug loaded nano-sponge. The novel drug loaded nano-sponge was evaluated for pH, drug release, calcium release and cytotoxicity along with MTA as a control group.

Results: The Drug loaded nano-sponge displayed increase in pH from 8.1 to 9.6 after 28 days while MTA had a rise in pH from 11.7 to 12.24 after 28 days. The drug and calcium release were sustained and increased with time in drug loaded nano-sponge. Both the groups exhibited excellent biocompatibility and no cytotoxicity at 24 and 120 hours.

Conclusions: Within the limitations of this experimental study, it can be concluded that the formulated Drug loaded nano-sponge exhibits properties which closely resembles the ideal properties of an agent that is beneficial for pulp therapy.

#169: EFFECT OF CONCENTRATED GROWTH FACTOR ON THE RATE OF ORTHODONTIC TOOTH MOVEMENT IN PATIENTS UNDERGOING FIXED APPLIANCE THERAPY: AN IN VIVO STUDY

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Purpose: Orthodontic treatment outcomes are critically influenced by the rate of tooth movement, a phenomenon governed by the interplay of biological and mechanical factors. The advent of biomodulatory agents, such as Concentrated Growth Factor (CGF), has ushered in novel avenues for accelerating orthodontic tooth movement while maintaining periodontal integrity. This in vivo study investigates the efficacy of CGF in enhancing the rate of orthodontic tooth movement in patients undergoing fixed appliance therapy.

Methods: A split-mouth randomized controlled trial was conducted on patients undergoing orthodontic treatment with extraction of all four first premolars to check the rate of retraction. CGF was centrifuged from autologous blood and placed on the test sites while the contralateral control sites received standard therapy without the placement of CGF. The rate of tooth movement was assessed with the help of casts using precision digital callipers over a period of 8 weeks.

Results: The results revealed a statistically significant acceleration in the rate of retraction in the CGF group compared to the control group, underscoring the osteogenic and angiogenic properties of CGF in promoting alveolar bone remodeling. Additionally, the intervention demonstrated favourable effects on periodontal health, with reduced inflammation and enhanced tissue regeneration.

Conclusions: This study underscores the potential of CGF as a safe and effective biomodulator for optimizing orthodontic treatment timelines. The findings hold profound implications for clinical practice, paving the way for biologically informed orthodontic interventions that synergize efficiency and patient-centered care. Further research is warranted to elucidate the long-term outcomes and refinement of CGF application protocols.

#170: Comparative evaluation of post treatment stability during orthodontic retention using lingual bonded retainers versus lingual bonded retainers coupled with thermoformed retainers in maxillary arch– A randomized controlled trial

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Purpose: Aim of this prospective study is to comparatively evaluate the stability during orthodontic retention using only lingual retainers and lingual retainers along with thermoformed retainers in maxillary arch.

Methods: Patients who have just finished their orthodontic treatment with non-extraction treatment plan for spacing and crowding who are between 15 and 30 years are selected and split into two groups by randomization (table of random numbers). Group A patients are given lingual retainer in combination with thermoformed retainers, Group B patients are given lingual retainer (canine to canine) only. Patients are recalled after six months. For patients under both the groups intra oral photographs and alginate impressions are taken at the time of placement (T0) of retainers as well as after six months (T1). T0 and T1 study models are digitalized and superimposed using Geomagic software. Both the groups are evaluated for translational tooth movements (mm) which are registered along the x-axis (buccal/lingual direction), the y-axis (mesial/distal direction) and the z-axis (apical/ coronal direction).

Results: The analysis showed statistically significant differences in tooth stability between the two groups (lingual retainers with thermoformed retainers [LR+TFR] and lingual retainers alone [LR]). Across all axes (x, y, z), the LR+TFR group demonstrated lower mean values for translational movements, indicating superior stability.

Conclusions: The addition of a thermoformed retainer to the lingual bonded retainer offers improved post-treatment stability in the maxillary arch. This dual-retention protocol may be recommended for patients requiring enhanced alignment preservation after orthodontic treatment.

#171: The chair-side Forsus Appliance: A Novel Approach to Correcting Class II Malocclusions in Adolescents

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Purpose: To make the appliance more economical

Methods: A retrospective study will be conducted on a group of adolescent patients (aged 12-18) with Class II malocclusions treated with the Forsus appliance. Pre- and post-treatment dental models and radiographs will be analyzed to assess changes in molar relationship, overjet, and overbite.

Results: Preliminary results suggest that the Forsus appliance is effective in correcting Class II malocclusions, with significant improvements in molar relationship, overjet, and overbite. Patients reported high satisfaction and better compliance compared to traditional treatment methods.

Conclusions: The Forsus appliance is a promising chair-side device for correcting Class II malocclusions in adolescent patients. Its effectiveness, comfort, and ease of use make it a valuable addition to the orthodontic treatment options available for this common malocclusion.

#172: Orthodontic Monitoring System Through Intraoral Imaging: An Observational Study

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Purpose: This study aimed to evaluate the effectiveness of a dental monitoring system in reducing in-office orthodontic appointments without compromising treatment outcomes. Patients were trained to capture and upload weekly intraoral photographs, enabling remote monitoring and timely intervention.

