11th Annual Research Symposium Abstracts

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ROSEMAN UNIVERSITY
OF HEALTH SCIENCES

#1: The benefits of probiotic and prebiotic use in the gastrointestinal tract primarily focused on Bacillus coagulans and β-glucans for potential synergistic effects on beneficially modulating the GI tract and microbiome in humans.

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Purpose

The gastrointestinal (GI) tract plays a pivotal role in human health, influencing digestion, immunity, and overall well-being. Probiotic and prebiotic formulations are increasingly recognized for their potential to restore gut health by modulating the gut microbiota. This study explores the synergistic effects of a theoretical oral formulation combining Bacillus coagulans as the probiotic and beta-glucan as the prebiotic. The hypothesis is that this combination can enhance gut health by improving microbial diversity, reducing inflammation, and optimizing digestive function.

Methods

A comprehensive literature review and theoretical formulation design were undertaken to evaluate the stability, efficacy, and potential interactions of Bacillus coagulans spores and beta-glucan. Stability studies focus on the survivability of Bacillus coagulans spores under simulated gastric conditions, while beta-glucan's fermentative properties and its ability to enhance short-chain fatty acid (SCFA) production were analyzed. The formulation was modeled to include a controlled-release mechanism ensuring both components reach the colon effectively. Computational models maybe used to predict synergistic interactions and their effects on gut microbiota composition.

Results

Theoretical modeling suggests that Bacillus coagulans spores maintain viability through gastric transit, germinating in the intestines to produce metabolites beneficial for gut health. Beta-glucan acts as a fermentable substrate for commensal bacteria, enhancing SCFA production, particularly butyrate. The combined formulation demonstrated potential to:

1. Improve microbial diversity by fostering beneficial strains like Lactobacillus and Bifidobacterium.
2. Modulate inflammatory pathways by reducing pro-inflammatory cytokines and increasing anti-inflammatory markers such as IL-10 (suppressing inflammation).
3. Enhance gut barrier integrity by upregulating tight-junction proteins.

Conclusions

The theoretical oral formulation of Bacillus coagulans and beta-glucan demonstrates promising synergistic effects for improving human GI health. Its robust stability, ability to modulate gut microbiota, and potential to enhance digestive functionality make it an innovative candidate for future clinical trials. Further research is recommended to validate these findings in vivo and optimize the formulation for targeted delivery and efficacy. This study contributes to the growing body of evidence supporting probiotics and prebiotics as complementary strategies for gut health restoration.

#2: Investigating the Effects of the Combination of Doxorubicin and Paroxetine on MDA MD 231 Breast Cancer Cell Adhesion

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Purpose

Doxorubicin is a key chemotherapeutic for the treatment of breast cancer. However, it is possible that their effects could be enhanced by the co-administration of other medications that inhibit protein kinases involved its activity, such as the G protein coupled receptor kinase 2. In this study, we combine doxorubicin with paroxetine, a selective serotonin reuptake inhibitor and a weak GRK2 inhibitor and see its effect on MDA MD 231 breast cancer cell adhesion to fibronectin.

Methods

The triple negative MDA MD 231 breast cancer cells (control or GRK2 shRNA stably transfected) were treated or not with doxorubicin or doxorubicin and paroxetine for 72 hours (cell death) or 24 hours (adhesion). For cell death, trypan blue exclusion was utilized. For adhesion, cells (control or GRK2 shRNA stably transfected) were collected post treatment, counted and placed on fibronectin-coated wells within a 96 well plate from 5 to 40 minutes at 37 degrees celsius. Thereafter, cell were fixed with methanol and stained with violet blue. Subsequent absorbance of each well was quantified by a spectrometer and data was analyzed as % absorbance of untreated control shRNA cells at 40 minutes.

Results

We found that paroxetine enhanced doxorubicin- mediated adhesion to fibronectin. First, paroxetine combined with doxorubicin did not increase cell death associated with doxorubicin in control shRNA cells. In adhesion, paroxetine with doxorubicin increased breast cancer cell adhesion for the first 40 minutes. This was not significantly observed in GRK2 shRNA cells, which lacked GRK2. This suggests that paroxetine had an effect through GRK2 inhibition.

Conclusions

In this study, we observed MDA MB 231 breast cancer cell adhesion post doxorubicin treatment, combined without paroxetine or not. This study showed that paroxetine increased doxorubin mediated adhesion, which was not observed in cells lacking GRK2. This suggests that paroxetine, as a GRK2 inhibitor, may have synergistic effects with doxorubicin in increasing cancer cell adhesion, which may lead to less metastatic potential of the cancer cell.

#3: Exploring the Effects of Norepinephrine in Caenorhabditis Elegans- Function of G Protein Coupled Receptor Kinases

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Purpose

Caenorhabditis Elegans are often used as an experimental model for disease research. However, they lack certain signaling systems, limiting their usefulness. For example, they do not have the adrenergic system. However, they do have the octopamine system, which replaces the adrenergic system in C. elegans. The octopamine receptors have some similarity to the adrenergic counterparts. Therefore, the question is could the octopamine system also respond to norepinephrine and how does this relate to the G protein coupled receptor kinases, which are known to control adrenergic receptor signaling. In this study, we treated C. elegans lacking GRK1 and GRK2 with norepinephrine and studied their egg laying behavior and movements.

Methods

For C. elegans egg laying assays, C. elegans were treated with norepinephrine on NGM plates. Egg laying was assessed after 30 minutes, 1 hour and overnight. For movement, C. elegans were treated for 30 minutes on NGM plates. They were then moved individually to a well with 100 uL water within a 96 well plate and tail flicks were counted for 1 minute. All data was collected and analyzed using graphpad prism.

Results

Overall, we observed an inhibition of egg laying when all C. elegans strains were treated with norepinephrine. This inhibition was not observed at 30 minutes or 1 hour. However, it was observed for all strains- N2, grk-1 and grk-2 knockout animals- when exposed to norepinephrine overnight. No difference was observed in movement after 30 minute norepinephrine treatment.

Conclusions

In this study, we tested if C. elegans respond to norepinephrine and if G protein coupled receptor kinases modify this effect. We observed that norepinephrine reduced egg laying in all strains, similar to that observed for octopamine. This suggests that octopamine receptors may respond to norepinephrine, meaning that they could also respond to other adrenergic drugs as well. This may allow for C. elegans to be utilized as a model for adrenergic drug development.

#4: Utilizing Caenorhabditis Elegans as an Experimental Model to Study the Effects of G Protein Coupled Receptor Kinases on Behaviors Mediated by a Dopamine Transporter Inhibitor

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Purpose

Dopamine modulates many different neurological effects and these are modified by G protein coupled receptor kinases, which phosphorylates activated dopamine receptors, leading to their desensitization. What is uncertain is how varying levels of G protein coupled receptor kinases seen in various diseases can alter dopamine receptor responses to dopaminergic medications such as a dopamine transporter inhibitor. In this study, we utilize the model organism Caenorhabditis (C.) Elegans, with a more primitive dopamine receptor system and their own G protein coupled receptor kinases, to see what these effects are when kinase levels are reduced.

Methods

For C. elegans egg laying assays, C. elegans were treated with GBM on NGM plates. Egg laying was assessed after 30 minutes, 1 hour and overnight. For movement, C. elegans were treated for 30 minutes on NGM plates. They were then moved individually to a well with 100 uL water within a 96 well plate and tail flicks were counted for 1 minute. All data was collected and analyzed using graphpad prism.

Results

Overall, we observed variable inhibition of egg laying when all C. elegans strains were treated with GBM. All strains tested did not demonstrate a reduction of egg laying at 30 minutes treatment. However, inhibition was only observed for the GRK2 knockout strain at 1 hour. With overnight treatment, only the N2 and GRK1 knockout strain displayed reduced egg laying in response to GBM. Preliminarily, GRK2 knockout animals demonstrated an increased movement after 30 minutes GBM treatment. This suggests that, potentially, GRK2 knockout animals demonstrate an increased susceptibility to the dopamine transporter inhibitor.

Conclusions

In this study, we tested if C. elegans respond to a dopamine transporter inhibitor GBM and if G protein coupled receptor kinases modify this effect. We observed that GBM reduced egg laying variably, depending if egg laying was counted at 1 hour or after overnight treatment. This suggests that lowering GRK levels may affect drug sensitivities, particularly for GRK2, and this may result in different dopaminergic drug responses in the brain if GRK levels are altered in neurological diseases.

#5: Comparing Octopamine and Norepinephrine Activity Using Caenorhabditis Elegans as an Experimental Model

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Purpose

Despite being potentially usable as a model organism for drug discovery because of its similarity to humans, it is unclear if this organism is usable for drug discovery for adrenergic receptor-targeting medications. This is because c. elegans do not have adrenergic receptors. Instead, they have octopamine receptors, which is the ancestral predecessor of adrenergic receptors. In this study, we treated the C. elegans with norepinephrine and compared these effects with that of octopamine.

Methods

We approached this issue using both bioinformatics and c. elegans egg laying assays. We assessed similarity of octopamine receptors with current adrenergic receptors using uniprot. For C. elegans egg laying assays, C. elegans were treated with octopamine or norepinephrine. Egg laying was assessed after 1-2 hours and overnight. This data was then collected and analyzed using graphpad prism.

Results

Overall, we found similar, yet distinct functions associated with octopamine versus norepinephrine. In terms of homology to beta 1 adrenergic receptors, we found some similarities in regards to key norepinephrine binding sites between human beta 1 adrenergic receptors and the octopamine receptors. However, there were some key differences as well, suggesting potentially norepinephrine may not have similar effects on C. elegans octopamine receptors. After 1-2 hour treatments, octopamine inhibited egg laying whereas for norepinephrine, it stimulated egg laying. This suggests potentially a different drug behavior in C elegans between octopamine and norepinephrine.

Conclusions

In this study, we compared the effects of octopamine and norepinephrine in C. elegans even though C. elegans do not have adrenergic receptors. This study showed some similarity homology-speaking between beta1 and octopamine receptors. However, when it comes to egg laying effects, it appears like octopamine reduced egg laying whereas norepinephrine increased egg laying. This may mean that norepinephrine may have different effects on C. elegans compared to octopamine on the same octopamine receptors, potentially acting as an antagonist due to fundamental differences in the binding pocket of octopamine receptors.

#6: Monitoring the Effects of Co-Administration of Fluoxetine or Paroxetine with Doxorubicin on MDA MD 231 Breast Cancer Cell Activity- Death and Cell Number Over Time

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Purpose

Doxorubicin effects on cancer cells may be modified by co-administration with other medications, especially those that may target mediators of its activity, such as protein kinases.. In this study, we combine doxorubicin with paroxetine, a selective serotonin reuptake inhibitor and a weak G Protein Coupled Receptor Kinase 2 inhibitor, or fluoxetine, also a selective serotonin reuptake inhibitor but with no GRK2 affinity. Then the effect of this combination is compared to doxorubicin alone on MDA MD 231 breast cancer cells and celll death and number over a 72 hour period was assessed.

Methods

The triple negative MDA MD 231 breast cancer cells were treated or not with doxorubicin or with fluoxetine or paroxetine for 24- 72 hours and cell death, assessed by trypan blue exclusion, and cell number, assessed by counting on hemocytometer, were counted.

Results

We observed surprising effects when doxorubicin was combined with fluoxetine or paroxetine. First of all, a decrease in cell death was observed compared to cells treated with doxorubicin alone at the 48 hour mark of treatment. Looking at cell number, both drugs combined with doxorubicin, particularly fluoxetine, increased the cell number at all time points at which cells were counted.

Conclusions

In this study, breast cancer MDA MD 231 cells were treated with doxorubicin combined with either fluoxetine or paroxetine, a GRK2 inhibitor, because GRK2 inhibition has been demonstrated previously to modify doxorubicin- mediated cell activity. We observed that neither selective serotonin reuptake inhibitor increased doxorubicin-mediated effects but, instead, decreased it. This may be because of the antioxidant effects of fluoxetine and paroxetine, which reduces the free radicals formed by doxorubicin.

#7: Identifying Mutations of G Protein Coupled Receptor Kinase 2 and Associated Proteins in Pancreatic Cancer Samples

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Purpose

Pancreatic cancer could be mediated by the malfunction of various protein mutations. This is important since dysfunction of these mutant proteins may lead to improper regulation of cellular processes, giving pancreatic cancer distinct survival advantages. This study seeks to identify GRK2 mutants and mutants associated with the mdm2-p16/arf- p53 pathway in pancreatic cancer samples with high and low expression of the GRK2 protein.

Methods

In this study, we used the proteinatlas database and crossed these samples with the tgca database. To identify proteins involved in GRK2 expression, STRING was utilized. Mutants of GRKs, especially GRK2, were noted as well as those mutants of mdm2, p53 and p14/arf.

Results

Overall, we explored 178 pancreatic cancer samples with high to low expression of GRK2. One synonymous GRK2 mutation was observed in high GRK2 expressing cancer samples whereas no GRK2 mutation was found in low GRK2 expressing samples. Exploring for mdm2, p53 and p14/arf mutations, we observed that 59% of high GRK2 expressing samples contained some p53 mutation versus 39.3% of low GRK2 expressing samples. Similarly, a higher number of p14/arf mutants were observed in high GRK2 expressing samples versus low GRK2 expressing samples. This suggests that a potential link with mutations within the ubiquitylation pathway may contribute to higher GRK2 expression levels in these cancer samples.

Conclusions

In this study, we sought to identify GRK2 mutants in pancreatic cancer samples. We observed very few GRK2 mutants. However, within the mdm2-linked ubiquitylation pathway which controls GRK2 expression, pancreatic cancer samples with higher GRK2 had a higher number of p53 and p14/arf mutations. This may mean that potentially high aberrant GRK2 expression may be linked to mutations within the ubiquitylation pathway.

#8: Using Caenorhabditis Elegans to Predict Beta Blocker Impact: Analysis of Carvedilol and Propranolol Effects on Egg Laying and Organism Size

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Purpose

It is currently unclear what the effects of adrenergic antagonists are on the octopamine system in Caenorhabditis elegans. This is important as it can potentially allow for the development of new adrenergic drugs. In this study, we identify the effects of various adrenergic antagonist drugs on C. elegans. In particular, a first generation, propranolol, and third generation, carvedilol, drug were tested.

Methods

Regarding egg laying behavior, four adults were placed in propranolol and carvedilol-treated agar plates, and eggs were counted after 1, 4, and 24 hours. Regarding sizing, C. elegans eggs were placed in drug-treated agars and the growth was measured at the L4 stage using an eye reticle.

Results

The experiment showed a reduction in egg laying rate for the C.elegans treated with propranolol and carvedilol compared to the control (untreated animals). Results have also show that propranolol-treated C.elegans had a reduced size compared to the control. Carvedilol-treated C.elegans showed no reduction in size compared to the control

Conclusions

In this study, we sought to determine if beta blockers can impact C.elegans as they have a similar receptor to the beta-adrenergic receptor called the octopamine receptor. Beta blockers tested here seemed to antagonize the octopamine receptors which is indicated through the reduction of the egg-laying behavior of the drug-treated C.elegans. These results indicate that C.elegans can be used as model animals to test the effects of new medications as they are relatively cheap.

#9: Identifying Mutations of Members of the GRK2- like Family in Skin Cancer- Mutations and Potential Clinical Significance

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Purpose

Understanding protein mutations in cancer may lead to the discovery of valuable information on prevention, treatment, and/or improvement of current treatment methods. This may be particularly important in skin cancer, which is one of the most common forms of cancer in U.S. This study seeks to identify somatic mutations in skin cancer in hopes of identifying the role played by members of the G Protein Coupled Receptor Kinase 2 (GRK2) subclass, GRK2 and GRK3, in skin cancer development and patient prognosis.

Methods

In this study, we used COSMIC to identify somatic mutations in skin cancer. We assessed the types of mutations found in skin cancer patients in GRK2 and GRK3 and compared them to that found for all cancers. We also looked at particular patients who had particular mutations, noting peculiar characteristics and outcomes.

Results

GRK2 and GRK3 mutations were found in skin cancer, with, by percentage, more GRK3 missense mutations compared to those of GRK2. Of note, missense mutations associated with GRK2 and GRK3 in skin cancer is more associated with male patients versus female patients, with 73% (GRK2) and 77% (GRK3) of samples with known gender associated with male patients. Looking at samples with amino acid mutations within BRCA (361 of 1793 samples), a higher percentage of those samples (29.6%) have an associated GRK3 amino acid mutation compared to those with GRK2 amino acid mutation (23.8%).

Conclusions

We utilized COSMIC to identify mutations within skin cancer involving GRK2 and GRK3. This study showed different characteristics associated with GRK2 and GRK3 mutations in skin cancer, with more GRK3 missense mutations by percentage compared to GRK2. Albeit a small sample size, GRK2 and GRK3 missense mutations is associated more with male patients, suggesting the occurrence of this type of mutation may be more found in males. Further investigation is needed to query the importance of this observation to help determine why this is occurring and what is its function in males.

#10: 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, there is a 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.

#11: Evaluating G Protein Coupled Receptor Kinase 4 Family Mutations in Stomach Cancer- Types and Clinical Significance

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Purpose

Identifying the potential prevalent causes of stomach cancer, such as the activity of key mutations of various proteins, may be important since understanding the mechanisms by which stomach cancer develop could allow us to improve the treatment of this type of cancer, potentially with less harm and invasion to the patient. This is important since stomach cancer continues to be one of the most prevalent cancers worldwide. This study seeks to identify somatic GRK4- like family mutants in stomach cancer.

Methods

In this study, we used COSMIC to identify somatic mutations in stomach cancer. We assessed the types of mutations found in stomach cancer patients in GRK4, GRK5 and GRK6 and compared them to that found for all cancers. We also looked at particular patients who had particular mutations, noting peculiar characteristics and outcomes.

Results

GRK4, GRK5 and GRK6 mutations were found in stomach cancer but notable differences were observed. For example, a higher percentage of GRK6 mutations were missense mutations compared to GRK4 mutations. At the DNA level, the majority of GRK6 mutants are C>T substitutions- a trend not observed for the other GRK4-like family mutants. In regard to the gender of respective patient populations, preliminarily, more male patients seem to have GRK4 and GRK6 mutants whereas no such trend is observed for patients with GRK5 mutations. In regard to age, those with GRK4 mutations tend to be older (70-79) compared to those with GRK5 and GRK6 mutations.

Conclusions

We utilized COSMIC to identify GRK4, GRK5 and GRK6 mutants within stomach. This study showed different characteristics associated with GRK4-like family mutants in stomach cancer. Notably, albeit a small sample size, GRK4 and GRK6 missense mutations is associated more with male patients, suggesting the occurrence of this type of mutation may be more found in males. Further investigation is needed to query the importance of this observation to help determine why this is occurring and what is its function in males.

#12: Investigating the Association between GRK2 and Mutations of Protein Markers for Melanoma

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Purpose

In melanoma, there are key proteins that play a role in its development. Some contain mutations that potentially lead to aberrant signaling that contribute to cancer cell development. In this study, we will assess GRK2 and their association with BRAF, HRAS and KIT, 3 key markers for melanoma. This would be important since GRK2 plays an important role in controlling receptor signaling. Therefore, any unique association may contribute to altering GRK2 activity.

Methods

In this study, we compared the protein expression data of GRK2, BRAF, HRAS and KIT with the mutation data of these proteins on tgca.org for melanoma samples. We assessed any relationship between those melanoma samples with high or low GRK2 protein expression with BRAF, HRAS and KIT mutations.

Results

Unique relationships are found between high GRK2 protein expression and low GRK2 protein expression samples with the tested markers. Only 3 GRK2 mutations are found among the high expressing- GRK2 melanoma samples. A higher level of BRAF mutations were found among the low GRK2 protein expression samples versus the high. Of interest, slightly more KIT mutations are found in the high GRK2 protein expression samples versus the low.

Conclusions

In this study, the relationship between GRK2 and BRAF, HRAS and KIT were explored. THis study showed different amounts of BRAF and KIT depending on if GRK2 is expressed high or low. This may mean a potential unique relationship between GRK2 and melanoma.

#13: Exploring GRK Mutations in Colorectal Cancer and Predicting their Effects Using AlphaFold

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Purpose

Protein mutations in colorectal cancer are important in the development of the cancer. Finding these mutations could be important since some of these mutations are associated with abnormal signaling. In this study, we identify mutations of G protein coupled receptor kinases and using alphafold to predict the effect of the missense mutations on protein stability.

Methods

Clinical sample data from proteinatlas for colorectal cancer samples with high GRK5 were collected and GRK mutations for each were identified by cross-referencing sample data with the mutation data from the cancer genome atlas (https://portal.gdc.cancer.gov/). The stability of the identified missense mutations were then predicted by alphafold (utilizing https://alphamissense.hegelab.org/) and compared back to the clinical data, especially comparing what was predicted with the prognosis of the patient.

Results

4 GRK5 mutations were identified within 296 samples, with 2 missense mutations identified in 1 patient. Utilizing alphafold, both these mutations were likely pathogenic, potentially suggesting the mutation leads to misfolded proteins that could relate to the cancer in this patient. Additional GRK mutations were discovered within the high GRK5 expressing samples.

Conclusions

We looked at GRK5 mutations in colorectal cancer samples with high GRK5 expression. We found that of these samples, only 4 GRK5 mutations were identified, with 2 mutations within the same individual. Of note, these mutations were suggested to be likely pathogenic according to alphafold. This may suggest that potentially these mutations may relate to the cancer itself. However, because this was found only in one patient, it is unclear how important this mutation would be overall.

#14: Investigating the Protein Expression Relationship between GRK2 and Biomarkers for Thyroid Cancer

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Purpose

Certain biomarker proteins are associated with the development of thyroid cancer. These proteins may play important roles in the growth of thyroid cancer. Understanding the relationship between these proteins and others may give us an idea as to how these proteins became potentially dysfunctional, leading to the development of thyroid cancer cells. In this study, we looked at the association between BRAF, KRAS and G protein coupled receptor kinase 2 (GRK2), a protein associated with thyroid cancer cell signaling.

Methods

In this study, we utilized data from proteinatlas (proteinatlas.org) for GRK2, BRAF and KRAS in thyroid cancer samples, among others. We explored if there is a correlation between the expressions of BRAF, KRAS and GRK2. We also utilized the Genomic Data Commons Data Portal (https://portal.gdc.cancer.gov/) to identify GRK2 mutations within the GRK2 thyroid cancer data.

Results

500 samples were queried for mutations and expression. No GRK2 mutants were identified in any thyroid cancer tissue samples. Preliminarily, no correlation between the expression of GRK2 and either BRAF or KRAS was identified.

Conclusions

We queried for any expression correlation between GRK2 versus known thyroid cancer markers BRAF and KRAS in thyroid cancer samples. No correlation was observed. Future studies will be performed with other thyroid cancer markers as well as with data sorted for clinical presentation (age, gender, staging, etc).

#15: The improvement of masticatory efficiency after Class III orthognathic surgery- A scoping review

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Purpose: The objective of this review is to summarize the current literature evidence regarding the impact of OS on the masticatory performance of patients with Class III skeletal malocclusion. This information will be useful to oral health professionals involved in OS cases.

Methods: The protocol was developed using the methodological framework for scoping reviews proposed by the Joanna Briggs Institute (https://jbi.global/scoping-review-network/resources). The scoping review was reported following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) extension for scoping reviews checklist16.

Results: Overall, 36/44 studies (81.8%) reported a significant improvement in masticatory performance19,20,23-33,35-40,42-48,50-53,56,57,59-62 from as early as three months, up to three years following OS. Regardless of the assessment modality, the masticatory efficiency of OS patients failed to reach control values in most studies. Only in 4/44 (9%) studies post-OS subjects reached the masticatory efficiency levels of the respective control groups, at no earlier than three years post-operatively or later.

Conclusions: Masticatory performance gradually improves after OS of Class III skeletal cases and can reach preoperative levels as early as three months after surgery. However, OS subjects do not always achieve the masticatory efficiency levels of orthognathic subjects earlier than three years postoperatively. Longer follow-up periods and standardized multimodality protocols for a more comprehensive assessment of masticatory function are recommended to facilitate future clinical research and improve clinical practice.

#16: Treacher Collins Syndrome in Orthodontics

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Purpose

The aim of this paper is to provide a recent orthodontically focused review that covers current practices in this population and to find out areas where future research needs to be done

Methods

PICO used: population being patients with TCS, intervention being orthodontic treatment/facial treatment, no comparison, and outcome being malocclusion
•Keywords used “Treacher Collins” AND “Orthodont*”, “Treacher Collins” AND “Orthodontic Interventions”, AND “Craniofacial Development. Articles from 2012-2012 in English only.
•Inclusion criteria of studies selected were TCS and orthodontic interventions

Results

Reduced salivary flow
•Due to maldeveloped mandible, malocclusion, and crowded dentition 3
•Treatment should be to use fluoride toothpaste, avoid alcohol containing mouth rinse, stimulate salivary flow by sucking on sugarless gum or candies and use saliva substitutes 3
•Dysphagia
•Due to hypoplastic development of the anatomy of the jaws and their surrounding tissues
•Treatment should include minimizing risk of aspiration and feeding tube 3,4
•Cleft lip and palate
•Use of specialized bottles and nipples to feed until obturator can be fabricated
•In early mixed dentition, use removable appliance such as palatal expanders to correct crossbites and malocclusion 5,6,7

Conclusions

There is not any literature on how orthodontics is affected in populations with treacher collins syndrome. Mandibular distraction osteogenesis has shown to be challenging and have high rates of relapse and does not maintain airway patency. Moreover, there are different levels of severity in this syndrome and with some levels orthodontics might just be enough to resolve something like airway issues. In others, a more aggressive treatment might be needed. Further research needs to be done focusing only on the orthodontics aspect and how it can help improve the quality of life in patients with TCS.

#17: Dentofacial Effects of Radiotherapy on Pediatric Population with Retinoblastoma

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Purpose

This literature review investigates the dentofacial consequences of radiotherapy in young patients with retinoblastoma by referencing current research. In addition, the management and rehabilitation of the dentofacial abnormalities, highlighting orthodontic, surgical, and prosthetic approaches, is examined. By understanding the changes of dentofacial development due to retinoblastoma treatment, effective management techniques can be implemented to resolve significant issues, relating to dental and skeletal relationship and facial appearance.

Methods

A literature search was conducted to identify peer-reviewed English language articles pertaining to the dentofacial effects of radiotherapy in retinoblastoma patients, with a particular focus on the pediatric population.

Results

Alteration of Growth, Dental Development, And Craniofacial Growth
The dentofacial abnormalities identified in retinoblastoma patients treated with radiotherapy had a substantial impact on growth and development. Martin et al. (2019) highlighted that facial growth alterations were a common consequence of radiotherapy in retinoblastoma survivors4. These alterations manifested as asymmetry in maxillary and mandibular development, leading to facial disharmony4,5,6. There was an anteroposterior skeletal deficiency seen in the maxilla, revealing angle class III malocclusion, severe anterior and posterior crossbite, and posterior openbite4,5,6 (Fig.1-2). The disrupted growth patterns often resulted in malocclusion, affecting occlusal relationships, and contributing to functional challenges4,5. Kim et al. (2023) highlighted the functional implications of dentofacial abnormalities, particularly in severe cases. The altered facial anatomy and occlusal discrepancies could lead to challenges in speech, mastication, and overall oral function5. These functional limitations contributed to the overall burden on the patients' quality of life.

Conclusions

The literature review highlighted the multifaceted nature of dentofacial abnormalities observed in retinoblastoma patients treated with radiotherapy. These abnormalities encompassed disruptions in facial growth, variations in odontogenesis, skeletal and craniofacial deformities, and functional limitations. The complexity of these abnormalities demonstrates the need for a comprehensive understanding of their etiology, progression, and impact on patients' overall well-being. The dentofacial abnormalities identified in retinoblastoma survivors exerted a profound impact on growth and development, both physically and psychosocially. The altered facial anatomy and occlusal discrepancies posed challenges in speech, mastication, and overall oral function, affecting the patients' quality of life. Moreover, the presence of noticeable facial asymmetry and malocclusion contributed to psychosocial concerns, including issues related to self-esteem and body image. Addressing these concerns requires holistic approaches that

encompass not only physical rehabilitation but also psychological support and social integration. Orthodontic, surgical, and prosthetic interventions play pivotal roles in addressing these challenges, each offering unique contributions to the overall management strategy. However, achieving optimal outcomes requires careful coordination and communication among healthcare providers, as well as tailored treatment plans that account for individual patient characteristics and preferences.

#18: Pierre Robin Sequence in Orthodontics

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Purpose

To examine Pierre Robin Sequence and the orthodontic treatment of these patients

Methods

When looking into and compiling the data, the first strategy was to find relevant and recent research that had been done on the topic. This section shall go through the search strategies that were used and the criteria employed to select each study. This comprehensive literature review utilized a certain search strategy to scan the relevant literature through the following electronic databases: PubMed, Medline, and Web of Science. “Pierre Robin Syndrome,” “Pierre Robin Sequence”, “dental or Orthodont*”, “airway or breath”, and “mandibular development” were the terms employed in order to search through the various databases in English from 1923-2021. The reference list obtained was reviewed by the PI as well. The search of the literature was carried out from August 2022 until present.

Results

The role of orthodontist concerns the patient’s dental and skeletal development. This includes the transversely narrow maxilla, cleft, mandibular retrognathia, and the vertical growth tendency. Patients with PRS will have class II malocclusion, hypodontia, severe crowding, and tooth bud injury due to mandibular distraction. 14 It is very common for PRS patients to be treated in a two phase orthodontic treatment for the best results. The first visit can begin when the primary dentition has erupted and continued monitoring of the dentition persists until the permanent dentition comes in. A phase I orthodontic treatment aims to reduce the severity of malocclusion, fix crowding or any asymmetry of the dental arches. After phase 1, RS patients are monitored to see if growth of the mandible catches up. If not, then many patients will undergo orthognathic surgery once when are done growing. Surgery will depend on the anterioposterior discrepancy of the dental arches. In Phase II, corrections for missing and malformed dentition, crowding, and skeletal discrepancies are made. Presurgical extractions can be done at this stage to increase the anteroposterior discrepancy in order for a larger mandibular advancement. Class II correctors such as elastics or forsus can be used. For esthetics, an elective surgical procedure can be done to increase the prominence of the chin.

Conclusions

Pierre Robin Sequence causes a multitude of craniofacial symptoms that all require many specialists working on these patients. This review delved into the role the orthodontist plays in their care. More specifically, the orthodontist on the team looks at the tooth development, narrow maxilla arch as a result of the cleft palate, and deficient mandibular jaw growth. While most of the time the lower jaw does in fact catch up to the upper jaw, if it does not then further interventions are addressed. One such technique is Mandibular Distraction Osteogenesis, and although its role is still relatively new, it provides skeletal change to help a retrognathic mandible. There still needs to be more research on the orthodontic interventions that can aide patients surgically to repair abnormalities caused by Pierre Robin Sequence.

#19: Regulation of Hematopoiesis by A Methylation-Phosphorylation Switch in PRC2/EZH2

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Purpose

To investigate the regulation of hematopoiesis by EZH2 (Enhancer of zeste homolog 2) and the Polycomb Repressive Complex 2 (PRC2).

Methods

Mouse genetic knock-in of EZH2 K20R mutants and the knock-out mutants of Lsd1 (Kdm1a), L3mbtl3, and Dcaf5 alleles, as well as RNAi-mediated interference in cultured cells.

Results

EZH2 is methylated at lysine 20 (K20) by SET7 (SETD7) and dynamically demethylated by a demethylase LSD1 (KDM1A), demethylation leads to stabilize EZH2 and PRC2. The K20 methylation of EZH2 is recognized by a methyl reader protein, L3MBTL3, promoting the ubiqutin dependent proteolysis of modified EZH2 by the CRL4DCAF5 ubiqutin ligase complex. Mouse Lsd1 null mutation causes dramatic reduction of EZH2 and its associated other PRC2 subunits, whereas homozygous L3mbtl3 or Dcaf5 deletion results in accumulation of EZH2 and other PRC2 components that increase the levels of H3K27 trimethylation. K20 methylation of EZH2 is inhibited by the PI3K/PTEN-regulated and AKT-mediated phosphorylation of serine 21 (S21) of EZH2. Mouse homozygous Ezh2K20R/K20R mutants develop hepatosplenomegaly associated with high GFI1B expression, and Ezh2K20R/K20R mutant bone marrows expand hematopoietic stem cells and downstream hematopoietic populations.

Conclusions

Our studies etsablished that EZH2 is regulated by methylation-dependent proteolysis, which is negatively controlled by AKT-mediated S21 phosphorylation to establish a methylation-phosphorylation switch to control the PRC2 activity and hematopoiesis.

#20: How do hormonal changes and the oral microbiome interact with periodontal and Alzheimer's disease to influence chronic inflammation and cognitive decline?

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Purpose

This review aims to investigate the potential of the bidirectional relationship between Alzheimer's disease and periodontal disease. The Key players of hormonal fluctuations and microbiome dysbiosis emphasize the shared mechanisms that interplay among both conditions to identify the potential therapeutic opportunities.

Methods

With existing literature, a comprehensive review utilizing databases such as PubMed, ScienceDirect, and Google Scholar, utilizing key terms such as "Alzheimer's disease and periodontal disease," "hormones and Alzheimer's," "oral microbiome and Alzheimer's," and "oral-gut-brain axis." The examination involved a range of peer-reviewed journal articles, meta-analyses, and comprehensive reviews published in the past 20 years. Inclusion criteria examined the role of specific hormones such as estrogen and cortisol that shape the gut and oral microbiome, the complexities of the oral-gut-brain axis mechanism, and the microbial dysbiosis influence on Nero and oral inflammation.

Results

The investigation indicated that chronic inflammation from periodontal pathogens can increase the ability of neurodegenerative processes in Alzheimer's disease through the disruption of the blood-brain barrier. Imbalances in hormonal fluctuations such as aging and menopause sought to be critical key players in the progression of both Periodontitis and Alzheimer's disease by altering the activity of the oral microbiome, which in turn will allow inflammatory molecules to enter the brain to trigger Neurodegeneration.

Conclusions

The conclusion of this review emphasizes the central roles of microbiome dynamics and hormone regulation in influencing the interconnections of the bidirectional relationship between Alzheimer's and Periodontal disease. Further investigation will be beneficial in cultivating interventions to address chronic inflammation and microbiome dysbiosis, decreasing the progression and risk of both diseases.

#21: Evaluation of Immunotherapy in the Treatment of Hepatocellular Carcinoma

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Purpose

Hepatocellular carcinoma (HCC) is a common malignancy which is responsible for over 12,000 deaths annually and represents the 9th leading cause of cancer deaths in the United States alone. It is the most common form of primary liver malignancy and despite advances in treatment and diagnosis, incidences of HCC and mortality rate continue to rise. Major risk factors for HCC include cirrhosis, Hepatitis B and C, and alcohol abuse. The frequent recurrence following curative treatment presents a significant hurdle in the management of HCC. Development of tumors and progression of HCC is heavily modulated by the immune system and strong anti-tumor activity has been shown by immunotherapy methods utilizing checkpoint inhibitors. Other immunotherapy options including virotherapy and adoptive T-cell therapy have not yet been extensively tested and do not currently represent clinical treatment options. Despite the lack of clinical testing, robust antitumor immunity is closely linked to the presence of T-cells that target tumor-specific antigens, making adoptive T-cell therapy a viable option for treatment of HCC. The objective of this work is to review published clinical trials in order to analyze immunotherapy options as compared to traditional methods for the treatment of hepatocellular carcinoma.

Methods

The method will involve: a) evaluating the current non-immunotherapy treatment options available for patients suffering from hepatocellular carcinoma, b) an extensive analysis of the success rates of published clinical trials, and c) a review of adoptive cell transfer (ACT) immunotherapy as a viable treatment option for HCC.

Results

Research in progress; data not yet available.

Conclusions

In conclusion, the results of this study will compare the success of traditional treatment options as compared to immunotherapy in order to analyze the viability of adoptive cell transfer (ACT) therapy in the clinical treatment of hepatocellular carcinoma. Future direction of this project includes lab studies of various immunotherapeutic drugs and their effects on Hepatitis B infected human liver HCC cell cultures.

#22: Impact of Various Antidepressants on Neural Progenitor Cell Survival and Proliferation

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Purpose

Antidepressants aid in repairing hippocampal atrophy by stimulating neurogenesis, increasing BDNF, and promoting brain plasticity, all of which support the regeneration of the hippocampus and recovery of cognitive and emotional health. Currently, there is no definitive answer as to which antidepressant will best promote hippocampal regeneration or neurogenesis. The effects of antidepressants can vary widely in different patients, and tailoring of therapy is limited. This study aims to evaluate the effects of different classes of antidepressants on the survival and proliferation of neural progenitor cells, focusing on changes in BDNF expression. Ultimately, this research aims to provide insights into more tailored and effective antidepressant therapies, improving chances of hippocampal regeneration.

Methods

The current work involves a) analyzing journal articles through Pubmed with keyword search “Antidepressants”, “BDNF”, “Neural Progenitor Cell Regeneration”, and “Neurogenesis” , b) narrowing down search results to include articles which directly studied affects of antidepressants on proliferation and survival of Neural Progenitor Cells, and c) designing a lab study to gather data to test our hypothesis by administering various antidepressants to neural progenitor cells and measuring changes in BDNF expression, signaling pathway activation, and potential neurogenic effects.

Results

N/A

Conclusions

In conclusion, the study's findings will assess the effectiveness of evaluating various antidepressants. We anticipate identifying key differences between various antidepressants and their effects on NPC growth and proliferation which can be used.

#23: Comparing Selective and Nonselective COX inhibitors in Reducing Ocular Inflammation

Elizabeth Bondurant[1], and Jasnoor Shergill[1]

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Purpose

Inflammation is present in many ocular diseases, the cyclooxygenase (COX) enzyme plays a key role in this inflammatory response. The purpose of this study is to compare the effects of selective COX-2 inhibitors and non-selective COX inhibitors in reducing ocular inflammation in cell culture models. While both classes of inhibitors target the COX pathway, selective COX-2 inhibitors are thought to reduce inflammation more specifically, potentially minimizing gastrointestinal and renal side effects associated with non-selective COX inhibition.

Methods

Cultured human retinal pigment epithelial (RPE) cells will be exposed to inflammatory stimuli, such as lipopolysaccharide (LPS) or tumor necrosis factor-alpha (TNF-α), and other stimuli to induce inflammation. Cells will then be treated with varying concentrations of celecoxib (COX-2 selective inhibitor) and aspirin (non-selective COX inhibitor) to assess their effects on pro-inflammatory cytokine production, prostaglandin synthesis, and cell viability. Enzyme-linked immunosorbent assays (ELISA) will be used to evaluate the levels of IL-6, TNF-α, and PGE2. The MTT assay will also be used to evaluate cell viability in order to identify any possible harmful effects of any medication.

Results

N/A

Conclusions

In conclusion, the study's findings will assess the effectiveness of selective COX-2 inhibitors and non-selective COX inhibitors in reducing ocular inflammation in cell culture models. We anticipate identifying key differences between the selective and non-selective COX inhibitors and their effects on pro-inflammatory cytokine production, prostaglandin synthesis, and cell viability.

#24: Primary Failure of Eruption, Mechanical Failure of Eruption, Ankylosis, and Their Orthodontic Implications

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Purpose

The aim of this paper is to provide a review of the available literature on the etiology, diagnostic criteria, clinical and radiographic characteristics of primary failure of eruption, mechanical failure of eruption and ankylosis and their implications in orthodontic treatment

Methods

Using an electronic search of PubMed and Web of science, appropriate systematic reviews, traditional reviews and case reports in the English language was selected from the years 1999 to 2022. Articles were selected using combinations of the terms 'tooth' , 'eruption' , 'failure' , 'orthodontics' , 'PFE' , 'ankylosis' and 'mechanical'. This was supplemented by a manual search of reference lists taken from identified publications in relevant articles from referred journals. Eligibility of selected articles was determined by screening the titles, keywords, and abstracts of potential studies identified from the literature searches

Results

A total of 21 publications were identified and conformed to the inclusion criteria for this literature review. Reported diagnostic criteria, case report findings, and subsequent orthodontic treatment recommendations for primary failure of eruption, mechanical failure of eruption and ankylosis described in the identified publications was extracted and organized in this paper to facilitate a proper clinician diagnosis and treatment modalities.

Conclusions

Common clinical dilemma is distinguishing primary failure of eruption, mechanical failure of eruption and ankylosis as they can have a similar clinical appearance. Must first rule out more common causes of an open bite such as mechanical failure of eruption or tongue thrust as these can typically be treated successfully with orthodontics or surgery. It is then crucial to recognize the differences between ankylosis and primary failure of eruption as they dictate distinct treatment modalities. An inaccurate diagnosis can lead to inappropriate and extended treatment, patient frustration, financial burdens, and poor occlusion.

#25: Evaluating the Impact of Osteopathic Manipulative Medicine on Cytokine Modulation: A Pathway to Inflammatory Disease Management

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Purpose

Autoimmune conditions are characterized by dysregulated immune responses, often involving elevated levels of pro-inflammatory cytokines. Psoriasis is a prevalent and chronic autoimmune disease that has elevated inflammatory markers such as IL-17, IL-23, and TNF-alpha which are central cytokines to the Th17 pathway. Osteopathic Manipulative Medicine (OMM) techniques may influence immune function by enhancing lymphatic circulation, modulating autonomic nervous system activity, and reducing inflammation. This study investigates the effects of the three OMM techniques—Lymphatic Pump Technique (LPT), Rib Raising, and Thoracic Inlet Release—on cytokine levels in healthy individuals. LPT promotes lymphatic flow, facilitating the clearance of inflammatory mediators; Rib Raising modulates sympathetic tone to reduce proinflammatory activity; and Thoracic Inlet Release improves lymphatic and vascular drainage. Therefore these techniques can demonstrate that OMM techniques can modulate cytokine levels in healthy individuals, potentially reducing inflammation and benefiting those with autoimmune conditions like psoriasis. Thus this can widen the breadth of knowledge of nonpharmacologic treatments by highlighting the usage of OMM techniques in non-invasive management of autoimmune conditions.

Methods

This prospective, interventional cohort study will involve 20 healthy medical students. Participants will receive three consecutive days of OMM treatments (10-15 minutes each). To assess both immediate and sustained effects, blood samples will be collected at four time points: baseline (prior to treatment), 24 hours after the first OMM treatment, 24 hours after the second treatment, and 24 hours after the third treatment. Cytokine levels (IL-17, IL-23, and TNF-alpha) will be measured using enzyme-linked immunosorbent assay (ELISA).

Results

N/A

Conclusions

We hypothesize that through the application of Osteopathic Manipulative Medicine techniques, we will be able to measure a significant reduction in pro-inflammatory cytokine levels in a healthy population, suggesting potential therapeutic applications for autoimmune conditions such as psoriasis.

#26: Fecal Virome Transplantation as treatment for Metabolic Syndrome: A review of current literature

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Purpose

Metabolic Syndrome (MetS) is increasingly prevalent in the United States, affecting about 1 in 3 adults. MetS is defined by a cluster of conditions that elevate the risk of diabetes, cardiovascular diseases, and liver and kidney disorders. Its criteria includes abnormalities in three or more of the following: waist circumference, blood pressure, fasting triglyceride levels, fasting HDL levels, and fasting blood glucose levels. Disruption of the gut microbiota has been implicated in the pathogenesis of MetS, and fecal microbiota transplantation (FMT) has been explored as a therapy to restore gut microbiota and relieve symptoms of MetS. However, concerns about pathogen transmission with FMT have led to the exploration of fecal virome transplantation (FVT), which transfers primarily bacteriophages and offers a safer alternative. This review aims to evaluate the impact of FVT on MetS symptoms.

Methods

A search of PubMed was conducted for studies published before July 2024, using keywords such as "fecal virome transplantation," "bacteriophage," and "metabolic syndrome." The review was not limited by gender, animal models, race, or publication date. A preliminary search identified 10 studies, all conducted in mice.

Results

FVT was shown to induce gene expression changes in diet-induced obese mice as well as reduce markers of MetS symptoms like weight gain and glucose tolerance. Although FVT significantly altered gut microbiota, it did not consistently improve phenotypic traits in obese mice. One study found that the impact of FVT on the ileal microbiota was diet-dependent.

Conclusions

FVT shows promise for alleviating MetS symptoms, but studies are limited to non-human models.

#27: Tales from the crypto: A cryptosporidial protease and implications for drug discovery

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Purpose

Cryptosporidiosis (etiological agent Cryptosporidium spp.) causes self-limiting diarrhea in immunocompetent patients. However, in immunocompromised individuals, the infection can be severe. Further, recent research suggests that this nuisance parasite has broader impacts, potentially affecting things like microbial dysbiosis and autoimmune disease. Cysteine proteases (CPs) from such parasites are known to play roles in infection, and we are interested in screening molecules against cryptopain from Cryptosporidium, as well as CP4 from another nuisance parasite Trichomonas vaginalis, in a search for agents that can prevent or
treat these diseases.

Methods

Cryptopain and TvCP4 were synthesized and inserted into pET30(a)+ containing an N-terminal His-tag, subcloned into E. coli DH5α, and subcloned into the expression vector E. coli BL21 (DE3). Proteins were purified with a Bio-Rad LP and nickel affinity column. Refolding protocols used include gluathione and dialysis. Enzyme assays are being developed with fluorogenic dipeptide substrates and human CPs in a 384-well plate HTS format.

Results

BL21 (DE3) strains harboring cryptopain or TvCP4 produced proteins with molecular weights of approximately 45kDa or 33 kDa. Currently, we are optimizing refolding these CPs and developing microplate assays with human CPs to translate to purified pathogenic CPs.

Conclusions

After successful refolding of parasite CPs, future directions will include inhibitor screens of compound libraries. Inhibitors identified in that screen may be leads
towards agents that can prevent or treat their associated diseases.

#28: Volumetric Normalization: Evaluating the Application of Residual and Proportional Adjustment in Neuroimaging

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Purpose

Normalization allows for analysis of specific brain volumes or regions when evaluating neurological alterations. Common normalization techniques include residual adjustment (RA) and proportional adjustment (PA) methods. This review compares PA and RA by analyzing studies using automated volumetric tracing techniques that utilize algorithms for MRI normalization to assess various characteristics and diseases in relation to total brain volume (TBV) and region of interest (ROI).

Methods

Research was identified through PubMed, Elsevier, and Google Scholar using keywords like ‘volumetric tracing,’ ‘total intracranial volume,’ ‘proportional adjustment,’ and ‘residual adjustment.’ Included studies adjusted for race/ethnicity, sex, age, or regions of interest, and analyzed cranial volume normalization in pathologies like multiple sclerosis, Alzheimer's, and semantic dementia. Only studies with sample sizes larger than 10 using 1.5 T and 3T MRI were included to enhance statistical power and generalizability; case studies were excluded.

Results

The RA adjusts for covariates such as headsize, brain size, or body size by using data from linear regression within a control group, which are subtracted from dataset values to compare with a ROI. PA tests group differences across proportionalized volumes, normalizing for intracranial brain volume using a certain ROI which is divided by the TBV, generating proportional ratios; a group analysis is conducted via t-test or ANOVA.

Conclusions

RA is optimal for healthy patients to eliminate gender differences. PA is recommended for multiple sclerosis. PA tends to overcorrect gray matter volumes. In Alzheimer's disease, RA removes gender differences, while both RA and PAs are applied for hippocampal normalization. RA effectively removes ROI-ICV correlations, negating the influence of brain size. These findings underscore the use of adjustment methods depending on the clinical context and neuroanatomical regions under study, highlighting these techniques in different disease states, but further research is needed to address the common issues of overestimation and underestimation in each approach.

#29: uNADulterated Antimycotics Targeting NAD Homeostasis in Candida

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Purpose

Invasive candidiasis is a growing concern. Several Candida species have been placed in the Critical Priority and High Priority groups by the WHO, and within months of these new priorities, the CDC published a study noting prevalence of nosocomial candidemia in 26 states. Climate change and drug resistance are compounding the health threat, and new agents are needed in the antimycotic armamentarium. To better understand fungal energy homeostasis and explore new potential drug targets, we cloned and characterized nicotinamide mononucleotide adenylyltransferase (NMNAT) from C. parapsilosis (CpNMNAT) and performed a small in vitro inhibitor screen.