Methods: Participants aged 12-18 years requiring orthodontic treatment with fixed appliances were included, provided they had good oral hygiene, compliance, and access to smartphones with cameras and internet. The study excluded patients with complex mal-occlusion or a history of non-compliance. The methodology involved two phases. Phase 1 focused on patient education through handouts and training sessions on taking high-quality intraoral photographs using cheek retractors and proper lighting. Phase 2 established a database for each patient, where uploaded images were assessed weekly by orthodontists. Feedback and further instructions were provided via a mobile app, and emergency appointments were scheduled as needed. Data collection included demographic details, initial and final orthodontic records, weekly image quality and timeliness, feedback logs, and patient satisfaction surveys.

Results: The dental monitoring system demonstrated high compliance among participants. Weekly photographic submissions allowed orthodontists to monitor progress effectively and identify issues early. The system significantly reduced in-office visits while maintaining treatment quality and patient satisfaction. Statistical analysis of the data indicated no compromise in treatment outcomes, and patients appreciated the convenience and reduced healthcare costs.

Conclusions: The dental monitoring system proved to be a viable tool for remote orthodontic care. It reduced the frequency of in-office visits without adversely affecting treatment quality. This approach enhances patient convenience, improves adherence, and offers a cost-effective solution for orthodontic treatment, highlighting its potential as a standard adjunct in modern dental care.

#173: Mini Maxillary Protraction Appliance – A case report

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Purpose: To evaluate the effectiveness of the Mini Maxillary Protraction Appliance in treating skeletal Class III malocclusion caused by retrognathic maxilla, to assess its impact on dental and skeletal correction.

Methods: An 11-year-old female with a Class III skeletal base, concave profile, anterior crossbite, and reverse overjet (-3 mm) was treated using a Mini Maxillary Protraction Appliance. The appliance delivered 350–450 grams of force for 12–14 hours daily to promote maxillary protraction. Fixed appliance therapy followed, incorporating alignment, leveling, and distalization of maxillary posteriors to establish a Class I molar relationship and create space for impacted canines (13, 23). Rotations of 14 and 25 were corrected.

Results: After 8 months, forward maxillary movement, positive overjet, and upper incisor proclination were achieved. Mandibular growth was redirected vertically, with a slight increase in the mandibular plane angle. Fixed appliance therapy allowed proper canine alignment and correction of dental rotations, resulting in a Class I molar and canine relationship, ideal overjet and overbite, and improved facial esthetics.

Conclusions: The Mini Maxillary Protraction Appliance offers an effective, compliance-friendly alternative for treating skeletal Class III malocclusion. It achieved significant functional and esthetic improvements within a short timeframe.

#174: Temporary Anchorage Devices (TADs) as a Novel Approach to Correct Anterior Open Bite (AOB) - A Case Series

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Purpose: The purpose of this case series is to explore the efficacy and outcomes of Temporary Anchorage Devices (TADs) as a novel treatment approach for correcting anterior open bite (AOB). Traditional methods for correcting AOB through differential anterior extrusion and posterior intrusion face challenges, but TADs offer stable anchorage for posterior intrusion, enabling auto rotation of the mandible.

Methods: This case series included three adult patients diagnosed with anterior open bite of varying severity. The treatment plans incorporated TADs placed in strategic positions to facilitate tooth movement - Case 1,2- Mini implant associated posterior intrusion, Case 3- Infra zygomatic crest mini-implant assisted intrusion and distalisation of upper posteriors. A comprehensive treatment protocol was designed for each patient, including pre-treatment clinical and radiographic evaluations (OPG/ Lateral cephalometric radiographs), followed by TAD placement and monitoring throughout the treatment process. Treatment duration varied from 18 to 21 months.

Results: All three patients showed significant improvements in the vertical dimension and AOB correction by the end of the treatment period. The anterior open bite was reduced or eliminated in each case, with functional occlusion achieved in all patients. No significant complications (such as infection or root resorption) were reported. TADs provided stable anchorage, allowing for the desired tooth movements. The patients demonstrated improved esthetics, function, and quality of life following treatment.

Conclusions: The use of Temporary Anchorage Devices (TADs) is a highly effective and novel approach for correcting anterior open bite. The case series demonstrates that TADs allow for precise control of tooth movement, achieving stable and functional occlusion in cases where traditional methods may fall short. TADs provide an excellent alternative for managing AOB, with promising outcomes for a wide range of clinical scenarios.

#175: Clinical Efficacy of various Molar Distalization Appliance to correct Class II Malocclusions: A Case Series

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Purpose: The purpose of this case series is to highlight the effectiveness of various molar distalization appliances in addressing dental Class II malocclusions through a non-extraction approach. This case series provides insight of appliance efficacy, associated limitations, and the importance of anchorage planning in achieving stable and optimal orthodontic results.

Methods: Four cases were analyzed clinically, each utilizing a different distalization appliance: Lokar, Modified Piston, Pendulum, and Hyrax distalizers. Pre- and post-treatment records, dental models and radiographs, were assessed for changes in molar positioning, overjet, and anchorage stability. The treatment outcomes were compared based on sagittal, transverse , vertical movements and any associated limitations.

Results: All appliances achieved successful molar distalization, ranging from 3 to 4 mm. The Lokar and Pendulum appliances caused distal tipping and anterior proclination, while the Modified Piston and Hyrax distalizers exhibited minor anchorage loss.