Methods

CpNMNAT was synthesized and inserted into pET30(a)+ containing an N-terminal His-tag, subcloned into E. coli. Enzyme assays were conducted using modified NMNAT assay from our laboratory (doi: 10.1177/2472555219879644), employing a luciferase-coupled assay to monitor end-point concentrations of ATP. CpNMNAT assays were run in the “forward” direction using ATP and NMN as substrates and generating NAD and PPi, as well as the “reverse” direction using NAD and PPi as substrates and generating ATP and NMN.

Results

BL21 (DE3) harboring CpNMNAT produced a protein with a molecular weight of approximately 46kDa, which had enzymatic activity with both the forward and reverse directions. CpNMNAT displayed Michaelis-Menten kinetics, with Kms of around 1 and 400 μM for NAD and PPi, respectively, and the reaction was inhibited by known human NMNAT inhibitors gallotannin and dichloronapthoquinone. The inhibitor screen identified a micromolar inhibitor of CpNMNAT.

Conclusions

These results show promise towards identifying small molecule probes for ATP/NAD homeostasis in fungal pathogens, which ultimately could better inform antimycotic drug discovery. Future directions will include expanding our compound library, in addition to test CpNMNAT-active hits against Candida cultures.

#30: Pharmacist-led Education to Decrease Inappropriate Meropenem Usage at Valley Hospital Medical Center

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Purpose

Meropenem is increasingly being prescribed inappropriately for empiric therapy at Valley Hospital Medical Center. Meropenem inappropriate usage has led to increased resistance, specifically to Pseudomonas aeruginosa. The purpose of this study is to provide pharmacist-led education to first and second-year Graduate Medical Education (GME) residents to reduce inappropriate meropenem usage.

Methods

This is a quality improvement study, in which there will be a pharmacist-led education on the appropriate use of meropenem at Valley Hospital Medical Center. Education will be an educational service, which consists of a 5-minute discussion and handout covering the situations which are considered appropriate or inappropriate use of meropenem. Education will be provided to the first- and second-year Graduate Medical Education (GME) residents who are in their intensive care unit, emergency department, and internal medicine rotations. Exclusion criteria are GME residents who are not currently on these aforementioned rotations. Education will take place between October to November 2024. Post-education data will be collected in December 2024 for October and November 2024. Meropenem orders by the residents who were educated will be assessed for appropriateness, and then be compared to the residents on the included rotations from the previous year for the months of October and November 2023. The primary outcome is the percentage of appropriate use of meropenem orders based on hospital criteria. Secondary outcomes measured will be days of therapy, indication, infectious disease consultation, prescriber, pharmacist interventions on meropenem orders, and dosing strength of meropenem. Statistical analysis of continuous data will be evaluated with Mann-Whitney U test, and categorical data will be evaluated with either Fischer's exact test or Chi-square. IRB approval is pending.

Results

N/A

Conclusions

N/A

#31: Takotsubo Cardiomyopathy: A Case of the Broken Heart

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Purpose

Takotsubo cardiomyopathy (TC), also referred to as “apical ballooning syndrome,” “broken heart syndrome,” or “stress-induced cardiomyopathy,” is a rare but serious non-ischemic cardiac condition with a transient and reversible systolic dysfunction of the left ventricle (LV) triggered by severe emotional or physical stress. TC has an unclear etiology and pathogenesis, with catecholamine excess, coronary artery diseases, and predisposing factors as the main three hypotheses. Its clinical manifestation mimics that of myocardial infarction, and some patients may be susceptible to developing cardiogenic shock. However, current guidelines on the management of TC are lacking as there are no prospective randomized data; it is based on clinical experience and expert consensus from current heart failure guidelines, along with strategies to prevent acute complications from cardiogenic shock.

Methods

We report a case of a 64-year-old female patient with a past medical history of hypertension and prediabetes who presented to Valley Hospital Medical Center diagnosed with cardiogenic shock secondary to TC, which was likely precipitated by the emotional stress related to her son’s recent medical history.

Results

Throughout the patient’s admission, she required various supportive therapies including vasopressors, a percutaneous intervention without stenting, and an Impella device for cardiac support. After clinical stabilization, she received medications consistent with the American College of Cardiology/American Heart Association (ACC/AHA) 2022 guideline-directed medication therapies (GDMT) for heart failure, ST-elevated myocardial infarction (STEMI), and secondary prevention, including Entresto, furosemide, carvedilol, atorvastatin, aspirin, and apixaban.

Conclusions

This report highlights a comprehensive overview of a rare cardiac condition that was intervened with cardiac procedures and medications that ultimately led to treatment success. This raises further questions about the optimal treatments for managing TC and cardiogenic shock in addition to the current GDMT for heart failure. Through observation of this patient and the therapeutic approaches, the significance of these findings provides beneficial insights that could establish guideline optimizations for the management of similar cases.

#32: N-acetylcysteine in non-acetaminophen induced acute liver failure (NAI-ALF): a retrospective analysis of outcomes and treatment efficacy

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Purpose

The use of N-acetylcysteine (NAC) has been shown to improve outcomes in patients with acute liver failure caused by acetaminophen overdose. However, its efficacy in non-acetaminophen-induced acute liver failure remains under investigation. The potential benefits of NAC in NAI-ALF cases—arising from factors such as ischemic hepatitis, alcohol intoxication, viral hepatitis, or drug- and toxin-related hepatotoxicity—are still inconclusive. This project aims to retrospectively analyze the outcomes of patients with NAI-ALF who received NAC treatment at our institution. By collecting and evaluating this data, the study seeks to determine whether NAC offers a significant benefit in NAI-ALF cases and assess its potential integration into our facility protocols for these patients.

Methods

This is a retrospective chart review of patients who were admitted to MountainView Hospital from January 1st 2023 – October 1st 2024. Inclusion criteria includes adult patients (age ≥ 18 years), diagnosis of acute liver failure with an INR ≥ 1.5, elevated ALT, AST, bilirubin and hepatic encephalopathy for less than 26 weeks, non-acetaminophen-induced etiology of liver failure (ischemic hepatitis, viral hepatitis, alcohol-induced liver injury, drug-induced liver injury, autoimmune hepatitis), and documented treatment with NAC. Exclusion criteria includes Known acetaminophen overdose or liver failure due to acetaminophen, chronic liver disease or end-stage liver disease, active malignancy with liver involvement, severe renal impairment (eGFR < 30 mL/min/1.73 m^2), and pregnancy or breastfeeding. The primary outcome is survival to hospital discharge. Secondary outcomes include length of hospital stay, documented need for liver transplantation, improvement in encephalopathy, jaundice or ascites if present prior to NAC administration, and improvement in liver function after NAC administration defined by at least 25% reduction in one of the following AST/ALT, Tbili and INR.

Results

To be presented at the 11th Annual Roseman Research Symposium.

Conclusions

To be presented at the 11th Annual Roseman Research Symposium.

#33: Optimizing Anticoagulation: Enhancing Time to Therapeutic Levels in Acute Pulmonary Embolism Management

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Purpose

Pulmonary embolism (PE) requires prompt anticoagulation, with unfractionated heparin (UFH) often used for initial treatment, especially in unstable patients. Achieving therapeutic anticoagulation levels, monitored via activated partial thromboplastin time (aPTT), is crucial but challenging due to individual factors and protocol differences. Timely therapeutic anticoagulation prevents thrombus propagation and reduces recurrent VTE risk. Our institution follows a nurse-driven heparin infusion protocol, where nurses are responsible for monitoring and adjusting the rate of heparin infusion. The rate of heparin infusion is adjusted based on routine aPTT levels every 6 hours by nurses. This quality improvement initiative seeks to assess the time to achieve therapeutic aPTT levels in patients with acute PE treated with UFH. It also aims to evaluate the effectiveness of our current protocol in achieving timely therapeutic anticoagulation, assess protocol adherence, and identify potential areas for improvement in our PE management process.

Methods

This retrospective chart review will include adult patients (18 years or older) diagnosed with acute PE and treated with UFH following our institution's weight – based protocol from August 1, 2024, to December 1, 2024. Patient were excluded if they were treated with non-heparin anticoagulants, unable to undergo routine aPTT monitoring, or managed off-protocol. Data were collected from electronic medical records, extracting patient demographics, relevant medical history, aPTT levels at baseline and 6, 12, 18, and 24 hours after heparin initiation, times of aPTT level draws, times of heparin infusion rate adjustments, bleeding events, and occurrences of re-thrombosis events. Key metrics for analysis include the percentage of patients achieving therapeutic aPTT at various time intervals, adherence to timely aPTT level draws and heparin rate adjustments, incidence of bleeding complications, and VTE recurrence.

Results

To be presented at the 11th Annual Roseman Research Symposium

Conclusions

To be presented at the 11th Annual Roseman Research Symposium

#34: Evaluating the incidence of fungemia in acutely ill hospitalized patients receiving intravenous parenteral nutrition

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Purpose

Fungemia is a severe infection with a 30-day mortality rate can be up to thirty percent. Identifying the underlying cause of infection is essential for improving patient outcomes. Studies have shown conflicting results regarding the association between total parenteral nutrition (TPN) and the risk of fungemia. While some studies highlight factors such as low pH and hyperglycemia as contributors to fungal infections, other studies and case reports suggest that lipid emulsions in TPN may play a significant role. Proposed mechanisms include the ability of lipid emulsions to alter the surface properties of catheters which promote fungal adhesion, or the potential for triglycerides and free fatty acids to provide an ideal nutrient source for microbial growth, including fungi. In this study, we aim to assess the incidence of fungemia in patients receiving TPNs containing lipid emulsions.

Methods

This is a retrospective analysis conducted between January 01, 2023 and December 31, 2024 at a community hospital. For ease of screening fungal infections, medical records of adult patients on both TPN and either micafungin or fluconazole were reviewed. Patients who developed fungemia while on TPN were analyzed for potential risk factors contributing to the infection. Exclusion criteria include peripheral parenteral nutrition. Data collected include demographic characteristics, medical history, indications and duration of TPN, cumulative dose and duration of lipid emulsions, levels of care while receiving TPN, and relevant laboratory findings including white blood count (WBC), blood glucose, and triglyceride. The primary outcome measured was the incidence of fungemia, defined as a positive blood culture. Secondary outcomes include markers indicating probable fungemia, such as a positive fungitell test or the presence of galactomannan antigen, hospital length of stay and other bloodstream infections not related to fungemia.

Results

To be presented at the Annual Roseman University Research Symposium.

Conclusions

To be presented at the Annual Roseman University Research Symposium.

#35: Evaluation of an Electrolyte Replacement Protocol in a Community Hospital

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Purpose

Electrolyte abnormalities are commonly observed amongst hospitalized patients and may increase the risk of both morbidity and mortality. To mitigate this, our institution utilizes an electrolyte replacement protocol to make appropriate adjustments toward each patients' care. Our hospital's original process consisted of adding an exhaustive list of "as needed" (PRN) electrolyte orders onto a patient's profile for nurses to sieve through and select for administration. Recently, our institution modified its electrolyte replacement process by requiring each electrolyte replacement to be ordered individually and verified by a pharmacist. The primary objective of this study is to evaluate the incidence of electrolyte replacement variance between the original and new electrolyte replacement process. The secondary objective is to evaluate the incidence of delayed follow-up labs after an electrolyte replacement administration.

Methods

A retrospective chart review was conducted on hospitalized patients from July 1-31, 2023 and July 1-31, 2024. Patients included in this study had an active order for the electrolyte replacement protocol and met the following inclusion criteria: age ≥18 years old, creatinine clearance (CrCL) >30 milliliters/minute (ml/min), weight >50 kilograms (kg) and serum creatinine (SCr) <1.8 milligrams/deciliter (mg/dL). Exclusion criteria were defined as: patients who received dialysis or parenteral nutrition feeding during their hospital admission. Data collection was performed using our hospital's electronic health record and clinical decision support system, which included: age, SCr, electrolyte level prior to replacement, replacement dose administered, incidence of administration variances from the required amount to be administered and the incidence of delayed follow-up lab orders.

Results

to be completed

Conclusions

#36: Assessment of condylar anatomy and degenerative changes in temporomandibular joint disorders – A scoping review

Huy Tran [1], Nadine Alpani [1], and Anna Ferris [1]

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Purpose

Introduction: Temporomandibular disorders (TMDs) are a group of conditions that cause pain and dysfunction in the temporomandibular joint (TMJ) and muscles that control mandibular movement. In most cases, the etiology is not clear, and it is considered multifactorial. Recent research suggests that some forms of TMD could be associated with specific TMJ anatomical characteristics. Aim: The aim of this study is to provide a review of the anatomy of condyles of subjects with a clinical diagnosis of TMD as described with the use of CBCT imaging, as well as the detection of potential predisposing anatomical factors.

Methods

Methods: This review was developed and reported in accordance with the Joanna Briggs Institute Manual for Evidence Synthesis: Scoping Review Chapter and the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist. A comprehensive search was performed in five databases and supplemented with grey literature searches. Reports were screened by two independent reviewers based on preselected inclusion and exclusion criteria.

Results

Results: 45 studies were eventually included in this review. The main morphological abnormalities associated with TMD were condylar flattening, erosion of the condylar surface and osteophyte., Anatomical characteristics, other than osteoarthritic changes, included small condylar size, and a superior and posterior position of the condylar head. The anterosuperior area of the condylar head appears to be the most frequently affected. Females present with a more superior and posterior position of the condylar head.

Conclusions

Conclusions: Apart from the abnormalities that are visible in CBCTs and are directly related to TMD, only small condylar size has been reported as a morphological predisposing anatomical factor. More studies are required to determine potential predisposing anatomical characteristics in more detail and with the use of longitudinal CBCT databases.

#37: Analysis of Overall Orthodontic Treatment Time When Using LightForce: A Literature Review

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Purpose

The length of orthodontic treatment is one of the major factors in determining the success of a patient's final outcome. For most patients, any treatment time longer than anticipated in full fixed appliances can negatively impact oral health. As treatment time increases, compliance and motivation tend to decrease. Improper brushing and flossing techniques greatly increase the risk of poor oral hygiene, ultimately leading to gingivitis, periodontal disease, and decay. The objective of this literature review is to investigate if LightForce is an effective and efficient treatment option that does in fact reduce overall treatment time. Finishing treatment in a timely fashion would be beneficial for not only the patient's oral health, but their overall well-being.

Methods

A literature search was conducted utilizing the following databases: PubMed, Scopus, and Google Scholar. The search included the following key words: "LightForce Orthodontics," "3D printed customized brackets," and "LightForce Treatment Time." Peer-reviewed articles containing information on the efficiency and effectiveness of the LightForce bracket system along with duration of total treatment time were considered eligible for review. Search results are currently being studied, analyzed, and summarized accordingly.

Results

Conclusions

#38: Hidden Pathologies: The diagnostic benefits of a CBCT on craniofacial diagnosis

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Purpose

Since its introduction in the early 2000s, dental Cone Beam Computed Tomography (CBCT) imaging has gained significant popularity due to its superior diagnostic capabilities compared to traditional two-dimensional (2-D) radiographic techniques. CBCT provides more precise, accurate, and comprehensive diagnostic information, which has led to a notable increase in the detection and diagnosis of previously hidden or occult pathologies, such as foreign bodies, dental abnormalities, airway anomalies, and temporomandibular disorders. In contrast to 2-D imaging, which is prone to distortion and magnification issues, CBCT offers accurate 1:1 geometry, allowing precise measurements and comprehensive assessments of both hard and soft tissue structures in three dimensions. This article explores how CBCT has proven invaluable in identifying anomalies and pathologies that are not easily detected on 2-D radiographs. Case examples are presented where CBCT was instrumental in detecting and diagnosing unique conditions, with confirmation from oral maxillofacial radiology specialists. The findings highlight the clinical advantages of incorporating CBCT into daily dental practice for improved diagnosis and treatment planning.

Methods

Find 6 patients that have been treated or are currently being treated at Roseman University Orthodontics who have radiographic anomalies present in their CBCT imaging. Present each patient in a case report type format with multiple radiographs including; a standard 2D lateral cephalographic view and imaging obtained from CBCT imaging. Compare the standard 2D lateral cephalography to the other CBCT imaging obtained.
Explain the relevance of why this matters to orthodontics and dentistry in general.

Results

Results will be the diagnoses of the patients in the case studies, this is too long to write in 1 paragraph.

Conclusions

With its introduction, 2-D imaging allowed for diagnostic capabilities that greatly enhanced patient treatment effectiveness making the importance of traditional 2-D imaging undeniable as an instrumental part of orthodontics and health care in general. These case reports elucidate that while pertinent information is obtained from 2-D radiographs, 3-D radiographs can more fully capture underlying pathology, more accurately show where teeth are within the maxilla and mandible, and illuminate respiratory pathways, all in an effort to improve the patient’s diagnosis, treatment, and quality of life.

#39: Slow maxillary expansion in adult patient with Hyrax expander: A case report.

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Purpose

The aim of this case report is to discuss the orthodontic treatment of a 20-year-old patient with a bilateral posterior crossbite.

Methods

Orthodontic treatment was done with full fixed appliances, and extraction of a mandibular right lateral incisor.

Results

Pt was successfully treated with slow maxillary expansion keeping molars at an appropriate angulation and acceptable clinical result.

Conclusions

This case report shows that slow maxillary expansion can be used in an adult to achieve the objectives set by both the orthodontist and patient while also considering treatment modalities most agreeable to the patient.

#40: The efficacy of temporary skeletal anchorage appliances in the correction of skeletal anterior open bite – A scoping review

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Purpose

The purpose of this scoping review is to summarize the current scientific evidence regarding the efficacy of Temporary Anchorage Devices (TADs) in the correction of skeletal anterior open bite (AOB). Skeletal AOB, characterized by a lack of vertical overlap between the anterior teeth, is typically caused by the vertical overgrowth of the posterior maxillary dentoalveolar segments. Traditional treatments, including orthognathic surgery, are invasive, costly, and associated with potential complications. In growing patients, functional appliances and headgear require extensive compliance and are often ineffective in severe cases.

TADs, including mini-screws and mini-plates, have expanded orthodontic treatment capabilities by providing fixed skeletal anchorage with minimal invasiveness. These devices allow for precise force application, enabling controlled intrusion of the posterior teeth, which is crucial for AOB correction. Compared to surgical interventions, TADs are less invasive, can be inserted under local anesthesia, and reduce the reliance on patient compliance.

This review adheres to PRISMA-ScR guidelines and synthesizes data from six major databases. Studies involving human participants with skeletal AOB were included, while those involving syndromic or non-standard cases were excluded. The findings indicate that TADs reliably facilitate AOB correction, often through mandibular counterclockwise rotation. Mini-plates showed greater molar intrusion compared to mini-screws, with comparable treatment durations. Complications were infrequent, mainly involving soft tissue inflammation, TMD symptoms, and TAD failures.

In conclusion, TADs offer a promising, less invasive alternative for skeletal AOB correction, bridging the gap between traditional orthodontic and surgical approaches.

Methods

This scoping review followed the Joanna Briggs Institute framework and PRISMA-ScR guidelines. Six databases (MEDLINE, EMBASE, Web of Science, Scopus, Cochrane Library, and ProQuest) were searched for peer-reviewed human studies up to August 2023, using predefined keywords related to skeletal anterior open bite (AOB) and Temporary Anchorage Devices (TADs). Grey literature was also explored using Google Scholar.

Eligibility criteria included human studies involving skeletal AOB correction using TADs, excluding cases with syndromic conditions, genetic disorders, or AOB caused by trauma, ankylosis, or TMD. Study designs considered included randomized controlled trials, observational studies, and descriptive studies, while reviews, conference abstracts, and case reports were excluded.

Article screening and data extraction were independently conducted by two reviewers. Disagreements were resolved through discussion. Data items extracted included participant details, treatment methods, outcomes, and study contexts. Results were summarized in tables and narrative formats to present study characteristics, treatment methods, and outcomes.

Results

The review found that Temporary Anchorage Devices (TADs) are effective for correcting skeletal anterior open bite (AOB). Initial correction was successful in all cases, with most treatments involving the intrusion of posterior maxillary segments and mandibular counterclockwise rotation. Mini-plates achieved greater molar intrusion and overbite correction compared to mini-screws, although treatment durations were similar.

Complications were rare and included soft tissue inflammation at TAD insertion sites, TMD symptoms due to posterior maxillary intrusion, and occasional TAD loosening or failure. Overall, TADs were shown to be a reliable and less invasive alternative to surgical treatment for skeletal AOB correction.

Conclusions

The review found that Temporary Anchorage Devices (TADs) are effective for correcting skeletal anterior open bite (AOB). Initial correction was successful in all cases, with most treatments involving the intrusion of posterior maxillary segments and mandibular counterclockwise rotation. Mini-plates achieved greater molar intrusion and overbite correction compared to mini-screws, although treatment durations were similar.

Complications were rare and included soft tissue inflammation at TAD insertion sites, TMD symptoms due to posterior maxillary intrusion, and occasional TAD loosening or failure. Overall, TADs were shown to be a reliable and less invasive alternative to surgical treatment for skeletal AOB correction.

#41: Invisalign Effects of Gingival Health

Rea Ghodasra [1], and Joseph Cheever [1]

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Purpose

This literature review aims to explore the existing research on Invisalign and its influence on gingival health, focusing on both short-term and long-term outcomes. By examining various clinical studies and patient reports, this review seeks to provide a comprehensive understanding of how Invisalign treatment may contribute to or mitigate gingival issues. This analysis will help to clarify whether Invisalign poses any unique risks or benefits to overall periodontal health compared to traditional orthodontic methods.

Methods

For this literature review, a systematic search was performed using databases such as PubMed, MEDLINE, and Google Scholar to identify studies related to Invisalign and gingival health. Keywords including "Invisalign," "clear aligners," "gingival inflammation," "periodontal health," and "orthodontic treatment" were used to retrieve relevant articles. The inclusion criteria were peer-reviewed articles focusing on the effects of Invisalign on gingival or periodontal health. Studies were screened in two phases: first, by evaluating the titles and abstracts for relevance, and second, by conducting a full-text review to assess the quality and depth of each article. Data extraction involved documenting study design, sample size, intervention details, duration of treatment, and periodontal health outcomes. The collected data were synthesized to provide insights into the effects of Invisalign treatment on gingival health, with attention to recurring findings and research gaps in the current literature.

Results

Patients treated with clear aligners demonstrated superior oral health outcomes compared to those with fixed orthodontic appliances. Plaque scores and gingival inflammation were significantly lower among aligner users, attributed to the ease of removing aligners for thorough oral hygiene practices. Clear aligners also supported a healthier oral microbiome, showing fewer pathogenic bacteria linked to conditions such as gingivitis and early periodontitis. In contrast, fixed appliances created challenging cleaning environments around brackets and wires, resulting in greater plaque accumulation and higher levels of bleeding on probing and periodontal pocket depths.

Patient satisfaction was markedly higher in the aligner group, driven by their comfort, aesthetic appeal, and functional advantages, such as easy removability during meals and cleaning. Behavioral studies revealed that aligner users adhered more consistently to recommended hygiene protocols, enhancing oral health outcomes. For patients with heightened periodontal risks, clear aligners emerged as a more favorable option, offering significant clinical benefits in maintaining oral health throughout orthodontic treatment.

Conclusions

Clear aligners provide a compelling alternative to fixed orthodontic appliances, offering improved oral health outcomes, greater patient satisfaction, and better hygiene compliance. By facilitating effective

cleaning and reducing periodontal risks, aligners are particularly advantageous for patients with existing periodontal concerns. These findings emphasize the importance of individualized treatment planning that considers both clinical outcomes and patient preferences to achieve optimal orthodontic results.

#42: Mini-Implant Success in Orthodontics: A Scoping Review

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Purpose

To comprehensively examine the use of TADS in orthodontics and identify the various factors affecting their success rates, with the goal of refining clinical approaches and improving treatment outcomes.

Methods

This systematic review adhered to PRISMA guidelines, analyzing human-based, peer-reviewed studies from 2013–2023 on orthodontic mini-implants. The review focused on success and failure factors of temporary anchorage devices (TADs). A comprehensive database search identified eligible studies, screened and verified through multi-tiered processes. Quantitative and qualitative analyses informed evidence-based recommendations.