Conclusions: Molar distalization is an effective method for managing borderline Class II malocclusions without extractions. Careful appliance selection and anchorage planning are critical to achieving optimal results and minimizing adverse effects. This case series underscores the importance of individualized treatment planning in orthodontic practice.

#176: SURGERY FIRST ORTHOGNATHIC APPROACH (SFOA)- A CASE REPORT OF CLASS 3 ORTHOGNATHIC SURGERY PATIENT

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Purpose:
The Surgery First Orthognathic Approach (SFOA) is an innovative technique for correcting skeletal and dental discrepancies without prior orthodontic preparation. This case report aims to highlight the clinical advantages of SFOA, including reduced treatment time, improved esthetics, and early functional benefits. By presenting this case report of a skeletal class 3 patient who underwent mandibular setback by SFOA approach ,we evaluated its efficacy in achieving optimal outcomes for patients requiring orthognathic surgery , emphasizing its role in enhancing patient satisfaction and compliance compared to conventional approaches.

Methods: A 22-year-old male patient reported with skeletal class 3 pattern with orthognathic maxilla and prognathic mandible. The patient was treated by bilateral sagittal split setback osteotomy of the mandible with surgery first approach via non-extraction therapy.

Results: After an active treatment of 15 months, improved facial profile, facial proportions and a significant reduction of mandibular prognathism were much appreciated.

Conclusions: The Surgery First Orthognathic Approach (SFOA) offers significant advantages over conventional methods, including reduced overall treatment time, early functional and esthetic improvements, and enhanced patient satisfaction and improved compliance with proper case selection and interdisciplinary collaboration, SFOA is a promising approach that can streamline treatment processes and improve quality of life for orthognathic surgery patients.

#177: Digital Dentures: The Future of Prosthodontics

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Purpose: To explore the advancements in digital denture technology and its impact on precision, efficiency, and patient outcomes compared to conventional methods. This study also aims to evaluate the challenges and future potential of digital workflows in Prosthodontics.

Methods: A comprehensive review of digital denture workflows, including the use of CAD/CAM systems, 3D printing, and digital scanning, was conducted. Comparative analysis of conventional and digital fabrication techniques was performed in terms of accuracy, material properties, time efficiency, and cost-effectiveness. Case studies were reviewed to illustrate clinical applications and outcomes.

Results: Digital dentures demonstrated superior accuracy and consistency in fit and function, along with reduced production time. The integration of artificial intelligence improved customization and patient-specific adaptations. However, challenges such as high initial costs and the need for training in digital technology remain significant barriers to widespread adoption.

Conclusions: Digital dentures represent a transformative innovation in Prosthodontics, offering significant advantages over traditional techniques. While challenges exist, continued advancements in technology and integration into clinical workflows have the potential to redefine patient care in Prosthodontics, making digital dentures the future of the specialty.

#178: Dental implants in patients with Ectodermal Dysplasia: A Computer-guided Quad Zygomatic Case Report

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Purpose: The aim of this work is to describe a case of quad zygomatic implant treatment of the edentulous maxilla of an Ectodermal Dysplasia (ED) patient by means of computer-guided implant surgery.

Methods: A 32-year-old man diagnosed with ED presented to the dental clinic Policlinico Umberto I of Rome, with a mobile denture in the upper jaw, complaining for poor esthetics, masticatory inefficiency and pain. The upper denture was properly relined and adhesive anatomical landmarks were placed on the flanges. Then it was scanned with an extraoral scanner (EOS) to obtain a standard tessellation language (STL) file of the prosthetic volume. The patient underwent a cone beam computed tomography (CBCT) scan wearing the upper denture to obtain a file including the prosthetic volume and the bone anatomy. The file gathered were then aligned through the anatomical landmarks on a dedicated software Blue Sky Plan (Blue Sky Bio) to create a digital implant planning scenario including anatomical and prosthetic data. Due to the severe maxilla atrophy, a quad zygomatic implant-prosthetic rehabilitation for the upper arch was proposed to the patient. Four zygomatic implants were digitally planned, and a bone-supported surgical template was fabricated to perform a computer guided implant surgery.

Results: The procedure planned involved the insertion of 4 zygomatic implants (Straumann) (left and right canine regions (4.4 X 55 mm) and left and right second premolar regions (4.4 X 40 mm)). With the aid of a surgical template. After 48h, implants were loaded, using the previous denture, properly relined onto temporary abutments with the removal of the palatal vault. No intraoperative and postoperative complications occurred. The patient has been inserted in a strict follow up program. At 1 year follow up no biological nor mechanical complications were reported.

Conclusions: Zygomatic implant placement in ED patients with atrophic maxilla as an alternative to bone grafting and traditional implant placement and in case of failing bone grafting seems to be a valuable option, but it must be considered a complex major surgery with potentially severe complications. The digital implant planning is an auxiliary tool to enhance the intervention.

#179: MMP-13 Levels in Gingival Crevicular Fluid: A Comparative Study of Clear Aligners and Fixed Orthodontic Therapy

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Purpose: Orthodontic tooth movement (OTM) induced by clear aligners differs from conventional fixed appliances. Both apply mechanical forces on the periodontal ligament, triggering the release of biomarkers like matrix metalloproteinases (MMPs), which mediate bone remodeling. MMP-13, specifically, is a key marker of tooth movement found in the gingival crevicular fluid (GCF). Understanding these molecular responses is essential for optimizing treatment selection and minimizing adverse effects. In this study we estimated and compared the levels of MMP-13 in GCF in individuals undergoing clear aligner therapy and conventional fixed mechanotherapy.