Results

The review analyzed 36 studies on mini-implant and temporary anchorage device success during orthodontic treatment. Key factors were placement location (maxillary and palatal favored), oral hygiene, bone quality, and clinician experience. Study designs varied widely, focusing on movements like distalization, intrusion, and retraction, emphasizing anchorage control and procedural precision.

Conclusions

Orthodontic treatment planning should consider placement location, oral hygiene, patient age, bone quality, and screw characteristics. Clinicians must prioritize patient education and evaluate anatomical and metabolic factors to optimize mini-implant or TAD success. Personalized approaches, tailored loading protocols, and adaptive strategies can enhance treatment outcomes and reduce failure rates, improving patient care.

#43: Microabrasion for Post Orthodontic Discoloration

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Purpose

This literature review synthesizes findings on the effectiveness, underlying mechanisms, procedural protocols, complementary treatments, and limitations of microabrasion for addressing enamel discolorations after orthodontic treatment.

Methods

The research team followed a guided plan for data extraction, initially identifying records from 1990-2023 through database searches. After applying inclusion/exclusion criteria, 6 articles were included in this review. Data sources included PubMed, Google Scholar, and Web of Science. Full-text review and data extraction were performed.

Results

Microabrasion Followed by Flouride Application (N = 3 studies)
Three studies showed microabrasion to be effective in treating WSLs particularly when combined with fluoride treatments. Findings suggest that regular fluoride use can reduce WSL incidence, underscoring fluoride's importance in maintaining enamel integrity post-microabrasion (Salmerón-Valdés et al., 2016).

Microabrasion Followed by Bleaching (N = 1 studies)
One study showed microabrasion to be most effective when followed by bleaching.
The study suggested this dual treatment approach as an effective strategy for addressing both surface and subsurface discolorations

Other Findings For Microabrasion Use (N = 2 studies)
One study showed microabrasion successfully reducing fluorosis related staining. This practice enhanced tooth appearance with minimal enamel lost compared to other techniques such as veneers.
One study concluded that microabrasion helped reduced WSLs by 83% of their size.

Conclusions

Enamel microabrasion is an effective, minimally invasive approach for treating post-orthodontic WSLs and similar enamel discolorations. By removing the discolored enamel layer and creating a polished surface resistant to plaque, microabrasion offers both aesthetic and functional improvements. The technique is conservative, preserving tooth structure and avoiding the need for more invasive cosmetic procedures. When combined with post-procedure fluoride treatments and, if necessary, dental bleaching, microabrasion provides comprehensive improvement in tooth appearance that aligns with patient expectations for a bright, uniform smile post-orthodontic treatment.

#44: Orthodontic Considerations for Children with Autism Spectrum Disorder: A Literature Review

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Purpose

Children with Autism Spectrum Disorder (ASD) present with complex oral health challenges resulting from a highly varied combination of behavioral differences, sensory sensitivities, and craniofacial and physical anomalies. These etiologies and comorbidities result in higher rates of malocclusion, obstructive sleep apnea (OSA), and oral care difficulties. Patients with ASD may necessitate modified treatment goals and approaches. This literature review synthesizes evidence from a wide scope of scientific articles to provide a broad exploration of orthodontic approaches for children and adolescents with ASD, with an emphasis on the prevalence and management of malocclusion and OSA through behavioral and treatment interventions. Through the adoption of individualized interdisciplinary approaches, orthodontists can address the oral health needs of children with ASD with the ultimate goals of improving systemic health, social wellbeing, and quality of life.

Methods

A narrative review was performed. Research articles were deemed eligible for inclusion if they specifically addressed Autism Spectrum Disorder or an underlying component of Autism Spectrum Disorder that could be linked to orthodontic treatment. In addition, eligible articles had to undergo peer review and be published in English between 2006 and 2024. Exclusion criteria targeted abstract-only articles and presentations, articles deficient of full text, conference proceedings, and opinion articles such as letter to the editor, editorial comments, and opinion pieces in an effort to uphold refinement criteria to include only empirical evidence.

The initial search was conducted across multiple databases, namely PubMed and ScienceDirect. These search engines were selected due to their extensive database of scholarly articles, clinical trials and research studies which spanned medical and dental fields. This intentional selection sought to broaden the scope of sources entered into the review, involving a vast array of scientific contributions. Specific keywords and search strategies were shaped to each database and implemented to ensure retrieval of a wide range of relevant articles.

Using the search terms, “Autism, ASD, Children, Pediatric, Epidemiology, Therapy, Malocclusion, Morphology, Functional Appliances, Orthodontics, Orthodontic Appliance, Obstructive Sleep Apnea, OSA, Physiopathology, Sleep Disorder.” Articles with subject matter relevant to this piece were included.

Results

In progress.

Conclusions

In progress.

#45: Turner Syndrome: Dental and Orthodontic Treatment Modifications

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Purpose

Turner Syndrome (TS) affects 1 in 2,500 female births and is characterized by the absence of one X chromosome. (45,X karyotype). There are significant implications in dentistry and orthodontics requiring a unique and tailored dental and orthodontic approach. This literature review serves to investigate current research and consulate knowledge to create dental and orthodontic clinical guidelines for patient care.

Methods

This literature review addresses Turner Syndrome (TS) and its impact on dentistry and orthodontics, aiming to improve patient care. We conducted a thorough search using PubMed and Google Scholar, focusing on recent, relevant studies using keywords like "Turner Syndrome" and "Orthodontics". Inclusion criteria were studies offering clinical insights into TS, while those not recent, lacking full text, or irrelevant were excluded. Data extraction focused on publication details, study design, key findings, and orthodontic recommendations, particularly concerning craniofacial deformities. The synthesis of data involved categorizing key themes to provide an overview of TS's dental implications, aiding professionals in effective treatment planning.

Results

Significant findings and characteristic craniofacial features associated with Turner Syndrome impact dental and orthodontic care. First a significant reduction in size of the cranial base is observed in TS. Additionally, a shorter length of the mandible is noted. Also, there is disproportion with smaller posterior facial height compared to the anterior facial height, leading to a retrognathic facial appearance. Also of significance, is a clockwise rotation of the mandible, contributing to the unique facial profile observed in individuals with this condition. Finally, micrognathia of mandible can lead to compromised and deficient airway.

Conclusions

It is necessary to find a dental and orthodontic home at an early age to create a tailored treatment plan and goal. All patients with turner syndrome should receive an orthodontic consult before eruption of permanent teeth. Patients may benefit from functional appliances such as MARA / Herbst Appliance for class II correction and growth modification. Additionally, patients may benefit from headgears and other growth modification appliances tailored to their specific needs. It is important that patients should receive an airway consult from ENT and consider maxillary expansion when indicated.

#46: Gingival Hyperplasia In Orthodontic Patients

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Purpose

The purpose of this literature review is to discuss the most recent information regarding the etiology of gingival hyperplasia in orthodontic patients and treatment methods.

Methods

When starting to gather information, it was important to ensure that we found studies that were appropriate for our topic. It was also important to make sure that previous studies had been done on this topic. In this section, we elaborate on our search strategy and selected studies. The following PICO was used: Population being patients with gingival hyperplasia, intervention being orthodontic treatment, no comparison, and outcome being malocclusion. A comprehensive literature review was done using the following electronic databases: Web of Science, PubMed, Cochrane, Medline. Keywords “Gingival Hyperplasia” AND “Orthodontic*”, “Gingival Hyperplasia” AND “Orthodontic Interventions”, AND “Gingival enlargement” were used to search for relevant articles from 2000-2024 in English only. The reference list obtained was reviewed by the principal investigator. The studies selected for this research met the inclusion criteria of topics related to Gingival Hyperplasia and orthodontic interventions. The selection criteria required the articles to provide specific information about gingival hyperplasia, and Orthodontic treatment

Results

Gingival hyperplasia is a multifactorial disease that occurs due to response to various stimuli as well as different host-environment interactions. This paper discusses the causes of gingival hyperplasia and current treatment and management methods for individuals suffering with gingival hyperplasia.
Gingival hypertrophy usually occurs 1 to 2 months after orthodontic treatment. Many factors can aggravate gingival inflammation and cause gingival fibrosis and hypertrophy, such as reduced plaque control, chemical and physical stimulation of adhesives, mechanical band stimulation and food impaction. Although plaque is often believed to be the leading cause of gingival inflammation and hypertrophy, it has been reported that gingival hypertrophy also occurs in patients with good oral hygiene, suggesting that orthodontic force and periodontal remodeling may also be associated with gingival hypertrophy.
For example, Surlin et al found that out of 22 fixed orthodontic patients, 15 developed gingival hypertrophy. The level of matrix metalloproteinase (MMP)-8 in these patients was significantly higher than that in the standard orthodontic treatment group (no periodontal lesions in the latter group). Based on these results, they believe that the increase in MMP level caused by orthodontic force may be one of the causes of gingival hypertrophy, but whether pure orthodontic power is a direct factor in gingival hypertrophy still needs to be explored further.
On the other hand, it was shown that a continuous low concentration of nickel ion stimulation in some orthodontic devices is an essential cause of gingival hypertrophy in orthodontic treatment, Nickel ions may stimulate the growth of epithelial cells 'and the proliferation of keratinocytes by inducing T-lymphocytes to produce interferon and interleukin (IL)-2, IL-5, and IL-10, which may lead to gingival hypertrophy. Nickel ion

release may be a time-dependent type IV allergic reaction.
Another factor that may be associated with the occurrence of GE is the hormonal changes that occur during puberty. Sexual maturation during puberty is related to increased levels of the steroid sex hormones. As a result, subclinical inflammatory changes may modulate periodontal tissues to be more sensitive to small amounts of plaque, and a hyperplastic reaction of the gingiva may occur.
It has been revealed by literature review that dental plaque formation contributes to the pathogenesis of gingivitis that eventually leads to gingival hyperplasia. It's a known fact that placing orthodontic appliances raises the amount of plaque accumulation that changes the subgingival ecosystem. All these changes push host cells to release several inflammatory cytokines that include interleukin 1β (IL-1β), interleukin 6 (IL -6) and interleukin 8, (IL-8) and several other growth factors like tumor growth factor (TGF). This results in an inflammatory response in periodontal tissues to such appliances. An increasing occurrence of GE was observed as the length of orthodontic treatment increased. Even after the adjustment for important cofactors, patients using fixed orthodontic appliances for 1, 2, or 3 years had a 20 to 28-fold increased risk for GE.Prevention and treatment of gingival hypertrophy
To prevent gingival hypertrophy, besides reasonable plaque control, careful diagnosis and regular periodontal maintenance during orthodontic treatment are also needed. Prior to orthodontic treatment, detailed inquiries about patients' allergies, chairside oral hygiene guidance, rational selection of orthodontic instruments and careful removal of bonding materials can effectively avoid gingival hypertrophy. Orthodontic patients with gingival hypertrophy should undergo standard periodontal treatment. In some patients, the problem can be eliminated partially or entirely. If the gingival hypertrophy has not completely subsided, gingivoplasty is required to restore the gingival shape to normal. Traditional scalpels, electric knives or lasers can remove hypertrophic gingival tissue. Use of an electrotome is simple and can stop bleeding at the same time, but it may cause thermal damage to adjacent tissues, leading to delayed wound healing. Use of lasers has many advantages, such as analgesia, rapid hemostasis, antibacterial and anti-inflammatory effects, and promotion of tissue healing. Thus, the use of oral soft-tissue laser gingivectomy and gingivoplasty is a possible choice.

Conclusions

The aim of this paper was to provide a comprehensive review of current practices within orthodontics in relation to gingival hyperplasia. After going through numerous articles, it was found that periodontal risk factors should be assessed, and prognostic judgements should be made to predict possible risks and provide effective prevention in addition to effective chairside oral health instruction. Periodontal examination and maintenance should be performed regularly during orthodontic treatment, and periodontal problems should be addressed actively. There is still a need to increase patients' awareness of oral hygiene maintenance after treatment to ensure they maintain their periodontal health. Orthodontists should strengthen interdisciplinary cooperation with periodontal practitioners to achieve the best therapeutic effect. Further longitudinal studies may elucidate the association between the use of fixed orthodontic appliances and gingival hyperplasia and how to prevent more effectively.

#47: Quantitative evaluation of mandibular asymmetry with the use of three-dimensional skeletal imaging techniques- A scoping review

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Purpose

The purpose of this study is to review and summarize current methodologies for assessing mandibular asymmetry using 3D imaging techniques, particularly in relation to orthodontic and orthognathic treatment planning. Mandibular asymmetry, which affects both facial aesthetics and oral function, can be difficult for clinicians to diagnose and treat due to its varied causes and presentations. Traditionally, mandibular asymmetry has been evaluated through clinical examination and 2D radiographs, which are less accurate due to inherent limitations such as image distortion. This study emphasizes the advantages of 3D imaging, which has become the standard of care for diagnosing craniofacial deformities.

The review includes 30 studies that utilized 3D imaging modalities such as Cone Beam Computed Tomography (CBCT) and Computed Tomography (CT) scans to assess skeletal mandibular asymmetry. These studies generally focused on creating symmetry planes, comparing the left and right sides of the mandible, and quantifying the degree of asymmetry through linear, angular, or volumetric measurements. Some studies also explored more advanced techniques, such as automated computer algorithms for 3D segmentation and landmark identification, which show promise for more precise and efficient assessments.

The findings suggest that while manual methods of identifying symmetry planes are still widely used, newer, algorithm-based approaches could provide more accurate and objective measurements. However, the study points out that existing methods have limitations, such as the potential for operator error and the need for more comprehensive protocols for combining skeletal and facial assessments. The review also highlights the current lack of clinical guidelines for 3D-based mandibular asymmetry evaluation, which could be addressed by incorporating automated assessment tools into routine clinical practice.

Ultimately, the study calls for the development of standardized, automated tools for mandibular asymmetry assessment, which could significantly enhance treatment planning, improve diagnostic accuracy, and contribute to better outcomes for patients undergoing orthodontic and surgical interventions.

Methods

This study aimed to review the available literature on the assessment of mandibular skeletal asymmetry using 3D imaging. To achieve this, a comprehensive scoping review was conducted following the PRISMA-ScR guidelines. The researchers searched five major online databases—MEDLINE (PubMed), Web of Science, Scopus, Cochrane Library, and ProQuest Dissertations and Thesis Global—for relevant peer-reviewed human studies published up to August 2023. The search was limited to English-language articles involving human participants with diagnosed skeletal mandibular asymmetry. Studies focusing on soft tissue asymmetry or those involving patients with syndromes like cleft lip and palate were excluded.

Article screening and data extraction were carried out independently by two reviewers. Initially, 935 records were identified, with 46 articles meeting the eligibility criteria based on their full texts. After further evaluation, 30 studies were included in the review. The selected studies utilized a variety of 3D imaging techniques, such as Cone Beam Computed Tomography (CBCT) and Computed Tomography (CT) scans, to assess skeletal mandibular asymmetry.

In terms of methodology, most studies involved establishing symmetry planes using anatomical landmarks and comparing the right and left sides of the mandible. These comparisons included linear and angular measurements and sometimes volumetric assessments. Some studies incorporated advanced techniques, such as segmentation of the mandible or the development of computer-generated symmetry planes using algorithms. Data was extracted from each study, focusing on participant characteristics, imaging techniques, and key findings related to mandibular asymmetry.

The synthesis of results highlighted the variability in methods and underscored the potential of automated systems for improving the accuracy and efficiency of mandibular asymmetry assessments in clinical settings. The study's methodology aimed to provide a thorough overview of current approaches to mandibular asymmetry evaluation using 3D imaging.

Results

The results of the scoping review revealed key insights into the current approaches for assessing mandibular asymmetry using 3D imaging techniques. From an initial 935 records, 30 studies were ultimately included in the review. These studies primarily utilized Cone Beam Computed Tomography (CBCT) and Computed Tomography (CT) scans to evaluate mandibular skeletal asymmetry, with CBCT being the more commonly used technique (25 out of 30 studies).

The majority of the studies (80%) were retrospective in design, involving cohorts of skeletally mature participants (22 out of 30 studies). These studies defined clinically significant mandibular asymmetry as a deviation of the chin from the facial midline, typically greater than 2 mm, with severe cases being identified as deviations exceeding 4 mm. The Menton landmark was frequently used as the reference point for measuring chin deviation.

Most of the studies employed a two-step process for assessing asymmetry: first, establishing facial or mandibular symmetry planes, and second, quantifying asymmetry by comparing the left and right sides. The symmetry planes were often defined using anatomical landmarks, though six studies developed computer-generated midline reference planes using algorithms to provide more accurate and objective assessments.

In terms of measurement, many studies used linear and angular comparisons of anatomical landmarks, while others added volumetric assessments and color-coded surface maps to visualize the asymmetry. A few studies incorporated more advanced techniques, such as segmentation of the mandible and geometric morphometric methods, to evaluate the structural differences in the mandible. Additionally, automated pipelines for 3D asymmetry assessment, including deep learning methods for landmark identification, were explored in some studies, with promising results for more efficient and precise analysis.

Overall, the results demonstrated that 3D imaging provides a high level of accuracy in assessing mandibular asymmetry, though challenges remain in standardizing methods and developing widely accessible automated tools.

Conclusions

The conclusions of the study emphasize the growing potential of 3D imaging technologies, particularly CBCT and CT scans, in accurately assessing mandibular asymmetry. The review highlights that these advanced imaging techniques are now the standard of care in diagnosing craniofacial deformities, offering a higher level of precision compared to traditional 2D radiographs. The ability to quantify mandibular asymmetry with linear, angular, and volumetric measurements is critical for effective treatment planning in orthodontics and orthognathic surgery.

However, the study also notes several challenges. The manual identification of symmetry planes based on anatomical landmarks remains the most common method, but it is operator-dependent and prone to error. This is particularly problematic in cases of bilateral structural asymmetry, where traditional methods may result in post-operative residual asymmetry. To address this, some studies have developed computer-generated symmetry planes using algorithms, which provide more objective and accurate assessments. These approaches show promise for enhancing diagnostic precision and treatment outcomes.

The review also emphasizes the importance of combining skeletal assessments with facial symmetry evaluations. While segmentation techniques can provide valuable details on the structural asymmetry of the mandible, they cannot fully account for positional components of asymmetry, which are critical for achieving overall facial symmetry. Thus, a comprehensive approach that integrates both skeletal and facial analysis is essential.

Despite the advancements in 3D imaging, the study underscores the lack of standardized clinical protocols for 3D-based mandibular asymmetry assessment. The integration of automated asymmetry assessment tools into clinical software could significantly improve efficiency, consistency, and the overall quality of care. The review concludes by calling for the development of standardized protocols and the widespread adoption of automated tools to optimize clinical practice and treatment planning in cases of mandibular asymmetry.

#48: Timing of Sedation Initiation Post-Intubation in the Emergency Department

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Purpose

Awareness with paralysis is a concerning complication for patients who are mechanically ventilated. 1 The timely initiation of sedation post-intubation is imperative to prevent patients from being alert when paralyzed. The purpose of this project is to assess our sedation initiation times post-intubation in the emergency department (ED) at our institution with the goal of improving the time to initiation of sedation for patients intubated in the ED.

Methods

This is a pre-post study of patients receiving sedation post-intubation in the ED before and after quality improvement education was implemented. The electronic health record (EHR) system and clinical support software was used to identify patients in the ED who received a sedating agent (propofol, fentanyl, dexmedetomidine, midazolam, ketamine), and the confirmation of intubation was completed using chart notes in the EHR. Data was collected prior to implementation of quality improvement education delivered to ED physicians, pharmacists, and nurses regarding sedation initiation post-intubation. Data will also be collected after implementation of this quality improvement education and the data will then be compared. The primary outcome of this study is time to administer maintenance sedation post intubation.

Results

Research in Progress

Conclusions

Research in Progress

#49: The Impact of N-Acetylcysteine in Non-Acetaminophen-Induced Acute Liver Failure: A Retrospective Analysis

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Purpose

The purpose of the study is to evaluate the effectiveness of N-acetylcysteine (NAC) in reducing aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels in patients with non-acetaminophen-induced acute liver failure (NAI-ALF) across Valley Health System (VHS) hospitals. NAC is widely used for acetaminophen-induced acute liver failure due to its role in restoring glutathione and reducing oxidative stress. However, its effectiveness in NAI-ALF remains uncertain despite preliminary evidence suggesting potential benefits. This study will address this gap by evaluating whether NAC can significantly lower AST and ALT in this patient population by 50% within three days of treatment.

Methods

This retrospective chart review will evaluate hospitalized adults from Valley Health System hospitals using data from January 2018 through November 2024. Primary inclusion criteria are patients aged 18 years or older with an INR greater than or equal to 1.5, any degree of encephalopathy, and documented AST/ALT levels after NAC administration. Patients with known or suspected acetaminophen overdose, liver cirrhosis, or death within 24 hours after admission will be excluded. The primary outcome is a 50% reduction of AST/ALT levels by day three of treatment. Secondary outcomes include NAC therapy duration, hospital length of stay (LOS), INR trends, 30-day all-cause mortality, and use of vasopressor therapy or ventilatory support. Data collection will include patient demographics, admission and discharge dates, peak MELD score, ALT/AST, bilirubin, INR, ammonia, and degree of encephalopathy. In addition, the Chi-square test will be used to analyze the primary outcome and other nominal variables, while Mann-Whitney U will be used to analyze continuous variables.

Results

Conclusions

#50: Nager Syndrome in Orthodontics

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Purpose

Nager syndrome, first identified by Nager and de Reynier in 1948, is a rare genetic disorder caused by abnormal development of the first and second branchial arches during early embryonic stages. With fewer than 100 cases reported worldwide, it remains an uncommon but complex condition. The disorder is most commonly linked to mutations in the SF3B4 gene, which is critical for RNA splicing and skeletal development. Hallmark features of Nager syndrome include severe craniofacial abnormalities such as mandibular hypoplasia, underdeveloped cheekbones, cleft palate, and limb defects like hypoplastic thumbs and radioulnar synostosis.
Orthodontic treatment plays a central role in managing the craniofacial and dental challenges associated with Nager syndrome. By addressing functional impairments such as restricted jaw movement and malocclusion, orthodontics significantly improves both oral health and quality of life for affected individuals. This review investigates the impact of orthodontic care on Nager syndrome, focusing on treatment strategies, patient outcomes, and the importance of multidisciplinary collaboration. Additionally, it highlights the ongoing challenges in long-term care and the need for innovative solutions to improve stability and patient satisfaction.

Methods

A systematic search was conducted using PubMed to identify studies on orthodontic approaches to managing Nager syndrome. Keywords such as "Nager syndrome," "orthodontic treatment," "distraction osteogenesis," and "mandibular hypoplasia" were employed to locate relevant literature. Articles published in English that detailed orthodontic interventions, outcomes, and case studies were included. Studies lacking orthodontic focus or clinical data were excluded to ensure relevance.
The selected studies were grouped into thematic categories, such as early treatment interventions, combined surgical and orthodontic techniques, and long-term care outcomes. Special attention was given to research that integrated orthodontics with advanced surgical methods, including distraction osteogenesis and genioplasty. Furthermore, the methodology and rigor of each study were reviewed to assess the reliability and applicability of the findings.

Results

Clinical Manifestations and Challenges
Patients with Nager syndrome exhibit various craniofacial anomalies, including micrognathia (small jaw), trismus (restricted jaw opening), and cleft palate. These structural abnormalities frequently cause functional issues such as airway obstruction, feeding difficulties, and poor oral hygiene. Prompt intervention is critical to mitigate these complications and improve patient outcomes. Additionally, the severity of symptoms varies widely, requiring individualized treatment plans tailored to each patient's unique needs. Addressing the interplay between anatomical deformities and functional limitations is essential for effective management.
Orthodontic Techniques and Outcomes

Orthodontic care often complements surgical treatments to correct craniofacial deformities. Key approaches include:

- Distraction Osteogenesis: This technique is widely used to lengthen the mandible and improve airway function. It involves gradually stretching the bone to allow for new tissue formation, effectively addressing severe mandibular hypoplasia. However, long-term studies have noted relapse tendencies due to limited mandibular growth in pediatric patients. Despite this, distraction osteogenesis remains a foundational treatment for severe cases, offering significant improvements in facial symmetry and function.
- Genioplasty Distraction and Hyoid Advancement: This advanced procedure targets persistent airway obstructions in patients who have not achieved sufficient improvement from mandibular advancement. The combined approach optimizes the position of the epiglottis and tongue, significantly enhancing airway dimensions and reducing symptoms of obstructive sleep apnea.