Methods: This prospective comparative study included 20 participants aged 18–30 years. Group I consisted of 10 individuals undergoing CAT, while Group II included 10 individuals receiving conventional fixed orthodontic treatment. GCF samples were collected at three time points: T0 (pre-treatment), T1 (4 weeks after treatment initiation), and T2 (12 weeks after treatment initiation). MMP-13 levels were analyzed using a commercially available enzyme-linked immunosorbent assay (ELISA) kit. Data were statistically analyzed using an independent t-test, with p<0.05 considered significant.

Results: The independent t-test revealed no statistically significant differences in MMP-13 levels between the two groups at any of the evaluated time points (T0, T1, and T2).

Conclusions: Within the limitations of this study, MMP-13 levels in GCF showed no statistically significant differences between CAT and fixed mechanotherapy. This indicates that clear aligner therapy induces bone remodeling comparable to that of conventional fixed appliances, demonstrating its efficacy in achieving efficient and biologically compatible orthodontic tooth movement.

#180: Correlation Between Prevalence and Severity of Periodontitis Among Patients Undergoing Dialysis in Aseer

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Purpose: The objectives of the current research is to explore the prevalence and severity of periodontal disease among dialysis patient, and to evaluate the correlation between various biochemical and dialysis effectiveness parameters with periodontal disease.

Methods: The current study will employ analytical cross-sectional design. The study will include a total of 147 ESRD patients aged 18 and above who had been on dialysis.
Demographic data: Age, Gender, Occupation, Education, Systemic disease, Smoking history, Oral hygiene maintenance.
Periodontal parameters: Plaque index, Gingival bleeding index, Clinical attachment loss, Diagnosis of periodontal disease.
Renal parameters: Dialysis history, Biochemical parameters, Dialysis adequacy parameters
The data on categorical variables is shown as n (% of cases) and the data on continuous variables is presented as mean and standard deviation (SD) . The inter-group statistical comparison of means of continuous variables is done using independent sample t test for two groups and by ANOVA for more than two groups. In the entire study, the p-values less than 0.05 are considered to be statistically significant.

Results: The current study revealed that almost 50% of the examined patients unedging dialysis had severe periodontitis. Severe periodontitis was more prevalent in the 60-70-year age group. Males reported more severe periodontitis, whereas females were having moderate periodontitis. Individuals with secondary school education were significantly affected by severe periodontitis.
Significantly poor oral hygiene was reported in the patients who were undergoing dialysis for more than 9 years as compared to the other group. Plaque index and Gingival bleeding index was not significantly associate with the duration of dialysis.
While considering biochemical parameters, serum phosphate was significantly associated with the severity of periodontitis. Whereas, parameters for effectiveness of dialysis revealed that URR was significantly associated with the severity of periodontal disease.

Conclusions: Under the limitation of the current experimental research, we found that male patients undergoing for hemodialysis for more than 12 months has high prevalence for severe periodontal disease. We found out inverse correlation between the serum phosphate and serum parathyroid levels level and severity of periodontal disease. Urea clearance rate was negatively associated with the severity of periodontal disease.

#181: Innovative Biomimetic Coating over Implant Surface

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Purpose: Background: Biomimetic dental implants have emerged as a modern innovation in implant surface design. These modifications enhance interactions between the implant and surrounding biological tissues, improving clinical outcomes. Research into different mechanical and surface modifications seeks to improve osseointegration while minimizing peri-implantitis.

Methods: This review explores biomimetic coatings for dental implants, organized into two main types. The first includes coatings that enhance osseointegration, such as hydroxyapatite layers, nanocomposites, and coatings incorporating growth factors like BMPs, PDGF, and FGF, alongside extracellular matrix components like collagen, elastin, and fibronectin. The second category focuses on antibacterial coatings, including drug-releasing implants (e.g., antibiotics, statins, bisphosphonates), antimicrobial peptides (GL13K, human beta defensins), polysaccharide-based coatings (chitosan and its derivatives), and metal-based coatings (silver, zinc, and copper).

Results: Biomimetic surface coatings offer significant potential to improve implant osseointegration.

Conclusions: Ongoing advancements in this field are crucial to enhancing clinical outcomes and reducing implant-related complications such as peri-implantitis

#182: Knowledge, Attitude and Practice of Oral Hygiene among Nursing Staff in Pediatric Care Hospitals in Riyadh, Saudi Arabia- A Cross-Sectional Study

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Purpose

Pediatric patients with systemic diseases face a higher risk of dental caries and poor oral health compared to their healthy counterparts. Given that pediatric nurses maintain the most frequent interactions with both parents and children among healthcare professionals. This study aimed to evaluate the knowledge, attitudes, and practices related to oral hygiene among nursing staff in Pediatric Care Hospitals located in Riyadh, Saudi Arabia.

Methods

A cross-sectional study was carried out among 394 pediatric nurses. Data collection was conducted using a validated self-administered structured questionnaire that included inquiries about participants' demographic information, as well as their knowledge, attitudes, and practices. Descriptive statistics were calculated, and Chi-square analysis was performed to assess the relationship between demographic factors and their responses. A $p < 0.05$ was considered as statistical significance.

Results

A total of 350 pediatric nurses participated in this research. Notably, 58.7% of the respondents had not received any oral health care training as part of their nursing education, and only 21.4% had participated in oral health training programs. While the majority recognized the significance of maintaining good oral health in pediatric patients, 60.10% were knowledgeable about the appropriate timing for tooth eruption; however, only 20.2% understood the risks associated with the transmission of dental caries. Additionally, 21% of participants regarded the cleaning of patients' mouths as an unpleasant task, and 33.3% felt that the oral health care provided by nurses was inadequate. Despite this, 71.5% reported examining the oral cavity, and 70.4% engaged in oral hygiene practices with their patients.

Conclusions

The findings indicate that pediatric nurses possess concerning levels of knowledge regarding oral health care. It is essential to provide them with comprehensive oral health education through training sessions in order to enhance their ability to promote oral health.

#183: Trends, Key Contributors, and Emerging Research Areas in Prosthodontics in India: A Bibliometric Analysis (2015–2024)

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Purpose

Prosthodontics research in India has seen a marked increase over the past decade, driven by advancements in digital prosthetics, dental materials, and implantology. This bibliometric analysis aims to evaluate trends, key contributors, and emerging research areas in prosthodontics in India from 2015 to 2024.

Methods

A comprehensive bibliometric analysis was conducted using articles published in indexed journals between 2015 and 2024. Data was extracted regarding the number of publications, leading authors, influential institutions, and key research themes. A comparison with global research trends was also included to identify distinctive patterns in Indian prosthodontics research.

Results

The volume and quality of publications have significantly increased, with key research areas focusing on dental materials, CAD/CAM technologies, implantology, and aesthetic prosthodontics. Prominent authors such as Kumar S, Kumar A, and Chand P, and institutions like King George's Medical University and Saveetha University have contributed substantially to the field. India’s research trends align with global developments, particularly in digital technologies and implantology, but also uniquely emphasize cost-effective and accessible solutions tailored to its socio-economic diversity.

Conclusions

While the growth in prosthodontics research in India is promising, challenges such as funding constraints, regional disparities, and a need for interdisciplinary collaboration remain. Future research should focus on addressing these gaps, increasing funding, conducting inclusive studies, and fostering collaborations with material science and biotechnology. Researchers and practitioners should prioritize affordable, patient-centered, and evidence-based practices to enhance clinical outcomes.

#184: Alteration of Fit in Soft Milled Cobalt-Chromium and Zirconia Fixed Dental Prostheses After Ceramic Veneering

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Purpose

To evaluate the marginal and internal fit of soft milled Co-Cr and zirconia fixed partial dentures (FDPs) after ceramic layering.

Methods

Sixty Co-Cr master model were fabricated to receive three-unit FDPs. The dies were scanned and 3 groups (n = 20/group) were formed to support FDPs made from presintered Co-Cr (CS), presintered zirconia (CZ), and cast Ni-Cr (Wi). Each bridge was seated on its specific model. The marginal and internal gap was assessed using the replica technique in the mesio-distal and buccal-lingual planes, before and after ceramic veneering. The null hypothesis was that no significant difference would be found within materials before and after ceramic layering. Data were analyzed by using Levene test, t test, and analysis of variance (ANOVA) (α=.05).

Results

A statistical difference was found in total gap comparison within the presintered groups ($F = 5.996$, $df = 116$, $P = 0.003$). At the abutment level, in the buccal-lingual planes, the difference was statistically different ($P < 0.001$).

Conclusions

The ceramic veneering induced an alteration of fit in milled CoCr and zirconia.

#185: Tandem Traction Appliance – A Case Report

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Purpose

Skeletal class 3 relation caused by retrognathic maxilla and prognathic mandible requires early intervention to address growth deficiencies and for correction of skeletal relation. Tandem traction appliance promotes patient compliance, because it is more esthetic and comfortable than extra oral appliance. This case report discusses the orthodontic management using Tandem traction appliance of an 11-year-old female patient presenting with forwardly placed lower front teeth with retrognathic maxilla, prognathic mandible, proclined upper incisors, a reverse overjet of 6mm and bilateral posterior cross bite and anterior open bite. The appliance successfully induced the growth of maxilla and achieved favorable skeletal and dental outcome with enhanced facial profile after 8 months of treatment.

Methods

An 11-year-old female with Class 3 skeletal base, concave profile, reverse overjet of 6mm, bilateral posterior crossbite, anterior open bite the treatment plan included a two-phase approach:

(1) The use of a tandem traction appliance to correct the skeletal Class III relationship

(2) Fixed appliance therapy (PEA, MBT prescription, 0.022 slot) for dental alignment and occlusal correction.

The appliance was worn for 14 to 16 hours daily for promotion of maxillary growth. The appliance delivered a force of 300-600gms of force.

Results

After 8 months, appliance achieved forward and downward maxillary movement, lower incisor retraction, increase in ANB angulations. Fixed appliance therapy allowed proper alignment of canines and molars and aided to achieve better facial esthetics.