Orthodontic interventions, such as fixed appliances and functional devices, are integral both before and after surgery. These treatments align teeth, stabilize surgical results, and prepare the oral structures for subsequent procedures. Advanced imaging tools, such as 3D cephalometric analysis, improve the precision of orthodontic planning and enhance overall treatment outcomes.

Stages of Intervention

Orthodontic treatment for Nager syndrome is typically delivered in stages, corresponding to the patient's developmental milestones:

1. Neonatal Phase: The focus during this stage is on managing life-threatening airway obstructions. Techniques such as nasopharyngeal tubes or tracheotomies are often necessary to ensure adequate breathing. Feeding difficulties are also addressed during this critical period.
2. Early Childhood: Orthodontic preparation and distraction osteogenesis are initiated to address significant skeletal anomalies. This phase aims to support functional development while mitigating the progressive effects of mandibular hypoplasia.
3. Adolescence: Definitive orthodontic care, including fixed appliances, is provided to achieve optimal dental alignment and functional occlusion. Treatments in this stage often involve resolving residual skeletal discrepancies and improving facial aesthetics.

Limitations and Challenges

Orthodontic management of Nager syndrome presents several challenges. High relapse rates following mandibular elongation remain a significant concern, particularly during periods of active growth. Restricted jaw mobility complicates oral hygiene and increases the risk of dental decay and gum disease. Additionally, the psychosocial impact of prolonged treatment and visible craniofacial deformities emphasizes the need for patient-centered care that addresses both physical and emotional well-being. Multidisciplinary collaboration is crucial for overcoming these challenges and delivering comprehensive care.

Conclusions

#51: Effects of Mouth Breathing on Children and Adolescents

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Purpose

The purpose of this literature review is to determine the effects of mouth breathing in children and in adolescents on the development of the dentofacial complex. Many dental professionals, especially orthodontists, can play an important role during their patients' growth period. By improving awareness and allowing for early screening, dental professionals can educate, prevent, and/or treat their patients with mouth breathing habits.

Methods

The initial search utilized five databases, i.e. Dentistry and Oral Sciences Source, Scopus, Web of Science, PubMed and Academic Search Premier, to identify relevant articles. Inclusion criteria were studies that focused on children under 18 years old (both sexes), topics that included prevalence, etiology, consequences, and treatments for mouth breathing, and clinical studies or clinical trials. Exclusion criteria included articles published before 2014. An excel sheet was created to organize compiled articles and data. Three reviewers studied the articles that fulfilled the criteria listed in the methods and materials section and extracted information to be compiled. The collected data was listed and compiled into the data extraction excel spreadsheet for review.

Results

To be concluded.

Conclusions

To be concluded.

#52: Three-Dimensional Cephalometric Landmark Annotation Demonstration on Human Cone Beam Computed Tomography Scans

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Purpose

Craniofacial cephalometric analysis assesses bone and soft tissue relationships in the head and face. Traditionally limited to 2D measurements, its evolution to 3D analysis is driven by the increasing use of CBCT, enabling a more comprehensive and realistic evaluation in all three planes.

Methods

This study showcases 3D cephalometric analysis using a validated set of skeletal tissue landmarks on human CBCT scans. It includes a step-by-step protocol with detailed instructions for annotating each landmark on a 3D volume

Results

Conclusions

Integrating 3D cephalometric analysis into craniofacial research will drive future advancements in understanding craniofacial growth and development.

#53: Orthodontics and Obstructive Sleep Apnea

Eileen Shah [1], and Joseph Cheever [1]

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Purpose

Sleep is a critical component to overall quality of life. Obstructions of the respiratory tract can occur due to flaccid tissue, retrognathic mandible, enlarged lymphoid tissue, or poor tongue posture resulting in poor respiration during sleep. Repeated episodes of upper airway collapse and obstruction during sleep are key components of a condition known as obstructive sleep apnea (OSA).1
It results in reduced or absent airflow for at least 10 seconds and is associated with a decrease in blood oxygen saturation or cortical arousal.2
According to the Sleep Heart Health study completed in 2002, 24% of men and 9% of women in the United States have some form of at least mild OSA.1 Many studies have shown that obstructive sleep apnea is a sleep disorder that goes extremely "underrecognized" and "underdiagnosed."1
It is becoming more vital to incorporate a multidisciplinary model for managing OSA.
The position of an orthodontist, for instance, is extremely valuable in helping identify patients with possible risks of having or developing sleep apnea.

Methods

We have used literature and studies from four electronic databases: PubMed, Cochrane, Web of Science and Google Scholar
The data search was determined by using the following keywords: obstructive sleep apnea, orthodontic*, sleep apnea, oral appliance treatment, screening and diagnosis for obstructive sleep apnea.

Results

Literature has provided information regarding the interdisciplinary role orthodontics plays in the management of OSA patients. It is in fact proven that orthodontics can have an impact on OSA management.
Examined studies did provide various oral appliance treatment modalities, risk factors and consequences as well as methods of screening for OSA; although clear and thorough guidelines on screening for OSA patients within an orthodontic setting was difficult to find.

Conclusions

In conclusion, it is clear that orthodontics offers many different, valuable adjunctive options for managing obstructive sleep apnea, especially when the condition is influenced by craniofacial factors. Treatment outcomes can vary significantly and a more personalized, multidisciplinary approach is essential for management of OSA in orthodontics.

#54: Antimicrobial methods for cleaning orthodontic thermoplastic appliances: A literature review

Hannah Jung [1], and Joseph Cheever [1]

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Purpose

The purpose of the literature review is to investigate the effectiveness of various antimicrobial methods towards reducing cariogenic bacteria found on orthodontic thermoplastic appliances such as clear aligners and retainers.

Methods

An electronic search was conducted on PubMed, Google Scholar, and ScienceDirect databases. Articles were selected based on predefined criteria involving clinical trials, systematic reviews, and peer-reviewed articles focused on the efficacy of antimicrobial methods including cleaning agents and surface coatings on clear aligners.

Results

Conclusions

#55: Management of Severe Gingival Hypertrophy in Orthodontic Patients

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Purpose

This literature review explores the potential causes of gingival hypertrophy in orthodontic patients. By examining the roles of mechanical irritation, microbial changes, and immune responses, the review seeks to provide a holistic understanding of the condition. It evaluates management approaches discussed in the literature, emphasizing the importance of an integrative strategy for addressing gingival hypertrophy.

Methods

Search Strategy:

The literature review was conducted using a multitude of academic databases which include PubMed, Scopus, and Google Scholar. The keywords used were “gingival hypertrophy,” “orthodontic treatment complications,” “periodontal pathogens,” “inflammatory cytokines,” and “management strategies.” The search was limited to studies published in English from 2000 to 2023.

Inclusion Criteria:

Included in this review were peer-reviewed articles that:
Discussed the etiology, pathophysiology, and management of gingival hypertrophy in orthodontic patients.
Reported on clinical trials, observational studies, or systematic reviews related to the mechanical, microbial, and immunological aspects of gingival hypertrophy.
Examined the effectiveness of various therapeutic interventions ranging from non-invasive techniques to surgical treatments.

Exclusion Criteria:

Articles that did not specifically address gingival hypertrophy related to orthodontic treatments.
Studies focusing solely on non-orthodontic induced gingival overgrowth.
Commentaries, editorials, and non-peer-reviewed conference abstracts.

Data Extraction:

Relevant data were extracted from each selected study, including the study design, participant characteristics, methods of diagnosis, interventions, outcomes, and conclusions. This data was used to synthesize a comprehensive overview of the current understanding and advancements in the management of gingival hypertrophy within orthodontic care.
Data Analysis
The extracted data were qualitatively analyzed to identify common findings and discrepancies among the studies. The review emphasizes the interplay between mechanical stressors from orthodontic devices and

the biological responses they elicit in gingival tissues. Statistical outcomes, such as prevalence rates of pathogens in hypertrophic versus control groups and effectiveness of different treatment modalities, were noted. The synthesis also considered the impact of methodological differences among studies on their findings and conclusions.

Results

Across the examined studies, a consensus was evident that mechanical irritation, primarily from fixed orthodontic appliances, is a foundational trigger for developing gingival hypertrophy. This mechanical stress fosters an environment conducive to plaque accumulation, thereby intensifying the risk of gingival overgrowth.

Microbiologically, the review noted a significant presence of specific pathogens, such as Porphyromonas gingivalis and Aggregatibacter actinomycetemcomitans, which were markedly more prevalent in the hypertrophic samples compared to controls. This increased bacterial load correlates strongly with the severity of gingival enlargement, suggesting that microbial factors are not merely correlative but potentially causative.

From an immunological perspective, the data indicated elevated levels of key inflammatory cytokines, including interleukin-1 beta (IL-1β) and transforming growth factor-beta 1 (TGF-β1), in cases of gingival hypertrophy. The cytokines are important in mediating inflammatory responses and tissue remodeling, contributing significantly to the pathology of hypertrophy.

The therapeutic strategies reflected in the literature vary widely but converge on a few key approaches: meticulous oral hygiene, targeted antimicrobial therapy, and, in severe cases, surgical intervention. Non-surgical were frequently effective in managing mild to moderate hypertrophy. Conversely, surgical methods were reserved for more severe manifestations, with procedures like gingivectomy showing high efficacy in reducing hypertrophic tissue and restoring normal gingival morphology.

While each category of factors—mechanical, microbial, and immunological—contributes distinctly to the pathogenesis of gingival hypertrophy, their convergence creates a complex interplay that exacerbates the condition. This comprehensive review suggests that effective management of gingival hypertrophy in orthodontic patients requires a multifaceted approach tailored to the individual's specific etiological profile.

Conclusions

Gingival hypertrophy remains a significant challenge in managing orthodontic patients, particularly those undergoing treatment with fixed appliances. This condition arises from an interplay of mechanical irritation, alterations in subgingival microflora, and immune-mediated inflammatory responses. Mechanical irritation caused by orthodontic appliances creates an environment conducive to plaque accumulation, triggering inflammatory processes that lead to tissue overgrowth (Gong et al., 2011; Robo et al., 2021). Additionally, shifts in subgingival microflora, including the proliferation of pathogenic bacteria such as Streptococcus anginosus, further exacerbate gingival hypertrophy and complicate treatment efforts (Robo et al., 2021).
Management strategies require a comprehensive and integrated approach. Nonsurgical interventions, such as periodontal therapy and consistent oral hygiene practices, have effectively resolved mild to moderate

cases (Kwon et al., 2015). However, compliance remains a critical factor for successful outcomes. Severe cases often necessitate surgical interventions, such as gingivectomy, particularly in cases of significant fibrosis where nonsurgical approaches are insufficient (Gong et al., 2011). Advances in surgical techniques, such as diode laser gingivectomy, offer promising alternatives, reducing postoperative discomfort and faster recovery times (European Journal of Orthodontics, 2019).

Histological studies have highlighted structural changes, including collagen remodeling, as key factors in gingival hypertrophy, reinforcing the need for targeted therapies (SciELO, 2021). Furthermore, understanding genetic predispositions, such as cytokine gene expression variations, may help identify patients at greater risk and inform personalized treatment approaches (American Journal of Orthodontics and Dentofacial Orthopedics, 2021). Adjunctive antimicrobial therapies also play a vital role in managing bacterial-induced inflammation and reducing recurrence rates (Robo et al., 2021).

Future research should continue to explore genetic, microbial, and immunological factors contributing to gingival hypertrophy. Developing therapeutic strategies, including targeted antimicrobial agents and biomaterials that minimize the adhesion of bacterial, may offer new opportunities for the prevention and management of gingival hypertrophy. By integrating these advancements into clinical practice, dental professionals can improve patient outcomes and mitigate the impact of gingival hypertrophy on oral health and orthodontic treatment success.

#56: Comparison of Minimally Invasive Treatment Modalities for Post-Orthodontic White Spot Lesions

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Purpose

The purpose of this study is to explore and compare the different minimally/non-invasive treatment options to treat white spot lesions including remineralizing agents, laser therapy, microabrasion, and resin infiltration to help clinicians make informed decisions.

Methods

A literature search was conducted to identify relevant studies on minimally invasive treatment options for WSL's. Databases including PubMed, Google Scholar, Scopus, and the Cochrane Library were utilized.

Results

Remineralizing agents such as fluoride varnish or CPP-ACP do show improvement in white spot lesions over time, but is dependent upon home care. Fluoride seems to be superior in it's remineralizing potential, but not at high concentrations. Tooth bleaching does not resolve the lesions, but rather whitens the surrounding tooth structure to better mask the WSL. Microabrasion has shown improvement in appearance of WSL's due to reducing the amount of tooth structure involved, but isn't as effective in deeper lesions. Resin infiltration has shown the best immediate and long-term results in esthetic recovery.

Conclusions

Resin infiltration shows the most promising effects when used alone, but a combination of these treatments may be used to achieve an optimal esthetic outcome.

#57: A Comparison of Outcomes with Alteplase versus Tenecteplase at a Stroke Center: A Protocol

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Purpose

Patients who have a thrombotic stroke are screened to determine if they are candidates for thrombolytic therapy and/or thrombectomy. If patients are candidates for a thrombolytic agent, it must be administered within 4.5 hours of the onset of stroke. For many years, alteplase was the only thrombolytic used in the United States for acute ischemic stroke (AIS); tenecteplase is a new thrombolytic agent which is being used for thrombolysis in AIS. Valley Hospital Medical Center made the switch from alteplase to tenecteplase in 2023 as the thrombolytic of choice for AIS. This was done due to its quicker administration time and ease of use. This study seeks to determine if this switch has any differences in safety or efficacy outcomes.

Methods

This secondary research will utilize electronic medical records to collect data. A list of patients who received a thrombolytic for AIS will be queried. Patients will be included if they are 18 years or older and received a complete dose of alteplase or tenecteplase for AIS. Patients will be excluded if they did not receive a CT brain within 72 hours after receiving the thrombolytic. Demographic information such as age, gender, ethnicity will be collected. Other information such as door to puncture time if thrombectomy performed, National Institutes of Health Stroke Scale (NIHSS), and hemorrhagic conversion will be collected. The objectives of this study are to compare the door to puncture time, NIHSS at discharge or at 90 days or whichever comes first, reduction in NIHSS from before thrombolytic to 24 hours post thrombolytic and rates of hemorrhagic conversion between the two groups. Statistical analysis such as two-sample t-tests and chi-squared tests will be conducted. Statistical analyses will be conducted using SPSS v30.

Results

Conclusions

#58: Single Stage Hinge Revision Total Knee Arthroplasty of a Chronically Infected Knee: A Case Report

Benjamin Huang [1], Angel Oliver [1], and Russell Nevins[2]

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Purpose

There is significant interest in single stage revision total knee arthroplasty in infection. However, specific details of patient-specific care is lacking in the literature. This case report aims to highlight key decisions made in the management of a chronically infected total knee arthroplasty.

Methods

A case report was written with supporting context, highlighting recent literature and surgeon expertise in the management of this patient.

This patient is status post debridement, irrigation, and polyethylene exchange and suppressive antibiotics. His infection was due to staphylococcus epidermidis, a biofilm forming bacteria.

Results

This specific case was not amenable to a debridement, irrigation, antibiotics, and implant retention procedure as the chronic nature of the infection would have allowed biofilm formation. The decision between single stage and two stage revision total knee arthroplasty was made based on previous literature showing equivalent outcomes as long as the risk of reinfection was adequately controlled.

Conclusions

It is likely that a successful single stage revision total knee arthroplasty in an infected knee requires thorough soft tissue and bony debridement. To achieve this, the collateral ligaments must be excised and ultimately this must change the choice of implant. A hinge knee implant is able to provide function in this situation. Future research should include specific randomized trials to confirm the requirement of a hinge knee in single stage infected revision total knee arthroplasty.

#59: Constrained Condylar Knee vs. Hinge Implant: When to Decide

Benjamin Huang [1], and Russell Nevins[2]

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Purpose

This clinical opinion algorithm describes an orthopedic surgeon's decision-making process to optimize the use of a constrained condylar knee (CCK) in the setting of soft tissue and bony instability for total knee arthroplasty and ultimately the key findings that necessitate the use of a hinge implant to create a functional knee.

Methods

Results

Current literature describes the use of a hinge knee implant when soft tissue and bony instability do not allow for a functional CCK. However, modern innovations in both bony augmentation and the fact that hinge prostheses have progressed enormously, a hinge knee has a unique and specific indication in the setting of complex and revision total knee arthroplasty.

Conclusions

This surgical algorithm describes a unique and specific indications for a hinge knee in total knee arthroplasty. Future research could look at outcomes in patients with complex or revision total knee arthroplasty where the surgeon applies this algorithm.

#60: Precision and accuracy in automated tracing software for neuroimaging

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Purpose

Neurodegenerative disorders, including Alzheimer's disease, Parkinson's disease, and ALS, affect nearly 7 million people in the U.S., with prevalence expected to rise as the population ages. The Alzheimer's Association projects $510 billion will be spent on dementia care by 2040 (Latsuka, 2024). Automated neuroimaging tools, such as NeuroQuant and FreeSurfer, have emerged as promising alternatives to manual tracing in regions with limited neuroradiologists or high patient volumes. This review examines the precision and accuracy of these tools in tracing brain structures, critical for reliable neuroimaging in clinical and research settings.

Methods

A comprehensive review of studies published after 2016 was conducted using Google Scholar and NCBI. Studies included had over 50 participants and focused on the reliability of NeuroQuant and FreeSurfer. Keywords such as “reliability in automated tracing software,” “Freesurfer,” and “NeuroQuant” were employed to filter relevant literature.

Results

Both NeuroQuant and FreeSurfer demonstrate robust automated tracing capabilities, achieving high accuracy in segmenting larger brain structures, such as the caudate nucleus and corpus callosum, with well-defined boundaries (Biffen, 2020). These tools are valuable for identifying brain atrophy indicative of neurodegenerative conditions like Alzheimer's disease or traumatic brain injury (Louis, 2020). However, limitations exist in segmenting smaller structures, such as the hippocampus and amygdala, where anatomical boundaries are less distinct (Kahhale, 2023).

Conclusions

NeuroQuant and FreeSurfer offer efficient, reliable alternatives to manual tracing for diagnosing and monitoring neurodegenerative conditions, particularly those involving larger brain structures. However, their limitations in measuring smaller structures must be addressed to improve evaluations of conditions like Alzheimer’s disease and trauma. Future advancements should focus on reducing variability, enhancing computational efficiency, and standardizing methods to optimize their clinical utility.

#61: Quantifying the Impact of Circadian Rhythm on Cognitive Domains: An Objective Assessment

Christian McCormick [1], Angel Oliver[1], Neha Doppalapudi[1], Austin Gibson[1], Micah Kwallek[1], Bardia Movafagh [1], Samuel Park [1], Jutta Ward[1], and Deborah Bell-Pedersen [2]

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Purpose

The circadian rhythm is a fundamental biological process that orchestrates a wide range of physiological functions, including cognitive function. Through its influence on gene expression, hormone levels, and neural activity, the circadian rhythm ensures that our brains are optimally prepared for the demands of different times of day. Data collected from this project will allow for a comparison of human cognitive performance during distinct phases of an individual's circadian rhythm to establish a relationship between higher cognitive performance and the phase of an individual's circadian clock.

Methods

Physiological data obtained from medically rated wearable biosensors was used to determine each participants' real time circadian phase and amplitude to correlate the optimal timing for cognitive testing. Physiological rhythms were obtained by gathering the following data: heart rate, HRV, R-R interval, cortisol, respiration rate, activity, sleep, and core body/skin temperature. The cognitive domains attention, working memory, pattern recognition, and emotional recognition were tested using the Brain Gauge cognitive assessment tool.

Results

Initial results indicate a relationship between cognitive function and peak HRV. Utilizing the cortical metric overall score (a measure of cognitive function/brain health) initial results indicate an increase in cortical metric scores around an individual's peak HRV. HRV rhythms were noted as independent from other variables such as core body temperature, breathing rate, and cortisol.

Conclusions

We hypothesized that using data collected from physiological rhythms and cognitive tests, we could identify a link between peak phase of one of our physiological parameters with peak cognitive testing. This study suggests a potential link between peak phase in HRV rhythms and peak cognitive functioning. Establishing a link between an individual's personal circadian rhythm and the effects of cognitive performance/brain health could allow for future applications involving the use of chronotherapy to improve cognitive function.

#62: Circadian Rhythm and its Impact on Balance and Physical Performance

Angel Oliver [1], Christian McCormick [1], Eseosa Aigbe[1], Tanner Erwin[1], Ariela Khandadash [1], Benjamin Khavkin [1], Samuel Park [1], Jutta Ward[1], and Deborah Bell-Pedersen [2]

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Purpose

The circadian clock serves as a regulator of many physiological, behavioral, and metabolic processes throughout the 24-hour environmental light-dark cycle. Current research in mice models demonstrates a link between exercise and changes in clock related gene expression, but human studies have been limited to alterations in sleep quality and cortisol levels.

Methods

This study utilizes a non-invasive wearable biosensor to track physiological markers including heart rate, R-R, core body/skin temperature, respiratory rate, and heart rate variability (HRV). These markers are used to estimate each participant's endogenous circadian rhythm to ascertain their hypothetical optimal time to perform physical tasks. Each participant will be assessed on physical tasks within the strength, vestibular, and cardiovascular domain during two separate time points (AM or PM) to evaluate if performance variations are related to changes in the phase of an individual's circadian rhythm.

Results

Preliminary results demonstrate an increase in cardiovascular performance for individual's testing near or after the peak of their circadian rhythm as correlated HRV while testing over five hours prior to peak HRV elicited a poorer cardiovascular performance. Additionally, HRV phase demonstrates an independent rhythm when compared to other metrics including core body temperature, respiratory rate, and cortisol.

Conclusions

These findings denote a possible link to HRV phase cycling and cardiovascular performance. Understanding the interplay between each person's unique circadian rhythm and its effect on physical performance offers insights into new applications of chronotherapy in physical rehabilitation and training.

#63: Investigating the Relationship between the Circadian Clock and Lifestyle and Aging

Samuel Park [1], Amaka Eziakonwa[1], Amega Nguyen[1], Madison Payne[1], Erich Stahmer[1], Alexis Salinas[1], Angel Oliver [1], Christian McCormick [1], Jasmyn Brown[1], Julie Zacharias-Simpson[1], Jutta Ward[1], and Deborah Bell-Pedersen [2]

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Purpose

Circadian clocks are known to play a crucial role in various physiological and behavioral processes and a better understanding of these mechanisms has the potential to significantly affect quality of life and lifespan. Cell and animal models have demonstrated links between circadian decline and dysfunction with aging, but this has yet to be concretely demonstrated in large-scale and "real life" condition experiments. However, there is a lack of research demonstrating the relationships between strength (amplitude) and phase of the clock with human health and lifespan. This work seeks to expand our understanding of how metrics of circadian rhythms change based on age and lifestyle which may lead to: (1) recommendations on lifestyle changes which may increase lifespan and quality, and (2) a pharmacologic approach utilizing compounds which target and act to restore and shift the activities of cellular and system circadian clocks

Methods

This study recruited subjects between the ages of 20-80 to expand our understanding of how the metrics of circadian rhythms change based on age and lifestyle. Research subjects were asked to wear a medical grade, multi-sensor bracelet (Corsano Cardiowatch 287-2B) for at least a week and fill out a comprehensive survey to gather data on their current and past medical and social histories. Exclusion criteria included those diagnosed with neurocognitive disorders and CPAP users.

Results

The study identified trends in multiple biometrics. Core body temperature and cortisol amplitudes decreased with age while the amplitude of HRV increased with age. Additionally, while several metrics retained the same phase regardless of age, the phase differentials between CBT, HRV, and cortisol rhythms began to converge with increasing age.

Conclusions

These results support the hypothesis that increased dysfunction and decreased strength of the circadian clock is correlated with aging, allowing for further research into reducing age-related morbidities by developing and targeting treatments that help maintain the circadian clock.