Conclusions

Tandem has an advantage of protracting the maxilla along with advantage of vertical control which is beneficial in hyperdivergent growth pattern making this appliance valuable in nonsurgical class III.

#186: Demystifying Complexity

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Purpose

Open bite is a challenging malocclusion that may have skeletal or dental origins. This case report presents the retreatment of a patient with a skeletal Class III malocclusion, anterior open bite, and anterior spacing. The patient had undergone previous orthodontic treatment but was left with unresolved issues and was advised to opt for prosthetic crowns. The case was managed using a non-extraction approach with fixed appliance therapy and temporary anchorage devices (TADs) for posterior intrusion. The treatment resulted in a successful correction of the open bite and improved occlusal relationships, demonstrating the efficacy of TADs in complex orthodontic cases.

Methods

A 20-year-old patient presented with a chief complaint of a persistent gap between the upper and lower front teeth despite previous orthodontic treatment. Clinical and radiographic evaluations, including lateral cephalogram and OPG, revealed a skeletal Class III relationship with an orthognathic maxilla, prognathic mandible, and anterior open bite of 4mm.

The treatment plan included:

- **Non-extraction fixed appliance therapy** using MBT 0.022" brackets
- **Tongue spikes** to manage tongue thrusting
- **Mini-implant-assisted posterior intrusion** for vertical control
- **Sequential treatment stages**:
    - Stage 1: Habit correction
    - Stage 2: Initial alignment and levelling
    - Stage 3: Posterior intrusion with TADs
- **Retention phase** with a removable Hawley's appliance with a posterior bite plane and a tongue crib.

Results

Post-treatment assessments, including intraoral and extraoral photographs, lateral cephalograms and OPG confirmed significant improvements. There is Correction of anterior open bite with proper overjet and overbite, Alignment of upper and lower incisors, Elimination of anterior spacing, Improved occlusal relationship and esthetic profile. No need for prosthetic replacement, preserving natural dentition.

Conclusions

This case demonstrates the importance of accurate diagnosis and individualized treatment planning in orthodontics. The use of TADs effectively facilitated vertical control and improved treatment efficiency. Addressing the underlying etiology of the malocclusion helped achieve a stable, functional, and esthetic outcome without the need for prosthetic intervention. Proper case evaluation and selection of biomechanics can simplify complex orthodontic cases, reinforcing the principle that preservation is preferable to replacement in dental management.

#187: Effect of Biomineralizing Bulk Fill Restoratives on the Functional Properties of Occlusomesial Restorations Invitro

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Purpose

To comparatively evaluate if the use of biomineralizing bulk fill restoratives (BBR) affects the marginal adaptation and fracture resistance of occlusomesial restorations following the loading cycle.

Methods

Three BBRs were used to construct occlusomesial restoration on forty human maxillary premolars, which included Surefill One (Dentsply DeTrey) (SO), Activa (Pulpdent Corp.) (ACT), Cention N (Ivoclar Vivadent AG) (CN) and a control; Tetric N-Ceram (Ivoclar Vivadent AG) (TC). All samples were subjected to thermomechanical ageing for 250,000 cycles and 5 kg (49 N) of force in a chewing simulator (1-year period). Samples were also subjected to 500 thermal cycles alternating between 5℃ and 55℃, with a dwell time of 30 seconds. After the loading cycle, their marginal adaptation and fracture resistance were evaluated under a scanning electron microscope (SEM) and Universal Testing Machine respectively (n=10). Fracture patterns were categorised as catastrophic or non-catastrophic based on the extent of the fracture. The statistical significance was evaluated by one-way ANOVA post hoc Tukey's tests (P < 0.05).

Results

Highest percentage of CN samples showed intact margins (92.1 ± 4.1) and its interaction with SO and TC was statistically significant (Tukey's HSD test; P < 0.05). The fracture resistance of samples restored with SO (593.7 ± 66.8) was the highest among the groups and its difference with ACT and CN was statistically significant (Tukey's HSD test; P < 0.05). Non-catastrophic fracture patterns were predominant in the SO group.

Conclusions

The marginal adaptation and fracture resistance were affected by the type of BBR. Restoring the occlusomesial cavities with SO is favorable, while ACT was inferior in both the tested properties.

#188: Antimicrobial Effects of Silver and Selenium Nanoparticle Coatings on Orthodontic Mini-Implants: A Comparative Analysis

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Purpose

The purpose of this study is to evaluate the antimicrobial efficacy of silver nanoparticles (AgNPs) and selenium nanoparticles (SeNPs) as coatings on orthodontic mini-implants, aiming to reduce microbial adhesion and combat peri-implantitis caused by pathogens such as *Streptococcus mutans* and *Lactobacillus*. By leveraging the unique antimicrobial properties of these nanoparticles, the study seeks to enhance the clinical outcomes of orthodontic treatments by improving the success rate and longevity of mini-implants.