#64: Tracking the effects of time zone shift on an individual's circadian rhythm, a case study

Amaka Eziakonwa [1], Amega Nguyen[1], Madison Payne[1], Erich Stahmer[1], Alexis Salinas[1], Samuel Park [1], Julie Zacharias-Simpson[1], and Deborah Bell-Pedersen [2]

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Purpose

Desynchronosis is caused by the misalignment between the body's internal circadian rhythm and the external environment, with jetlag one of the most common acute subsets caused by an external stimulus. Jetlag is caused by rapid travel across multiple time zones and can cause sleep disturbances, daytime fatigue, impaired cognitive function, and gastrointestinal issues. We wanted to be able to quantitatively observe the desynchronization and changes which occur to an individual's circadian rhythms following a rapid time-zone change

Methods

This study tracked the effects of jetlag in a subject wearing a Corsano Cardiowatch 287-2B, a medical grade, multi-sensor bracelet. The subject traveled from Las Vegas to Chicago and returned after 96 hours.

Results

The data revealed phase advance and quick phase and amplitude adaptation in their core body temperature while other rhythms such as heart rate matched the new phase quickly but had a reduced amplitude. The phase of their cortisol rhythms tentatively recovered to match the new environment within a couple days for both the phase advance and delay, but its amplitude and minimum failed to recover until after the subject returned to Las Vegas. Rhythms in the patient's HRV and Respiration completely failed to recover fully in both phase and amplitude after the phase advance. The subject reported that sleeping was difficult after the phase advance, which matches the desynchronization in these different biometrics.

Conclusions

These results offer insight into how the effects of jetlag can be quantitatively tracked, allowing for targeted therapeutic interventions to mitigate the negative effects of jetlag. These results offer insight into how the effects of jetlag can be quantitatively tracked, allowing for targeted therapeutic interventions to mitigate the negative effects of jetlag.

#65: Using variations in the circadian rhythm to identify optimal vaccination times in healthy adults who receive an influenza vaccine.

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Purpose

The circadian clock, which governs daily biological rhythms, has a complex relationship with the immune system, influencing host-microbe interactions and immune responses. Emerging research highlights the potential impact of circadian timing on vaccination efficacy. While some studies suggest morning influenza vaccination may enhance effectiveness, the role of circadian phase in vaccine response remains underexplored, especially in human subjects. This project seeks to identify a physiological circadian phase that aligns with peak immune activity to the influenza vaccine, leading to a more personalized approach to vaccination and immunity, considering wearable health devices and physiological circadian phase.

Methods

This proof-of-concept quasi-experiment investigated the relationship between circadian phase and immune response to the 2024-2025 influenza vaccine. Twenty healthy adults were randomly assigned to receive the vaccine either in the morning or afternoon. Participants completed social and medical history surveys, with exclusions for recent illness, vaccination, or specific medical conditions. Eligible participants wore a Corsano Cardiowatch 287-2B for one week pre- and post-vaccination to quantify physiological circadian rhythms using factors such as heart rate and core body temperature fluctuations. Blood samples were collected pre-vaccination to measure baseline antibody titers and inflammation (via HA-I assay and ESR) and one-month post-vaccination to assess antibody response.

Results

Preliminary analysis confirmed significant differences in the phase of the circadian clock in both HR & CBT fluctuations between the two groups at the time of vaccination. Upon HA-I assay completion, antibody titer differences will be analyzed. Statistical analysis will investigate associations between groups' circadian phase and antibody response.

Conclusions

If morning vaccination demonstrates increased antibody titers, this study will provide insight into the ideal physiological circadian phase to receive the influenza vaccine, better defining the relationship between circadian biology and immunity, and supporting a simple & cost-effective strategy to optimize influenza vaccine efficacy.

#66: Can We Eliminate the Negative Consequences of Circadian Desynchronization Caused by Night Shift Work by using a Light Therapy Lamp to Simulate a Sunset?

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Purpose

Desynchronosis is a disorder in which the body's various independent circadian clocks are desynchronized from each other, the external environment, or both. Desynchronosis can be classified as either acute (jetlag, Seasonal Affective Disorder) or chronic (night shift workers), and further categorized as external or internal desynchronization. Symptoms include, but are not limited to, fatigue, insomnia, digestive problems, nausea, and anxiety, while individuals with chronic desynchronization face an increased risk of developing other morbidities such as epilepsy, metabolic diseases, cancer, and infertility. This work may lead to further investigations into pharmacologic and non-pharmacologic methods to improve the health and well-being of our shift-workers; and potentially translate into jet lag and SAD treatment as well.

Methods

This study used the Corsano Cardiowatch 287-2B to track multiple physiological circadian rhythms of a night-shift worker before and after providing a targeted therapeutic treatment using a 10,000-lux sunlamp. The subject used the sunlamp daily at 0245 for approximately 20 minutes to simulate sunset and mimic "last light" exposure.

Results

Multiple differences in rhythms were measured between pre- and post-treatment including a reduction in the mesor and minimum of the core body temperature, stabilization amongst several biometric rhythms, consolidation of cortisol rhythms, and recovery of a respiratory rhythm. The subject reported increased mental clarity and a reduction in "sluggishness" and fatigue. They also reported becoming more active due to increased motivation and energy.

Conclusions

These results provide quantitative data on how changes in an individual's circadian clock impact their health and well-being, as well as how therapeutic interventions can fine-tune these effects.

#67: Comparative Analysis of Buprenorphine and Buprenorphine-Naloxone treatment on adherence

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Purpose

Buprenorphine is a critical medication for opioid use disorder (OUD) treatment, and prescription levels have increased over the opioid epidemic. Naloxone is an opioid antagonist designed to rapidly reverse opioid overdose, and is often combined with buprenorphine. The degree of how the number of days until the next prescription refill for buprenorphine affects adherence to the treatment is not fully understood. This retrospective study presents a comparative analysis of buprenorphine and buprenorphine-naloxone in Colorado's Prescription Drug Monitoring Program (PDMP). The purpose of this study is to relate the treatment regimen of buprenorphine OUD treatment to the adherence of the treatment.

Methods

Specifically, we looked at the number of days until the next prescription refill and the daily dosage of buprenorphine to adherence. We analyzed data from a retrospective review on 22,376 patients treated for OUD in Colorado's PDMP from 2018 to 2020, which included prescription label name, days until the next prescription fill, daily dosage of buprenorphine, quantity of pills, method of administration, and level of adherence to the treatment. A patient was considered adherent to the treatment if they filled their prescription on the date of refill or up to 3 days later.

Results

Logistic regression for the days until the next prescription refill and daily dosage of buprenorphine treatment showed an estimate of 1.34, standard deviation of 0.011, and a p-value of less than 2e-16 for buprenorphine. Logistic regression for the days until the next prescription refill and daily dosage of buprenorphine-naloxone treatment showed an estimate of 1.23, standard deviation of 0.007, and a p-value of less than 2e-16 for buprenorphine-naloxone treatment.

Conclusions

These results suggest that the number of days until the next prescription refill affected the level of patient adherence to the treatment. Study limitations include a narrow study population that only includes data from a specific drug monitoring program and the lack of other demographic data such as sex, age, and socioeconomic status which may act as confounding variables on levels of adherence. Further validation is required to ensure that buprenorphine treatment dosage and days until the next prescription refill can be applied to the general population being treated with buprenorphine for OUD.

#68: A Review of Total Hip Arthroplasty Dual Mobility Constructs from Conception to Outcomes

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Purpose

Total hip arthroplasty (THA) has become one of the most frequently performed orthopedic surgeries with over 450,000 in the United States last year alone. The dual mobility construct (DMC) is a distinct THA implant that is designed to reduce dislocations and improve range of motion. The DMC was approved by the United States Food and Drug Administration in 2009 and has since increased in popularity and undergone further development. The purpose of this literature review is to examine the biomechanical advantages, improved clinical outcomes, and complication rates of DMC in THA, comparing them to traditional implants.

Methods

A literature review was completed through Google Scholar, PubMed and Elsevier with the help of LitMaps on the topics of dual mobility total hip arthroplasty, total hip arthroplasty dislocation and previous review papers on DMC.

Results

Results of this search has showed that DMCs had a lower rate of revision due to dislocation with an odds ratio (OR) of 0.38 (P<0.001) compared to the traditional THA design. Long-term follow up studies on the first generation DMCs reported satisfactory global survival rates with lower dislocation rates than traditional implants. Further advancements in material sciences have shown improved wear rates for the DMC compared to its first generation and acceptable wear rates when compared to traditional implants. Additionally, DMC demonstrated cost-effectiveness over the traditional implants with potential for wider impact by reducing the overall economic burden on the healthcare system.

Conclusions

Overall, the DMC shows significantly better outcomes than traditional THA implants with additional long-term studies on the newer generations of the DMCs on broader patient populations needed.

#69: Evaluating the Comfort and Effectiveness of Different Ankle Immobilization Techniques

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Purpose

There are multiple options for treating ankle sprains in the Emergency Department (ED) including boot, ace wrap and ankle strapping. Different resources are involved with each of these methods, and the literature comparing the clinical outcomes of these different methods is sparse. The aim of this study is to compare comfort level and ankle range of motion of these three different ankle immobilization techniques.

Methods

Study participants had their ankles immobilized using the following three methods: Aircast boot, ace wrap and ankle strapping. Ankle strapping was performed in a standardized manner using a "figure-of-six" configuration. Ankle range of motion (plantarflexion, dorsiflexion) was measured using a goniometer. Each participant filled out a standardized form asking their comfort level for each immobilization method using a 7-point Likert Scale. Statistical analysis was performed using unpaired t-test with an alpha of 0.05.

Results

22 participants completed this study. The boot was rated as least comfortable overall (4.8 out of 7) while ankle strapping was rated as most comfortable overall (6.3 out of 7). On average, the boot was rated as least comfortable during each activity performed whereas ankle strapping was rated as the most comfortable (table 1). When comparing ace wrapping versus ankle strapping, ankle strapping was noted to be statistically more comfortable in every category except for sitting (table 2). There were no statistically significant differences in plantarflexion (29.2 vs. 27.4, p=0.3223) or dorsiflexion (18.4 vs. 19.0, p=0.3985) between the ace wrapping and ankle strapping cohorts (table 3).

Conclusions

These results suggest that ankle strapping provides superior overall comfort levels as well as superior comfort during various activities while maintaining ankle range motion when compared to ace wrapping and Aircast boots. This study is limited by its relatively small sample size and healthy patient population.

#70: Role of dexmedetomidine in psychiatry- a literature review

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Purpose

This literature review aims to evaluate the clinical use of dexmedetomidine in psychiatry, specifically in the management of neurobehavioral manifestations associated with psychiatric diagnoses defined by the DSM-5 or ICD-10. Dexmedetomidine, an alpha-2 receptor agonist, effectively reduces a heightened sympathetic response and provides sedative, analgesic, and anti-inflammatory effects. The neurobehavioral manifestations include psychomotor agitation, delirium, catatonia, impaired focus, hyperactivity, mania, and hallucinations as seen in psychiatric conditions such as bipolar disorder, schizophrenia, alcohol withdrawal syndrome, ADHD, and autism. The purpose of this review is to identify use of dexmedetomidine in clinical psychiatry in controlling neurobehavioral manifestations and identifying its effectiveness and safety profile.

Methods

This literature review includes studies where dexmedetomidine was administered to patients with psychiatric diagnoses for managing neurobehavioral manifestations in both an inpatient and outpatient setting. Psychiatric diagnoses met the diagnostic criteria in the DSM-5 or ICD-10. Literature was sourced from databases including PubMed, PsycINFO, and Embase, focusing on human and animal studies. The review includes randomized controlled trials, observational studies, and literature reviews. Data about dexmedetomidine's indications, mechanisms of action, routes of administration, treatment outcomes, and adverse effects were included.

Results

The review found that dexmedetomidine effectively reduces psychomotor agitation in patients with bipolar disorder, schizophrenia, and withdrawal syndromes, without severe sedation or respiratory depression. In alcohol withdrawal syndrome, dexmedetomidine safely managed autonomic hyperactivity and prevented progression to delirium tremens. Animal studies highlighted its potential to mitigate ADHD-like symptoms by reducing gut-brain axis inflammation, improving focus, and decreasing hyperactivity. Its anti-inflammatory and neuroprotective effects also showed promise in improving memory and reducing neuroinflammation in conditions like Alzheimer’s disease and depression. Additionally, in autism patients presenting with catatonia, dexmedetomidine provided acute stabilization.

Conclusions

Dexmedetomidine demonstrates potential to reduce neurobehavioral manifestations in psychiatry while also providing a safer side effect profile. Dexmedetomidine was successful in managing psychomotor agitation, delirium in alcohol withdrawal syndrome, ADHD, and catatonia in autism. Additionally, dexmedetomidine's neuroprotective effects may have potential in improving neuroinflammatory disorders like Alzheimer’s disease and depression. Dexmedetomidine’s ability to effectively reduce sympathetic hyperactivity without significant side effect risk emphasizes its potential in psychiatric care.

#71: GLP-1 Receptor Agonist Drugs: Diabetes, Weight Loss, and Beyond

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Purpose

Glucagon-like peptide-1 (GLP-1) agonists have moved to the center stage of medical treatment since their first approval in 2005. Initially approved for glycemic control in Type 2 diabetics, it was soon realized that these drugs have potential benefits beyond diabetes. In the last two years, these drugs have also been approved for obesity and cardiovascular conditions. With the increasing use, research studies have been exponentially booming for potential benefits in treating other chronic conditions. This study reviewed the ongoing research on the potential therapeutic applications of these drugs in other medical conditions.

Methods

We included longitudinal studies that were 3 months or longer and conducted after 2015, focusing on the possible use of these drugs outside of their previously approved effects. Search terms focused on chronic conditions, inflammatory disorders, metabolic syndrome, and psychiatric disorders. All searches were done through PubMed.

Results

Early studies were conducted to explore their potential in the treatment of alcoholism and drug addiction due to their effects on the central nervous system reward circuitry. These drugs appear to reduce drug craving and increase abstinence. Additive effects, with current medications, seem to delay disease progression in inflammatory conditions such as rheumatoid arthritis and COPD. These drugs are also investigated in neurodegenerative diseases such as Parkinson's and Alzheimer's disease.

Conclusions

The many uses of GLP-1 agonist drugs are just now being touched upon, shedding light on a new era of medical treatment for multiple diseases. While many of the studies researched are ongoing, the preliminary results have shown promising prospects for further expanding therapeutic applications. These efforts will establish additional therapeutic indications for these drugs in other chronic conditions such as addiction, drugs of abuse, and neurodegenerative diseases, to list a few.

#72: Dangerous pin migration in clavicular fixation - an unlearned lesson

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Purpose

Clavicle fractures rank as one of the most commonly sustained injuries in the realm of orthopedics. Oftentimes, intraoperative pins or Kirschner wires (K-wires) are utilized in fixing these in appropriate positions. However, it is important to note numerous instances in which pin migration to various locations within the body may occur, and it is of utmost importance that surgeons closely follow their patients to minimize this risk of lodging in inappropriate locations.

Methods

PubMed was utilized for our search with the search terms “pin migration + clavicle”. Only papers from 1990 onwards were included, as this was when the prominent case series by Rockwood et. al. was published. Within the included set, any articles not specifically pertaining to pin migration from the clavicle were excluded. Twenty-one research studies from 1990 onwards were included, demonstrating dangerous pin migration in clavicular fixation.

Results

From the 21 papers included, 33% indicated migration to the heart, 24% to the spine, 24% to the lung, and 10% to the trachea. Interestingly, 10% of the papers demonstrated contralateral migration patterns to the opposite shoulder and chest wall. The average number of months from surgery to migration diagnosis was approximately 90 months, with the lowest amount of time being 7 days and the longest amount of time being 360 months. Reasons for the pin remaining in the body varied between studies and included patient refusal, patient loss to follow-up, and surgeon inability to remove the wires.

Conclusions

Despite published findings warning surgeons of the risks involved with intra-clavicular pin migration, mistakes are still prevalent. The data presented in this review reveal the importance of closely following patients postoperatively to prevent migration into fragile anatomical structures.

#73: The Effectiveness of Cochlear Implants on Cognitive Function in Children and Adolescents with Hearing Loss: A Systematic Review

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Purpose

The majority of hearing loss (HL) cases are due to sensorineural hearing loss, but the presentation differs notably amongst adults and children. Pediatric patients have a higher incidence of HL that is asymmetrical and atypical HL configurations. Assistive devices such as cochlear implants (CI) and hearing aids have been proven to be successful in patients with HL. The auditory scaffolding hypothesis states that sound provides a framework for the processing of sequential information, therefore indicating the dependence of sensory processing on neurocognitive function.

Methods

This systematic review evaluates the effectiveness of CI on cognitive function (CF) in pediatric patients with HL. This review included quantitative studies evaluating CF in pediatric patients (0-18 years) with hearing loss who received unilateral or bilateral CIs. Studies that do not use objective neuropsychological assessments to assess cognitive outcomes will be excluded. MEDLINE, Embase, CINAHL, Scopus, and PsycInfo were searched for articles. During the title/abstract screening process, it was observed that a majority of papers that looked at the effects of CIs were focused on speech perception, emotional behavior and school performance when compared to children with no HL. Additionally, the language used when administering the neuropsychological assessments affects post-implant results.

Results

Currently, the review is ongoing, and full results will be presented.

Conclusions

This review suggests that pediatric patients with HL experience cognitive dysfunction and would experience long-term benefits from early intervention through cochlear implants.

#74: Optimizing Knee Osteoarthritis Treatment Through Strengthening Surrounding Muscles for Better Function and Pain Reduction: A Systematic Review

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Purpose

Knee osteoarthritis (OA) is a degenerative joint disease marked by cartilage breakdown in the knee, causing pain, stiffness, swelling, and reduced mobility. It is commonly linked to aging, joint overuse, or injury, and can significantly impair quality of life. Strengthening muscles around the knee—particularly the quadriceps, hamstrings, and hip muscles—helps stabilize and support the joint, playing a key role in managing OA. This systematic review is the first to examine the effectiveness of strengthening various adjacent muscle groups in treating knee OA.

Methods

The review followed PRISMA guidelines and analyzed studies from PubMed, Embase, and Cochrane Library. Evidence quality was assessed using the Newcastle-Ottawa Scale (NOS). A total of 43 studies, involving 1,474 patients, were included. Quadriceps strengthening was the most widely studied (20 studies, 947 patients, 64.2%), followed by hip strengthening (9 studies, 386 patients, 26.2%).

Results

Strengthening hip muscles resulted in significant reductions in WOMAC scores, with improvements in pain (0.77–10.0), stiffness (0.13–8.45), and function (1.45–8.8). KOOS scores also increased for pain (8.83–28.36) and function (8.4–24.12). Quadriceps strengthening alone led to significant decreases in VAS pain scores (1.2–40) and WOMAC scores (pain: 0.8–9.98, stiffness: -0.5 to -31.32, function: -0.4 to -21.48), along with consistent increases in quadriceps strength (0.1–4.87 Nm/kg). When both quadriceps and hamstrings were strengthened together, WOMAC scores improved (pain: 1.2–9.98, stiffness: 1–31.32, function: 1.1–24.18), and VAS pain scores decreased (3.3–40). Muscle strength also increased (hamstrings: 2.9 Nm/kg, quadriceps: 2.7–2.78 Nm/kg).

Conclusions

In conclusion, strengthening adjacent muscle groups is beneficial for knee OA patients. WOMAC and VAS scores showed similar improvements across all muscle strengthening methods. However, isolated quadriceps and combined quadriceps-hamstring strengthening led to greater reductions in stiffness and function compared to hip strengthening, offering guidance for clinical recommendations.

#75: Investigating the Role of Extracorporeal Shock Wave Therapy (ESWT) in reducing pain and improving function in Achilles Tendinopathy: A Literature Review

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Purpose

The Achilles tendon is one of the strongest tendons in the body, essential for daily movement. Achilles tendinopathy, characterized by pain, inflammation, and stiffness, encompasses two forms: insertional and noninsertional. Achilles tendinopathy is a common condition, particularly among athletes. A variety of treatments are available, including extracorporeal shock wave therapy (ESWT), which has gained popularity due to its potential for pain reduction and functional improvement. However, the mechanisms by which ESWT works remain unclear. This literature review aimed to evaluate the effectiveness of ESWT in treating Achilles tendinopathy.

Methods

Embase was searched for papers published from 2005 to 2024. The search terms were modified in order to narrow the amount of articles yielded. The final search terms included combinations of “achilles,” “treatment,” “ESWT,” and “physical therapy.” Studies addressing pain relief, increased recovery, and tissue regeneration were considered and analyzed.

Results

The search yielded a total of twenty-seven articles that met inclusion criteria. Most articles analyzed were found in support of the effectiveness of ESWT as a treatment modality. The majority of articles measured the efficacy of ESWT using two methods, VAS and VISA-A scores, which were measurements of pain and functionality, respectively. In most studies, ESWT, alone, or in combination with other treatment modalities was able to reduce pain (measured by VAS) and/or improve function (measured by VISA-A). Additionally, a handful of studies were unable to find significant evidence in the ability of ESWT to effectively impact recovery of achilles tendinopathy.

Conclusions

ESWT is a potentially promising treatment for Achilles tendinopathy, offering rapid improvements in pain, mobility, and tissue healing. However, further research is needed to establish its long-term efficacy. Integrating ESWT with other treatments, such as eccentric exercises, may provide optimal recovery. Future studies should focus on refining treatment protocols and establishing standardized data.

#76: They’re faking it! Diagnosing mTBIs using a Multimodal Approach

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Purpose

Mild traumatic brain injury (mTBI) affects 69 million people annually worldwide. A significant subset of those affected will develop long-term sequelae that can seriously impact quality of life and lead to other health problems. Clinical diagnosis of mTBI is complicated by patient malingering, subjective symptomatology, and variable patient reporting. This review aimed to evaluate the potential effectiveness of combining advanced neuroimaging techniques with psychometric testing and blood biomarker analyses for developing a more objective and comprehensive mTBI assessment protocol.

Methods

A review was conducted using PubMed as the primary database, analyzing studies published between 2015 and 2023. Included studies evaluated mTBI (defined as Glasgow Coma Scale score ≥ 14) and incorporated neuroimaging assessment. Studies had to include patients presenting with characteristic mTBI symptoms, such as headache, balance/motor deficits, cognitive impairments, and fatigue. Studies focused on diagnostic accuracy, clinical utility, and integration of different assessment modalities were included.

Results

Advanced neuroimaging techniques, particularly Diffusion Tensor Imaging (DTI), demonstrated superior detection of subtle axonal damage compared to conventional CT and MRI. Specific brain regions, including temporal, fusiform, inferior parietal, and lateral occipital areas, showed promising diagnostic potential. Psychometric assessments, notably the Test of Memory Malingering combined with pupillometry, demonstrated high sensitivity in detecting symptom validity. Blood biomarker analyses revealed S-100B, neurofilament light, and Tau proteins as potential diagnostic indicators, where temporal profiles correlating with symptom progression.

Conclusions

Evidence suggests that integration of multiple diagnostic modalities will significantly enhance mTBI diagnosis accuracy. A multimodal approach is the most effective way to overcome the limitations of individual methods. For example, psychometric tests are relatively subjective, while neuroimaging after an injury is unable to distinguish between pre-existing and new injuries. Devising a clinically relevant multimodal approach will require establishment of standardized norms and studies further validating individual approaches and estimating diagnostic accuracy for combinations of modalities relative to patient outcomes. These findings have particular relevance for Nevada's healthcare system, where rapid and accurate mTBI diagnosis could significantly impact patient care in both urban and rural settings. Future research should focus on validating specific combinations of these techniques and establishing standardized protocols for clinical implementation.

#77: Variation of the Pulmonary Vasculature of Lung and Their Surgical Significance- A Case Study

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Purpose

Variations in pulmonary vascular anatomy, though rare, are clinically significant due to their implications in thoracic surgeries and interventional procedures.1 This study examines a cadaveric case of aberrant pulmonary vasculature, characterized by inferior
pulmonary veins exiting below the pulmonary hilum bilaterally, a previously undocumented anomaly. Using detailed dissection techniques, the anatomy was carefully traced, measured, and documented for clinical insight.

Methods

A single embalmed cadaver, a 65-year-old male, was used for dissection at Touro University Nevada, College of Osteopathic Medicine. Findings revealed that the inferior pulmonary veins were displaced below the hilum bilaterally, merging into single vessels before
terminating in the left atrium.