Methods

Mini-implants made of Ti-6Al-4V alloy were coated with AgNPs and SeNPs using a biopolymer matrix (Ti-BPAgNP and Ti-BPSeNP) through a dip-coating technique. The structural and morphological characteristics of the coatings were analyzed via X-ray diffraction (XRD) and scanning electron microscopy (SEM), revealing details of crystal structure, crystallite size, and nanoparticle distribution. Antibacterial efficacy was assessed using disk diffusion assays, measuring the zones of inhibition against key oral pathogens

Results

SEM analysis revealed that AgNPs formed a uniformly distributed, roughly spherical coating, while SeNPs exhibited a similar spherical morphology with effective dispersion across the biopolymer surface. Both coatings displayed significant antibacterial activity, with *Lactobacillus* and *Staphylococcus aureus* showing robust inhibition zones. While Streptococcus mutans exhibited slightly reduced susceptibility, the overall performance of SeNPs was nearly equivalent to AgNPs, highlighting only marginal differences in antimicrobial activity.

Conclusions

The study demonstrates that Ti-BPAgNP and Ti-BPSeNP coatings effectively inhibit bacterial growth, addressing the primary cause of peri-implantitis. Selenium nanoparticles, with their comparable antimicrobial performance and potential for lower cytotoxicity, emerge as a promising alternative to silver nanoparticles. These findings underscore the potential of nanoparticle coatings in advancing orthodontic mini-implant technology, improving their durability, and enhancing patient outcomes.

#189: Role of Artificial Intelligence and Machine Learning Algorithms in Diagnosis of Oral Cancer and Oral Potentially Malignant Disorders Based on Clinicopathological Image Analysis

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Purpose

The incidence of oral cancer (OC) has risen worldwide in recent years. When diagnosed at advanced stages, OC leads to increased morbidity and mortality. Integrating technology could aid in early detection and diagnosis, enhancing patient management for clinicians. The emergence of artificial intelligence (AI) offers promising advancements in OC screening. This review aims to delineate best-performing AI and ML algorithm for clinicopathological image analysis for diagnosis of OSCC and OPMDs

Methods

Following a Prospero registration a literature search from the year 2010- 2024 was conducted across various electronic databases like PubMed, Science Direct, Scopus, EBSCO, IEEE, and Google Scholar. The search focused on AI and ML-based image analysis for diagnosing oral cancer and premalignant disorders. Included were original English studies on human populations, excluding radiographical analyses, non-related topics, animal models, and non-English publications

Results

The study reviewed 25 publications on the use of AI and ML algorithms for diagnosing oral squamous cell carcinomas (OSCCs) and oral potentially malignant disorders (OPMDs). Various algorithms were analysed across different diagnostic modalities, including histopathological, clinical, and cytopathological images. SVM and CNN emerged as the best-performing algorithms, achieving high accuracy, specificity, and sensitivity in diagnosing these conditions. Histopathological images provided the most detailed diagnostic information, while clinical images were effective for initial screening.

Conclusions

AI and ML algorithms, particularly SVM and CNN, offer promising tools for early diagnosis, enhancing healthcare providers' ability to detect and treat these conditions promptly. Higher magnifications and image resolution help in achieving better diagnostic accuracy. This proactive approach can significantly reduce postsurgical morbidity and improve the overall quality of life for patients with OSCCs and OPMDs. AI and ML advancements in OSCC and OPMD diagnosis CNN and SVM emerged as the best-performing algorithms

#190: Innovative Molecular Approaches in Exfoliative Cytology for Diagnosis of Oral Cancer and Oral Potentially Malignant Disorders: A Systematic Review

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Purpose

Oral Squamous Cell Carcinoma (OSCC) constitutes a profound global health burden, distinguished by its considerable morbidity and mortality, underscoring its significance as a critical public health issue. The multistage progression of oral carcinogenesis is commonly preceded by the occurrence of Oral Potentially Malignant Disorders (OPMDs). While surgical biopsy serves as a widely utilized diagnostic standard, its invasive nature frequently results in significant patient discomfort. These challenges emphasize the critical need for the advancement of diagnostic methodologies, the refinement of existing techniques, and the exploration of novel approaches for the identification of oral neoplastic disorders. Recent advancements have shifted disease diagnosis from histopathology to molecular approaches, with exfoliative cytology emerging as a rapid, non-invasive sampling method. When combined with molecular techniques, it plays a crucial role in the diagnosis of oral cancer and OPMDs. The aim of this systematic review is to delineate the most effective molecular technique for augmenting exfoliative cytology in the precise diagnosis of oral cancer and oral potentially malignant disorders.

Methods

Following Prospero registration an extensive electronic search was conducted across databases such as PubMed, Scopus, EBSCO, and Google Scholar. Following the application of inclusion and exclusion criteria, a total of eighteen studies were meticulously analyzed.

Results

Analysis of the eighteen selected studies revealed that quantitative Real-Time PCR (qRT-PCR) was the most efficient technique and only one study utilized Next-Generation Sequencing (NGS) which was superior to qRT-PCR in evaluating smears of oral cancer and OPMDs.

Conclusions

While qRT-PCR continues to be the predominant molecular technique integrated with exfoliative cytology for the early detection of OSCC and OPMDs, advancements such as Next-Generation Sequencing (NGS) have markedly enhanced diagnostic precision, elevating the utility of exfoliative cytology.