Results

Measurements showed the distances between the superior and inferior vasculature were 8.7cm on the right lung, and 11.5cm on the left. On cadavers with
typical anatomy, the distance between the superior and inferior vasculature is measured to be between 5-7 cm apart.

Conclusions

These findings underscore the complexity of pulmonary vein anatomy and the need for meticulous preoperative planning to avoid misdiagnosis or surgical complications. This case highlights the importance of understanding anatomical variations for radiologists and surgeons. Advanced imaging techniques, such as 3D-CT, and surgical approaches, such as robotic assisted lobectomies, can improve preoperative visualization and outcomes in such cases. Further research is needed to establish the prevalence and clinical implications of these anomalies in larger cohorts. This study emphasizes the necessity of heightened awareness and education on pulmonary vascular anomalies to enhance patient safety and procedural efficacy.

#78: Assessing the Effectiveness of Quality Improvement Approaches on Multiple-Choice Question Exams in Health Professions Education

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Purpose

Multiple-choice questions (MCQs) are an efficient tool for assessing knowledge in a short time. However, creating high-quality MCQs is challenging and prone to technical flaws such as redundant distractors and cueing the correct answers. To ensure validity, health professions schools employ various quality control processes. Despite numerous approaches described in literature, integrated research demonstrating their effectiveness and efficiency remains limited. This systematic review aims to compile evidence on methods to improve MCQ quality in medical schools.

Methods

We used the PICO strategy to search PubMed, Embase, and Web of Science databases for studies published between 2002-2022. We screened articles focusing on strategies to enhance MCQ quality in undergraduate and graduate medical schools. Data were extracted from each study, including participant type, sample size, study design, methods used to assess MCQ quality, data analysis techniques, and outcomes.

Results

We identified 1143 articles; twenty-one studies met our criteria. Faculty training workshops (11), committee/peer reviews (8), or a combination of both (2) were effective in significantly improving MCQ quality. Quality was measured using psychometric analysis, quality scores, Bloom's cognitive level, and distractor efficiency.

Conclusions

: Faculty training or committee/peer review positively impact the quality of MCQs. However, it is challenging to determine which intervention is most effective. Further research with meta-analysis may provide answers to this question. Despite these limitations, our review findings underscore the importance of institutional commitment and support in implementing appropriate interventions for improving the validity of in-house MCQ exams.

#79: From AI to OSCE: Evaluating ChatGPT's Contributions to Medical Student Training

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Purpose

OSCEs are crucial in medical education. They assess patient communication, history-taking, and applying medical knowledge, thereby increasing student competence. ChatGPT has advanced significantly, showing efficient uses in healthcare, such as supporting clinical decision-making. This study compared the performance of the free and paid versions of ChatGPT in generating SOAP (Subjective, Objective, Assessment, and Plan) notes for 25 common medical cases.

Methods

Two second-year medical students evaluated the responses provided by a free ChatGPT 4o-mini and a paid ChatGPT 4. A practicing physician, PI, reviewed the annotated SOAP notes for accuracy. The time taken for each version to generate a SOAP note was recorded, and the accuracy was evaluated by comparing the hallucinations detected by the students and then by the PI. The SOAP notes were compared case by case for analysis. The statistical analysis used paired t-tests and R software.

Results

The difference in the time to create a SOAP note by the free vs. paid version was statistically significant (p < 0.05). However, the number of hallucinations was similar in both versions, taken case-by-case scenarios. The number of hallucinations detected by the clinician on the free version was significantly different for cardiovascular vs. endocrine cases compared to that of the student researchers. Whereas, in the paid version this difference was detected between cardiovascular and gastrointestinal cases. As expected, there was a statistically significant difference between the number of hallucinations detected by students vs. PI, indicating the importance of experience and knowledge in detecting hallucinations by AI products in medical fields.

Conclusions

In this study, students learned which of the two AI tools would serve them better, thereby creating awareness about using AI for their clinical preparedness. Therefore, it encourages students to rely on accurate resources for OSCEs and prepares them for patient encounters during subsequent clinical rotations in medical school.

#80: United in Inquiry: Exploring Interprofessional Collaboration in Healthcare Research

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Purpose

Interprofessional collaboration in healthcare has been shown to increase job satisfaction and may improve patient outcomes. In medical research, it provides insights into developing knowledge and learning and thus could prove crucial to improving patient care. At this Annual Research Symposium, we would like to showcase how a research project between DO students, an OT professor, and a data analyst exemplifies interprofessional collaboration.

Methods

The project's idea was conceptualized by the OT professor and involved fear of falling avoidance behavior (FFAB) trends among the elderly. Analyzing these trends necessitated the usage of a longitudinal, national study called NHATS which incorporated the data analyst. The DO students who had a computing background started during the summer of 2024. The project involved weekly meetings with the professors to refine the coding as well as the variables of interest. The students spent 3 hours weekly analyzing the variables and drafting deliverables in order to build a profile of the data.

Results

Through this project, the students were able to improve their coding and data visualization skills. The faculty mentors were able to improve their existing mentoring skills by having a diverse team. The project has delivered multiple poster presentations at conferences in Nevada and has a manuscript in progress.

Conclusions

From this interprofessional collaboration, the research into FFAB was significantly advanced. The project helped the team to provide a descriptive analysis of factors contributing to FFAB, leading to multiple scholarly outputs. It was also a clear indicator of how learning was developed among this interdisciplinary team. Through this talk, faculty members will get information on how to set up such projects, and students will gain knowledge on how to be a part of such interprofessional teams.

#81: Improving Educational Barriers for Unaccompanied Unhoused Youth through Collaboration

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Purpose

Homelessness affects up to 1 in 30 adolescents in the U.S. with Nevada having the highest rate of unhoused unaccompanied youth. While increased risk of mental illness, substance use, STIs, and victimization is well-known, less attention is given to education. Many unaccompanied unhoused youth have career aspirations but face challenges obtaining guidance and support; shelters and other services often lack resources on education access. To address these barriers, we formed a collaborative with regional and state agencies to help empower youth pursuing educational goals.

Methods

Our aims were to: (1) identify unhoused youth aspiring to higher education, (2) improve access to essential information and resources, and (3) provide adult mentorship and support. To achieve these objectives, our inner city academic center, which provided clinical services at a local homeless youth residential shelter, partnered with a regional social services organization and the state Department of Education (DoE) to create and disseminate resources. The social services agency provided case management services, and DoE coordinators helped provide insight into state and federal regulations and programs. Recognizing a spectrum of literacy and engagement preference, we distributed flyers, posted on social media, and delivered live workshops to improve access to information about educational rights, applying for financial aid, and finding mentorship.

Results

Nearly 40% (n=46 out of 117) of shelter clients accessed resources, suggesting that a significant cohort of unhoused youth is interested in higher education. Client comments help to illustrate the successes of the program: “I had no idea where to start”; “I didn’t know what a FAFSA was”. Additionally, case management helped establish a mentorship and support network, maintaining relationships and ensuring follow-up, and we helped to provide guidance and assistance (i.e., letters for college and financial aid applications).

Conclusions

Taken together, our experience points toward a knowledge gap for unhoused youth with higher education goals which can be improved through community and academic partnerships. Further work is needed to ensure unaccompanied unhoused youth have equitable access to education, including developing a toolkit for organizations addressing youth homelessness and studying barriers to higher education and career outcomes.

#82: Nutritional Deficiencies and Their Oral Signatures: A Scoping Review on Adolescent Health

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Purpose

to examine the common patterns and themes in which these deficiencies and disorders manifest, to better serve patients and ensure they receive appropriate treatment. Additionally, the study aimed to identify the most common deficiencies in adolescents and their impact on growth patterns.

Methods

A literature search in PubMed, Dentistry & Oral Sciences, Source, Scopus, and Web of Science was conducted on September 13th, 2023. Peer-reviewed articles written in English and published from 2013 containing information on the negative impact of adolescent malnutrition on oral health were considered eligible for review. From the 594 studies obtained from the literature search, 88 studies were included.

Results

There is a high correlation between malnutrition, and oral health and development

Children that are under or overweight, stunted, and or vitamin deficient are at high risk to experience oral health complications.

Childhood caries is a consequence seen in an overwhelming number of studies on childhood malnutrition, which further perpetuates undernutrition

Conclusions

This review is one of the first to explore the relationship between malnutrition, oral health, and development in adolescents. There is a strong correlation that suggests nutritional deficiencies are associated with sub-optimal oral health in adolescents. While there are many risk factors for nutritional deficiencies in adolescents, educating mothers and increasing access to more nutritious foods is paramount to combat malnutrition-related oral health issues.

#83: Interdisciplinary education, models: incorporating oral health education into the nursing curriculum

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Purpose

The connection between systemic health and oral health has been well established in the literature and the relationship continues to be discovered and researched. Often systemic issues have been found to be compounded by poor oral health. To better care for patients, health care providers need to collaborate so that providers of all health care sectors can identify underlying oral issues and ensure patients receive adequate care. Often patients will seek medical care for systemic issues but fail to address underlying oral issues. To address oral issues more effectively, there is benefit in equipping medical personnel to assess oral health and either treat or refer accordingly as a part of their treatment for their systemic conditions.

Methods

Thorough literature search of any existing interdisciplinary programs outlined in the literature was completed using these search terms:(("Interprofessional Education"[Mesh]) OR ("Interprofessional Relations"[Mesh])) AND ("Models, Educational"[Mesh])(("Interprofessional Education"[Mesh]) OR ("Interprofessional Relations"[Mesh])) AND ("Models, Educational"[Mesh]) AND (Dental) AND (Nursing)

Results

Multiple universities have incorporated interdisciplinary education.
These schools' programs range from CE courses, to a few hours a day, to multiple courses spread out over weeks.
The programs with the best results included less time in the classroom and more time hands on with patients in the dental clinic.
After the course at UCSF, 83% of practitioners reported that they were now actively incorporating oral health services into their well-child visits.
Initially 45% of nursing students surveyed had a negative attitude towards learning about oral health and incorporating it into curriculum.
After the curriculum, surveys show that 25% of nursing students recognized the impact oral health has with systemic health and feel more confident about incorporating it into their visits.
Our proposed curriculum will mimic aspects of other programs that have shown the greatest impact in oral health education for nurses.

Conclusions

Interdisciplinary education plays a vital role in bridging the gap between different practitioners. Nurses, in particular, interact with patients across various healthcare settings and with a more comprehensive view of the patient’s health to include an understanding of oral health could greatly improve patient health outcomes.

#84: Immunotherapy for Melanoma: Disappointing or Promising?

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Purpose

The most common cancer in Nevada is skin cancer. The deadliest type of skin cancer is melanoma, which is more prevalent in Nevada due to the lifestyle and high UV index. It is a highly metastatic and malignant tumor with a grim prognosis.

Methods

Early detection of melanoma and surgical removal is the best treatment option, but strategies for advanced or metastatic melanoma are limited due to low sensitivity and strong toxic side effects. However, the advent of immunotherapies has the potential to revolutionize cancer treatment, inspiring a new wave of research and development. Melanoma has been the priority candidate of immunotherapy for solid tumors. Here, we summarize the standard immunotherapies and their applications for melanoma, present the current research status of melanoma immunotherapy delivery systems, and discuss the advantages and disadvantages of various approaches.

Results

Conclusions

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

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Purpose

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

Methods: A comprehensive review of literature published between 2014 and 2025 was conducted utilizing PubMed, Google Scholar, and Dentistry & Oral Sciences Source 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. Additionally, reports from international health organizations were reviewed to better understand barriers to implementation and current policies.

Results

Results: The literature demonstrates that SDF achieves caries arrest rates of up to 91%. SDF also has been shown to be more effective than preventative treatments that are currently the standard of care, such as fluoride varnishes. Cost analyses reveal SDF treatments to be less expensive than general anesthesia and conventional restorative care. Community health programs and school-based interventions have been shown to help improve oral health outcomes. Despite its history of safety and versatility, challenges persist in its widespread utilization. Regulatory limitations, insufficient professional education, and aesthetic concerns regarding staining, especially on anterior teeth, which impacts patient acceptance, are all barriers to its adoption.

Conclusions

Conclusions: The literature demonstrates that SDF is an effective, scalable, and affordable intervention capable of addressing obstacles involving access to oral healthcare in underserved populations. Regulatory barriers must be overcome, health provider education must increase, and innovative solutions to SDF's aesthetic challenges must be made to maximize SDF's potential. Future research should explore long-term outcomes and public health strategies to integrate SDF into broader health initiatives. SDF has the potential to greatly impact oral health inequities worldwide if these challenges can be met with solutions.

#86: Environmental Parasite Contamination: A Study Evaluating Soil in Urban Dog Parks

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Purpose

This research aims to raise awareness of local canine parasite prevalence with the goal of addressing prevention by presenting the results generated.

Methods

At each park, a target of five soil samples were collected at various landmarks; for parks with dog size restrictions, a set of samples was collected for each gated/separated segment. A total of N=77 soil samples were collected. Soil samples were dried, sifted by 1mm sieves, subjected to 5% NaOH solution to separate intestinal parasites from soil particles, and then tested in triplicate for parasites. Centrifugal flotations were conducted using sodium nitrate and Sheather's sugar solutions, and the third aliquot was prepared using a modified Ziehl-Neelsen acid-fast stain. Samples were viewed microscopically at x100 and x400 magnification to identify canine parasites.

Results

Four protozoal, five nematode, and one trematode parasite species were identified, with a total of 68 (88.3%) positive samples. The most prevalent parasites were Cystoisospora (22.1% of samples), Cryptosporidium (26.0%), Ancylostoma (31.2%), and Toxocara (41.6%); the latter three of which are zoonotic parasites of humans.

Conclusions

There were no significant differences based on park type ($X^2 = 2.34$, $p = 0.311$), or location within park ($X^2 = 6.08$, $p = 0.110$), suggesting that parasites were relatively ubiquitously distributed within parks but with no definable hotspots.

#87: Whole Brain DTI Analysis in Carbon Monoxide Exposure Patients

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Purpose

The significant neurological effects caused by carbon monoxide poisoning (COP) have prompted the use of Diffusion Tensor Imaging (DTI) to understand the impact on the brain's white matter structure. The goal of this review is to investigate the literature on DTI imaging of the whole brain to consolidate the different tracts or brain regions that are commonly affected during COP with the larger aim of using such findings for prognosis and diagnosis.

Methods

Pubmed was searched using the following key terms: "carbon monoxide poisoning" OR "CO poisoning" AND "diffusion tensor imaging" OR "DTI".
Studies that met one of the following were excluded: (1) systematic review, (2) meta-analysis, (3) case reports, or (4) non-English articles. Studies that met the following criteria were included: (1) studies with at least 10 patients, (2) studies with a healthy control group, (3) studies that measured DTI indices (i.e. FA, MD, AD, RD) in patients with COP compared to the control, and (4) studies investigating other imaging modalities but reported DTI indices. This yielded us with 12 studies with 328 patients with COP and 283 healthy controls as well as DTI indices for comparison.

Results

All included studies showed various white matter regions appear to be vulnerable to COP, but patients with delayed neurological sequelae (DNS) also have greater decrease in FA and increased diffusivity in those regions. Four studies highlighted lower Mini-Mental Status Exam (MMSE) scores in patients with COP compared to healthy controls. Vulnerable regions with low FA values appeared to be significantly correlated with MMSE scores.

Conclusions

This review highlighted the regions vulnerable to COP as well as areas with decreased FA values that correlated with lower MMSE scores. Further studies may be needed to analyze the relationships between carbon monoxide-mediated regions of white matter injury, including those that undergo remyelination, with specific neuropsychiatric symptoms.

#88: Investigating the Impact of Shift Work on Circadian Rhythms and Health in Healthcare Workers

Dominique Gillette [1], Angela Nguyen [1], Grace Godfrey [1], Jacob Godfrey[1], Carissa Salamatin[1], Hannah Gewaid[1], Colin Burton[1], Samuel Park[1], Neha Doppalapudi[1], and Daniel Oraee [1]

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Purpose

Through circadian rhythm studies, the relationship between disturbances in the body's internal clock and various medical conditions is examined. Healthcare workers are particularly susceptible to circadian misalignment due to unavoidable night shifts. To mitigate the risks involved with this, we look to further our understanding of shift work's effect on circadian rhythms.

Methods

A Qualtrics survey will be distributed to 50 day and night-shift healthcare workers at hospitals in the Las Vegas area to gather information on how occupational and personal habits, lifestyle, and health status affect circadian rhythm. Next, respondents will be selected to wear a Corsano Cardiowatch 287-2B for one week to track markers of circadian rhythm including heart rate variability, sleep cycles, and physical activity. Data will then be analyzed using R.

Results

Mostar University Hospital found healthcare workers with more workload during their shift, especially at night, have shown statistically significant differences (p<0.05) in their normal sleep-wake rhythm, hormone levels, and restfulness. 1 In our study, a 95% confidence interval will be used, and further analysis will be presented later. Based on the aforementioned study, we anticipate night shift workers at Sunrise Medical Center and St. Rose Siena Hospital will have circadian rhythm disturbances, particularly those who work multiple night shifts a week in stressful environments.

Conclusions

This study will delve into how night shift work contributes to health risks through the disruption of circadian rhythm, and ultimately, help develop strategies to promote healthier work environments and improve the health and well-being of night shift workers.

#89: Longitudinal analysis of the healthcare needs of Hispanic-Latinx population in Nevada and neighboring states

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Purpose

The rapidly growing Latinx population in California, Utah, Arizona, and Nevada is reshaping the identity of these states, but its impact on public health requires attention. As this population continues to grow, studies are observing a significant influence on the economic and social landscape of Nevada and its bordering states. This community faces considerable challenges in accessing health and human services, including issues with insurance coverage, eligibility restrictions for programs, immigration enforcement actions, and systemic inequities. These obstacles contribute to ongoing health disparities and unmet medical needs. This study aims to identify key medical issues within the Hispanic-Latinx community in Nevada and bordering states.

Methods

Data on the Latinx and Caucasian populations in Arizona, Utah, California, and Nevada were sourced from the 2022 Behavioral Risk Factor Surveillance System (BRFSS) data. The study examined the prevalence of chronic diseases such as cardiovascular disease (CVD), diabetes, and kidney disease. Statistical analysis was conducted using RStudio to further explore and compare these health metrics between the Latinx and Caucasian populations.

Results

Initial analysis showed that a majority of the Latinx populations were told that they did not have CVD (NV: 96%, CA: 94%, AZ: 22%, UT: no numbers). It was also observed that 82% of the Nevada Latinx population were never diagnosed with diabetes. Further results including the Caucasian population will be presented at the poster.

Conclusions

This project presents a snapshot of the incidence of chronic diseases in Nevada and its neighboring states. The findings aim to guide public health initiatives toward effective solutions that can reduce health inequities and enhance outcomes for this expanding community.

#90: The multifaceted impact of the COVID-19 pandemic on perceptions of overall health

Krystal Robinson [1], Grace Godfrey [1], Jacob Godfrey[1], Carissa Salamatin[1], Renee Chang[1], Payson Broome[1], Dominique Gillette[1], Kevin Tarrio[1], Sherli Koshy-Chenthittayil[1], and Karen Duus[1].

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Purpose

The World Health Organization (WHO) defines health as a “state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” Previous studies have indicated both mental health and overall physical health can decline due to heightened sedentary behavior.

Methods

This project investigates these concepts further by analyzing individual’s perceptions of their overall physical and mental health during the pandemic using Qualtrics and R. Participants aged 18 and older (n > 200) provided pre- and post-quarantine data with subgroup comparisons by gender, ethnicity, socioeconomic status, age, residence, and coping mechanisms.

Results

Initial results revealed a significant decline in perceived overall health during the COVID-19 pandemic. Physical and mental health declined for 39% of participants. Of the participants who reported a slightly worsened mental health, 83% reported a decrease in social engagement. Of the participants that reported poor mental health at the end of quarantine, 80% reported that they experienced loss and grief as well as loneliness during the quarantine. Among those who reported their physical health worsened over the course of the pandemic, 58% reported a poor diet.

Conclusions

In conclusion, this study provides valuable insights into the health impacts of COVID-19, which can guide future patient care and inform policies for potential quarantines. For example, addressing the decline in physical health and poor dietary habits could involve implementing grocery delivery services to ensure access to nutritious foods for all individuals. These measures may help mitigate the adverse effects observed in our study and during public health emergencies.

#91: Disparities in Pap Smear Rates Among Diverse California Populations: A Data-Driven Analysis

Angela Nguyen [1], Julie Paik [1], Thrisha Reddy [1], Giovanna Park [1], and Sherli Koshy-Chenthittayil[1]

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Purpose

Papanicolaou tests, also referred to as pap smears, are an integral part in reducing both the incidence and mortality rates of cervical cancer. However, routine examination rates are suboptimal amongst populations of color.1 This results in people of color (POC) having a lower proportion of diagnoses of early cervical cancer compared to non-people of color (non-POC).2 These disparities in access to screenings are a significant public health concern due to the large proportion of the California population consisting of immigrants and racially diverse groups. The primary study outcome investigated the incidence of Pap-Smear exams of POC compared to non-POC, aged 18-64, with associated socioeconomic variables, like income, insurance, and living areas within California.

Methods

Using the 2022 Behavioral Risk Factor Surveillance System database for the state of California, we evaluated socioeconomic variables such as ethnic group, household income, health insurance and living areas in relation to pap smear data found. Data analysis was carried out using RStudio.

Results

Out of 10952 people surveyed in California, approximately 22% (2434) reported they had a Pap smear at their most recent cervical cancer screening. Among these, it was seen that 37% of them identified as POC. After performing Fisher's exact test, it was observed that race and having a Pap smear was statistically independent (p-value=0.55 > 0.05). Unsurprisingly, it was noted that having a Pap smear was statistically dependent on having health insurance (p-value=0.0005 < 0.05). Further analysis will be presented at the poster.

Conclusions

Through this analysis, the study aims to create a data-driven foundation to create future potential interventions for improved access of routine health examinations, like pap smears, amongst all communities. Further studies can be done on the attitudes toward pap smears that are contributing to barriers to cervical cancer screening.

#92: NHPI Health of the Ninth Island

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Purpose

Since the 1970s, the population of Native Hawaiian and Pacific Islanders (NPHI) in Clark County, NV has increased. Between 2011 and 2021, a 40% growth in NHPIs was documented; thus terming Las Vegas Valley as the "Ninth Island." Socioeconomic demands associated with the cost of living in Hawaii have been the primary reason for this diaspora. Despite moving to mitigate economic challenges, healthcare disparities among NHPIs persist. Throughout the United States, NHPI populations experience among the highest COVID-19 death rates, have a 19.8% prevalence of self-reported diabetes, and have disproportionate cardiovascular disease (CVD) risk factors compared to White and Asian Americans. Both NHPI healthcare disparities and NHPI population growth in the Valley highlights the imminent need to evaluate healthcare access amongst this community, as it currently remains understudied. The objective of this study is to compare the prevalence of CVD, diabetes, and long COVID between NHPI populations in Hawaii and Nevada. This study will also evaluate the relationship between associated risk factors and chronic disease prevalence.

Methods

NHPI populations in Nevada and Hawaii were compared using 2019-2023 Behavioral Risk Factor Surveillance System (BRFSS) data. RStudio was used to statistically analyze chronic disease variables (diabetes, CVD, long COVID) with covariates including sex, age, education, employment, and healthcare access.

Results

Initial analysis from the 2022 data demonstrated that out of the total respondents recorded in Hawaii and Nevada, 657 and 22 identified as NHPI, respectively. More NHPI individuals in Nevada reported having diabetes (40% vs 17%), suffering from a myocardial infarction (9% vs 4%), and testing positive for COVID (37% vs 28%) compared to NHPI individuals in Hawaii. Fisher exact tests revealed an association between diabetes and age in Nevada and between diabetes and age, diabetes and insurance, and myocardial infarctions and age in Hawaii (P <0.01).

Conclusions

More effective approaches for accurately surveying the health of NHPI populations are crucial for US states with significantly growing NHPI diaspora such as Nevada. In addition, omitted BRFSS questions regarding chronic diseases prevent necessary resolutions to the healthcare needs of medically underserved communities.