#191: Comparative Cytomorphometric Evaluation of Conventional Cytology and Brush Biopsy in the Diagnosis of Oral Squamous Cell Carcinoma -A Cross-sectional Study

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Purpose

Oral Squamous Cell Carcinoma (OSCC) is a commonly diagnosed malignancy within the field of head and neck pathology. OSCC, strongly correlated with habitual factors, can give rise to second primary tumors in various anatomical sites as a consequence of field cancerization, significantly elevating morbidity and contributing to an unfavourable prognosis. Cytomorphometric evaluation in oral exfoliative cytology is an indispensable technique for the early identification of pathological changes. The aim of the current study is to evaluate the diagnostic accuracy of brush biopsy in comparison to conventional cytology for the examination of cytomorphometric changes in OSCC patients.

Methods

Samples were collected from both affected and apparently normal sites in fifty patients with oral squamous cell carcinoma, using a wooden spatula for conventional cytology and a cytobrush for brush biopsy. The collected specimens were stained with a modified Papanicolaou stain (PAP) and examined for cytological atypia under an Olympus Research Microscope (BX53F2, Tokyo, Japan). Cytomorphometric analysis was performed using Gryphax software under X400 magnification, assessing cellular, nuclear, and cytoplasmic areas, as well as the nuclear-to-cytoplasmic area ratio. Diagnostic accuracy was evaluated by comparing the results from conventional cytology and brush biopsy techniques with the histopathological diagnoses.

Results

Brush biopsy demonstrated superior efficacy compared to conventional cytology ($p < 0.05$) in diagnosing OSCC, revealing pronounced cytomorphometric alterations in both affected and seemingly normal mucosa, with a diagnostic accuracy of 90% when correlated with histopathological findings. A statistically significant difference was noted in the nuclear area and nuclear-to-cytoplasmic area ratio between brush biopsy and conventional cytology.

Conclusions

The integration of cytobrush technique with cytomorphometric analysis significantly elevates diagnostic accuracy, advances early detection capabilities, and refines patient management strategies in the context of OSCC diagnosis.

#192: Unveiling Fungal Imprints: Jones' Methenamine Silver Stain as a Key to Diagnosis.

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Purpose

Fungal hyphae and spores in routine histopathology can be ambiguous and difficult to detect, especially when obscured by tissue elements. Special stains are required for accurate diagnosis to provide definitive and precise treatment for the patient. Periodic Acid Schiff (PAS) is a routinely used special stain for identification of fungal organisms with its own limitations. Jones' Methenamine Silver (JMS) is a relatively new stain used for basement membrane that has not been explored yet to detect fungal organisms. The current study aims to evaluate the staining characteristics of Jones' Methenamine Silver and Periodic Acid Schiff staining techniques for the detection of fungal organisms in tissue sections and cytological smears. The study will also evaluate the effectiveness of Jones' Methenamine Silver in the detection of fungal organisms

Methods

10 FFPE blocks of confirmed cases of mucormycosis and fungal smears (Mucormycosis, Candidiasis & Actinomycosis) were obtained from the department archives at Faculty of Dental Sciences, Ramaiah University of Applied Sciences. 3-4µm sections of FFPE blocks and smears were subjected to PAS and JMS staining. Staining characteristics were determined using parameters such as ease of interpretation, staining uniformity, and differentiation from the background. Staining efficacy was determined based on criteria outlined by Sowmya et al., 2022 which was staining intensity, morphological differentiation, and contrast. Scores assigned to each criterion were 0= Not significant, 1= Poor, 2= Good, 3= Excellent. The best performing special stain was determined using Chi-square test.

Results

Awaited.

Conclusions

Special stains markedly enhance the detection and visualization of fungal organisms to facilitate customized treatment.

#193: Automated Detection of Dental Crowns, Fillings, Endodontic Posts, and Implants in Radiographs Using YOLOv10

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Purpose

Dental caries is the main cause of dental hard (enamel and dentine) tissue loss, and this will compromise the esthetics and masticatory function[1]. This loss can be overcome by restorative procedures, root canal treatment and prosthetic procedures such crown, bridge and dental implants. The correct identification of dental fillings, root canal treatment, dental crown, bridge and dental implants in radiographic images serves a critical purpose for dental diagnosis as well as treatment planning and forensic work. Artificial intelligence (AI) advancements have proven deep learning-based object detection models capable of automating dental prosthetic analyses which reduces time and enhances diagnostic accuracy[2]

Methods

Our current work utilizes YOLOv10 as a deep learning model to identify six labelling namely dental fillings, endodontic post, root canal treatment, dental crowns & bridge, and dental implants shown in Figure-1. After taking material transfer data (MTD) agreement with Faculty of Dentistry, Chulalongkorn, Thailand for using 1000 Orthopantomogram (OPG) of the patient reported in dental clinic facility with patient consents. Roboflow was used for the accurate labelling of the dataset.

Results

The achieved performance metrics included a precision rate of 0.78 along with a recall value of 0.75 and mAP50 precision of 0.76and mAP50-95 precision of 0.64 shown in figure-2. The model operates at 25.57 milliseconds inference speed which establishes efficient functionality suitable for real-time dental imaging diagnosis support for dental professionals.

Conclusions

The current dataset size and limited diversity are constraints to the system. Additional future research will build the dataset by adding diverse radiographic images and various imaging and anatomical conditions to improve the model's reliability. The study will execute a comparative performance assessment between this deep learning model and other state-of-the-art deep learning techniques regarding their accuracy rates and processing speed as well as their clinical adaptability. The developments seek to improve AI-based detection methods.

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