#93: Barriers in Dietary Approaches to Stop Hypertension (DASH): Acculturation and Adherence in Asian American Populations

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Purpose

The Dietary Approaches to Stop Hypertension (DASH) diet is a well-researched eating plan designed to reduce blood pressure and improve overall health. Its emphasis on fruits, vegetables, whole grains, lean proteins, and low-fat dairy has proven effective across various populations in China, the United States, and South Asia.1,3,5 However, adherence to the DASH diet can vary significantly among different ethnic groups, influenced by cultural preferences, socioeconomic status, and awareness of dietary guidelines.2 Asian Americans have a higher risk of developing cardiac comorbidities, like hypertension (HTN) than Caucasian populations in the US.4 In particular, Asian Americans face unique challenges in adopting and maintaining the DASH diet adherence, which merits further exploration to develop tailored interventions. The purpose for this narrative review is to examine DASH diet adherence among Asian American populations, identify key barriers, and suggest directions for future research.

Methods

Potential articles were identified through Google Scholar, National Library of Medicine and PubMed with keywords such as ‘DASH diet’, ‘Hypertension’, ‘Asian American’, ‘adherence’, ‘acculturation’. Inclusion criteria was based on studies that focused solely on the DASH diet in Asian populations or comparative studies with other populations. All studies that disregard adherence to the DASH diet are to be excluded. Further analysis would be done to find associations between the dash diet in Asian populations.

Results

Expected results would identify studies that demonstrate adherence, or lack thereof, in Asian populations.

Conclusions

Asian American populations face distinct barriers to adhering to the DASH diet, including economic constraints, cultural dietary preferences and knowledge gaps. These challenges emphasize the need for targeted interventions, such as culturally sensitive dietary education and policies to improve access to affordable healthy foods. Future research should focus on tailoring the DASH diet to align with Asian cuisines while maintaining its health benefits. By addressing these barriers, healthcare professionals and policymakers can support better dietary adherence and improved health outcomes for Asian American populations.

#94: The Impact of Teleophthalmology On Underserved Populations

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Purpose

Teleophthalmology has recently emerged as a new intervention to provide remote visual health care service. It has shown promise in helping to bridge the gap of health inequity for underserved populations who face significant barriers in accessing traditional in-person care. These barriers include affordability, availability of optometrists and ophthalmologists, and delay in referral from primary care physicians, as well as their lack of knowledge about their risks for vision loss or blindness. The purpose of this review is to assess the current literature on the impact of teleophthalmology to see if there is improvement in visual outcomes in underserved populations.

Methods

A comprehensive literature search is being conducted using PubMed, Google Scholar, and Prospero for studies published from January 2000 to December 2024. The search combined keywords such as “teleophthalmology,” “underserved populations,” “access to eye care,” and “remote screening.” Studies that evaluated the effectiveness, accessibility, and outcomes of teleophthalmology interventions in underserved communities were included in the review. A narrative summary of these studies will be presented.

Results

Out of the 5 articles retrieved so far, 2 found that the expansion of teleophthalmology to underserved populations has improved the detection of glaucoma, cataract, and other ocular conditions early on, and allowed for quick intervention. Another found that low income, urban, African-American patients with type 2 diabetes felt reassured due to reduced costs for transportation and seeing a physician. It was also found that rural populations, such as those in Arkansas would benefit from teleophthalmology, as geographic isolation was a major barrier to their access.

Conclusions

Overall, these findings show promise that teleophthalmology has the potential to help decrease cost of eye care, improve access to rural populations, and help screen for ocular diseases in those who cannot afford to see a physician in person. However, as our research is still currently ongoing, no definitive conclusion can be drawn yet.

#95: Meeting Community Needs with the CVS Health Spanish Pathway Program

Marcelo Garcia [1], and Vanessa Hill [1]

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Purpose

The mission of Roseman University of Health Sciences College of Pharmacy (RUCOP) is to develop skilled, compassionate, and ethical pharmacists who deliver patient-centered care and address community pharmacy needs. With a notable shortage of Spanish-speaking pharmacists across the United States, RUCOP aims to meet the increasing demands of the Hispanic/Latino population, particularly in the communities surrounding its campuses in Henderson, NV, and South Jordan, UT. With support from a grant by CVS Health, RUCOP has launched the CVS Health Spanish Pathway Program (SPP) with the mission aimed at increasing the number of qualified Spanish-speaking pharmacists in Hispanic/Latino communities.

Methods

The programs objectives to meet its mission include:

1. Introduce Hispanic and bilingual students to pharmacy careers
2. Recruit and retain Hispanic and bilingual students to Roseman University of Health Sciences (RUHS), by offering mentorship, education, and leadership development opportunities
3. Prepare students to serve the healthcare needs of Hispanic communities by pairing them with local community pharmacies in hispanic communities

Since 2018, RUHS has partnered with CVS Health to attract and retain Spanish-speaking students in pharmacy careers. Students in the Spanish Pathway Program (SPP) gain practical experience at primarily Spanish-speaking CVS pharmacies and can network with CVS leaders. The students' successes and activities completed during these experiences are tracked and reported. The program also focuses on leadership and personal development, offering coaching from SPP faculty and opportunities for involvement and community outreach events.

Results

From Spring 2018 to 2024, the CVS Health Spanish Pathway Program has enrolled a total of 41 pharmacy students. In the academic year 2023-2024, eleven students were enrolled. These 11 students achieved notable successes, including administering 1,223 immunizations, providing counseling or recommendations for 476 over-the-counter medications, and offering guidance on 583 cost-effective prescriptions. Additionally, the program students made 32 recommendations for therapeutic lifestyle changes and conducted 295 interventions to clarify or change prescriptions. Over the duration of this program these successes have totaled 9.085 immunizations administered, 4,066 over the counter recommendations,6,787 prescription consultations, 312 therapeutic lifestyle recommendations, and 3,278 interventions to clarify a prescription. These accomplishments demonstrate the program's significant impact on community health.

Conclusions

RUHS and the CVS Health Spanish Pathway Program have effectively addressed community needs by graduating proficient Spanish-speaking pharmacists who serve in Spanish-speaking pharmacies. This initiative not only fills a critical gap in healthcare access but also empowers individuals and families to receive care in their preferred language. The recent grant renewal from CVS Health for the 2023-2024 period further demonstrates the commitment to enhancing equitable healthcare access for the community.

#96: Achondroplasia, Sleep Apnea, and Orthodontic Interventions: A Comprehensive Literature Review

Hayden McKay[1], and Joseph Cheever [1]

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Purpose

This literature review, titled "Achondroplasia, Sleep Apnea, and Orthodontic Interventions: A comprehensive literature review investigated the intricate relationship between achondroplasia and sleep apnea, with a focus on the potential role of orthodontic interventions in mitigating these complications. The review employs a systematic approach, conducting a thorough search across electronic databases and employing inclusion criteria to select relevant studies. The discussion synthesizes findings from various studies, highlighting the multifaceted role of orthodontics in addressing obstructive sleep apnea in individuals with achondroplasia. It delves into orthodontic implications, challenges in surgical correction, correlations with craniofacial skeletal shape modifications, and emphasizes the need for a specialized multidisciplinary follow-up. The orthodontic perspective on recommended treatments, such as maxillary expansion and surgical interventions, is explored, along with insights from midface advancement procedures. The review concludes by advocating for a staged orthodontic treatment approach, acknowledging the current state of knowledge and calling for further research to enhance treatment modalities for this specific population.

Methods

For this literature review, a systematic search was conducted across multiple electronic databases, including PubMed, MEDLINE, and Google Scholar. The search strategy involved a combination of keywords, such as "achondroplasia," "sleep apnea," "orthodontic interventions," and many other related synonyms. Inclusion criteria included peer-reviewed articles and research studies published up to the modern day written in English. The texts were examining the relationship between sleep disordered breathing in patients with achondroplasia and orthodontic treatments. A screening process was applied to select studies for inclusion, with a focus on relevance and quality. Titles and abstracts were initially screened for relevance, followed by a full-text assessment of those articles in question. Data extraction included study design, participant characteristics, key findings, and details of orthodontic interventions. The summary of findings highlights common themes, variations, and gaps in the existing literature. Thus providing a foundation for a comprehensive overview of the current state of knowledge around achondroblastic patients and their treatment of sleep apnea with orthodontic interventions.

Results

The multifaceted role of orthodontics in managing obstructive sleep apnea (OSA) in individuals with achondroplasia (ACH) is highlighted by various studies. Karpagam et al. (2005) emphasize the need for tailored orthodontic interventions due to anatomical anomalies and age-related factors, such as adenoid and tonsil hypertrophy. The interplay between surgical correction and orthodontic treatment is crucial, as discussed by Savarirayan et al. (2022), pointing out persistent bony anomalies like short skull base and midface retrusion that necessitate ongoing orthodontic management.
Morice et al. (2023) reveal strong correlations between maxillo-mandibular anomalies and OSA severity,

indicating the importance of orthodontic assessments in addressing these issues for better OSA management. Hoover-Fong et al. (2020) stress the necessity of multidisciplinary follow-ups with a significant orthodontic component, ensuring that various specialties collaboratively aim to improve outcomes for ACH patients.

Further, Susarla et al. (2017) highlight orthodontic considerations in treatment options such as maxillary expansion and the effects of Continuous Positive Airway Pressure (CPAP) devices on orthodontic strategies, emphasizing the need for personalization in treatment approaches. Insights from Onodera et al. (2006) demonstrate that midface advancement can effectively enhance airway volume and improve OSA metrics.

Lastly, the staged orthodontic treatment proposed by Kitoh et al. (2022) places orthodontics at the forefront for addressing conditions like midfacial insufficiency and anterior open bite. This progressive approach underlines the complexity of craniofacial deformities, emphasizing the structured management of ACH patients with OSA.

Conclusions

In summary, this review underscores the integral role of orthodontics in understanding, managing, and optimizing outcomes in individuals with achondroplasia experiencing obstructive sleep apnea. Orthodontic considerations permeate various aspects, from addressing anomalies and age-related factors to correlating with craniofacial skeletal shape modifications and guiding multidisciplinary follow-up and treatment approaches. The cited studies further validate and contribute to the orthodontic perspective in the comprehensive management of OSA in ACH individuals. There is still a large amount of research that needs to be done to further the treatment modalities for this specific group, and further studies should focus on improvements of sleep quality and facial esthetics.

#97: Effects of Maxillary Expansion Techniques in Adults with Obstructive Sleep Apnea: A Review Article

Nader Karimi [1], and Joseph Cheever [1]

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Purpose

The purpose of my study is to evaluate the effectiveness of maxillary expansion techniques, including SARME, DOME, and MARPE, in improving obstructive sleep apnea outcomes in adults.

Methods

A review was conducted and reported according to PRISMA guidelines. Research studies, published in English in the last 10 years that assessed the effects of maxillary expansion techniques in the treatment of OSA in adults were included. A comprehensive search was performed in PubMed, EMBASE, CINAHL, Web of Science, Scopus, and the Cochrane Library. Title & abstract screening, full-text screening, data extraction, and quality assessment of the included studies were performed by two independent reviewers.

Results

Of the nine included studies, two were systematic reviews, one was a two-group non-randomized clinical trial, and the remaining six were single-group non-randomized studies (cohort studies). The included studies applied Surgically Assisted Rapid Maxillary Expansion (SARME), Distraction Osteogenesis Maxillary Expansion (DOME), and Mini-Implant Assisted Rapid Palatal Expansion (MARPE) as maxillary expansion techniques for the management of OSA in adults. The included studies reported that maxillary expansion techniques significantly improved OSA outcomes including apnea-hypopnea index, oxygen desaturation index, Epworth sleepiness scale, lowest oxygen saturation, Quebec sleep questionnaire scores, and nose obstruction symptom evaluation.

Conclusions

Maxillary expansion techniques are effective in the management of OSA in adults. The scarcity of high-quality randomized controlled clinical trials highlights the need to conduct large-scale, multicenter randomized controlled clinical trials to further explore the effectiveness of maxillary expansion techniques in the treatment of OSA in adults.

#98: Craniofacial effects of sickle cell anemia

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Purpose

This literature review aims to synthesize findings from scientific studies on the craniofacial effects of sickle cell anemia (SCA), with a focus on dental and skeletal manifestations, to better understand the relationship between SCA and craniofacial morphology.

Methods

A systematic search was conducted using PubMed to identify studies examining craniofacial features in individuals with SCA. Inclusion criteria required studies to be written in English, published in the last 10 years, and focused solely on SCA. Literature reviews and studies not meeting these criteria were excluded. The selected studies employed methodologies such as clinical evaluations, radiographic assessments, and cephalometric analyses.

Results

The review encompassed five studies, which highlight the diverse craniofacial effects associated with SCA. Key findings included skeletal abnormalities, such as retruded mandibles, vertical growth patterns, and increased lower facial heights, as well as dental manifestations like crowding, delayed eruption, increased overjet, and open bite. Gender-based differences in mandibular positioning and variability in facial aesthetics were also observed.

Conclusions

Sickle cell anemia significantly impacts craniofacial development, presenting challenges such as retruded mandibles, vertical growth patterns, and dental issues like crowding, delayed eruption, and malocclusion. These findings highlight the need for early, tailored interventions and interdisciplinary collaboration in managing the oral health of affected individuals. The dental community plays a vital role in improving care outcomes and contributing to research on the unique craniofacial alterations associated with SCA.

#99: Orthodontic management of single solitary central incisor syndrome

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Purpose

The unique presentation of SMMCI calls for a multidisciplinary approach when treating the patient orthodontically. While there have been few documented cases of SMCCI patients treated orthodontically, several treatment options have been postulated for treating this unique disorder. The aim of this paper is to review the orthodontic treatment options and considerations when treating patients with SMMCI.

Methods

A systematic search was conducted to identify relevant literature discussing orthodontic treatments for solitary median maxillary central incisor syndrome (SMMCI). The search included three electronic databases: PubMed, Google Scholar, and MEDLINE. The search strategy employed a combination of keywords, including “solitary median maxillary central incisor,” “orthodontic treatment,” and “management,” as well as their synonyms

Results

This review highlighted various orthodontic treatment strategies, including space opening for prosthetic restorations, premolar transplantation, and space closure with restorative modifications

Conclusions

The choice of treatment must consider the patient’s age, occlusal relationships, and psychosocial factors, as well as the potential for premature suture fusion and alveolar bone atrophy. Multidisciplinary collaboration is crucial to achieving both functional and esthetic outcomes in patients with SMMCI. Future research focusing on long-term outcomes and advancements in treatment modalities will further enhance our understanding and management of this complex condition.

#100: An Overview of Student Disability Services Offered by Medical Universities in Nevada and Hawaii

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Purpose

In 2019, 4.6% of medical students reported disabilities, a 69% relative increase from 2016. These numbers may be less than the actual size since not all students self-report their disability. One important resource for students with disability (SWD)'s success at a higher education institution is the student disability/accessibility services. This is required by institutions, both public and private, according to Section 504, a 1977 law. For a SWD, before choosing a particular university, their first point of contact is the services webpage.

Methods

In this project, we qualitatively reviewed the websites of student disability services of eight medical and allied health universities in Nevada and Hawaii that offer four year doctoral programs to analyze this first point of contact for SWDs. We did this as a first step to better understand what factors could influence a SWD to choose and persist in a particular institution. We chose content analysis as the primary method, coding the website content to analyze and reveal the nature of disability services provided in the website.

Results

Initial results showed that all the universities's websites mentioned a statement of values as well as some information related to legislation. They all included a definition of what they consider to be a disability. There was no information provided on the number of SWDs. The number of staff for these services either ranged from 1-11 or were not listed on the website. Five of the eight universities had comprehensive information about the process to get accommodations.

Conclusions

These factors would be relevant to a SWD making a decision about an institution. For example, the demographic information about SWDs would help an incoming student feel less like a token and be confident that the institution is familiar with serving SWDs. The poster will provide a detailed look at these websites and what that indicates for healthcare students with disabilities.

#101: Let's Cut to the Chase: Applying High-Stress Medical Training from Cut Suit Week

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Purpose

Simulation-based training has become essential in preparing medical professionals to manage high-stakes situations effectively before encountering them in real-life clinical settings. This study aimed to evaluate the impact of Cut Suit Week (CSW), a high-stress, trauma-focused simulation training for second-year military medical students hosted by Rocky Vista College of Osteopathic Medicine in San Diego, California. As members of the 2024 cohort, our team from Touro University Nevada (TUN) and Touro University California (TUC) sought to address three questions: (1) Does CSW improve confidence in managing stressful situations? (2) Does it enhance clinical and leadership skills? (3) Would similar training benefit the broader student body at TUN and TUC?

Methods

To address these questions, we completed reflective exercises and answered scaled questions assessing the training's effectiveness. Participants rated their preparedness, confidence, and skill development on a 1 to 5 scale and provided free-response reflections on their experiences. Results were analyzed for trends, and word clouds were generated from qualitative responses to highlight key themes.

Results

Our findings indicated overwhelmingly positive perceptions of CSW. Perceived preparedness for high-stress clinical situations increased from an average of 3.0 to 4.2, while clinical and leadership skill development was rated as “highly effective,” with an average score of 4.4. Confidence levels also showed marked improvement following the training. Free-response reflections identified descriptors like “realistic” and “invaluable,” underscoring the program's impact.

Conclusions

CSW significantly enhanced participants’ confidence and preparedness for clinical training, aligning with Touro University’s commitment to advanced simulation education. These findings suggest that implementing a similar high-stress, trauma-focused simulation training at TUN and TUC would benefit both military and non-military students. More broadly, such training could be a valuable addition to medical education programs across disciplines to better prepare the next generation of healthcare professionals.

#102: Leveraging Neural Networks for Early Detection of Breast Cancer

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Purpose

Breast cancer is the most common type of cancer and the second leading cause of death by cancer for women in the United States. Most research for predicting breast cancer now includes multiple image classification techniques, however, for purposes of efficiency, using tabled data is important for diagnoses as well. The purpose of our study was to find if the use of neural networks can effectively, and quickly return better results than existing methods.

Methods

Two datasets were used for our research purposes: the Breast Cancer Coimbra Dataset (BCCD) and the Wisconsin Breast Cancer Dataset (WBCD Diagnostic). 5 models were built and analyzed against each other. The first one was a simple DNN (deep neural network) with 16 neurons and 8 neurons in each layer respectively. The second model was an ANN model (Simple DNN and ANN are naming conventions used in our experiment) that has 64 and 32 neurons respectively. The third model was a DNN model with 5 layers. The 4th model was a Dropout-based DNN model that included dropout layers among general dense layers. Finally, we used a CNN model which was built with 1-D convolutions.

Results

In the BCCD the DNN model was the highest performing model with an accuracy of 87.5%. For the WBCD, the Dropout DNN model was the highest performing model with an accuracy of 99.12%. Additionally, compared to other papers our models even outperformed pre-existing papers. For instance, our results across multiple models for the WBDC beat out Idris and Ismael's fuzzy-ID3 method, which achieved a 94.534% accuracy.

Conclusions

The use of neural networks proved to be an even more effective strategy in terms of predicting breast cancer compared to studies done in the past. Deeper models for smaller datasets like the DNN for the BCCD proved to be an effective way to predict breast cancer. Additionally, preventing overfitting with neural networks helps with increasingly accurate predictions on larger datasets. Overall our findings found neural networks to be an effective method to predict breast cancer in a way that can be more inclusive and effective than traditional methods.

#103: Developing a NET-stimulated nanoparticle to target deep vein thrombi

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Purpose

Deep Vein Thrombosis (DVT) is a potentially fatal disease characterized by the formation of a thrombus commonly within lower leg veins, with high risk of breaking off and causing a pulmonary embolism. Treatment for DVT ranges from surgical implants to oral medication called anticoagulants; however, there are many consequences to the use of daily anticoagulants including body pain, gastrointestinal problems, uncontrolled bleeding from an injury, and more. Scientists developed iron oxide nanoparticles in the past to target DVT, but evidence pointed to high toxicity. The purpose of this research was to explore the use of nanoparticles, as an alternative to blood thinners, that can differentiate between pathogenic thrombosis and normal blood clots.

Methods

This project proposes a nanotechnological solution involving a Toll-like receptor 4 (TLR4) embedded onto a platelet-membrane functionalized nanoparticle with a modified TIR-domain-containing adapter-inducing interferon-β (TRIF) system. This would activate TANK-binding kinase (TBK1) which would cause a phosphorylation cascade and allow for controlled tissue plasminogen activator (tPA) release to break down pathogenic thrombi when in contact with neutrophil extracellular traps (NET). To synthesize the proposed nanoparticle, platelet membranes are isolated and fused onto a tPA and TBK1 loaded poly lactic-co-glycolic acid (PLGA) nanoparticle core. Western blotting analysis should be done on the platelet membrane to ensure functional TLR4 surface proteins. To amplify the presence of TLR4 and TRIF proteins, detergent-mediated insertion integrated TLR4 as a transmembrane protein and TRIF peripherally. Utilizing cell-free protein synthesis, channel proteins were engineered to enable tPA release from activation of TBK1 and they were embedded via membrane protein reconstitution methods. In vitro testing of the proposed nanoparticle would involve exposing the nanoparticle to NETs and quantifying tPA release using enzyme-linked immunosorbent assay (ELISA). A swine model could be used for in vivo testing of the nanoparticle to observe if thrombi are effectively detected and reduced in the presence of the nanoparticle. Expected results of these tests are that the nanoparticle will decrease the number of thrombus instances similarly to blood thinners, but will also see a reduced or absence of adverse symptoms associated with blood thinners.

Results

NA

Conclusion

NA

#104: Genetic screening and CRISPR editing of the RYR1 gene for patients with malignant hyperthermia suffering adverse reactions to anesthesia

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Purpose

Malignant hyperthermia (MH) is a life-threatening genetic disorder caused by mutations in the ryanodine receptor gene (*RYR1*). Triggered by certain anesthetics and muscle relaxants, MH releases excess calcium ions in muscle cells resulting in the depletion of ATP as active transport attempts to return them to the sarcoplasmic reticulum. The excess calcium ions also lead to random muscle contractions, which in turn triggers anaerobic metabolism, lactic acid accumulation, and metabolic and respiratory acidosis. Current treatment involves stopping the administration of the triggers, administering dantrolene to inhibit calcium release, and managing acidosis. However, these treatments are reactive rather than preventative. Gene screening and CRISPR-Cas9 gene editing present potential future solutions for MH. Screening would identify *RYR1* mutations before anesthesia administration, while CRISPR could insert the correct *RYR1* gene to code for the correct ryanodine receptor protein. However, significant risks and safety concerns with CRISPR must be addressed before these approaches can be widely implemented.

Methods

In this hypothetical research, initial genetic screening would determine if patients contained a mutated *RYR1* gene before CRISPR-Cas9 technology was used to edit and replace the mutated segment, inhibiting the effects of MH. The dysfunctional ryanodine receptors would not be produced, preventing the body from using excessive ATP. Genetic screening using a blood or saliva sample would indicate the presence of any harmful mutations. The process of CRISPR would work to replace the mutated segment with functional DNA.

Results

N/A

Conclusion

N/A

#105: Utilizing CRISPR to upregulate PCSK9 expression and reduce cholesterol levels as a therapeutic strategy for familial hypercholesterolemia

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Purpose

Familial hypercholesterolemia (FH) is a monogenic disorder of significantly elevated low-density lipoprotein-cholesterol (LDL-C) levels due to mutations in a gene regulating cholesterol metabolism, Proprotein convertase subtilisin/kexin type 9 (PCSK9). Current treatments such as statins and PCSK9 inhibitors focus on symptom management rather than addressing the underlying genetic cause. This study utilizes CRISPR activation technology to upregulate PCSK9, a protein that is significant in cholesterol metabolism, as a potential therapeutic strategy. Activating PCSK9 is expected to lower LDL-C levels by increasing the breakdown of receptors and improving the removal of LDL-C from the bloodstream.

Methods

To model FH, human hepatocyte-like cells derived from FH patients would be cultured in controlled lab conditions. CRISPR activation would be used to target DNA regions regulating the *PCSK9* gene, and a system combining a deactivated Cas9 protein with transcriptional activators would be introduced to upregulate PCSK9 expression. After the treatment, cells would be incubated, to allow for the activation of the targeted gene and subsequent production of mRNA and protein. Multiple techniques would be utilized to assess the effectiveness of the therapy. One technique to measure mRNA levels would be northern blot probing for the CRISPR-targeted gene. Another technique would be reverse transcriptase quantitative PCR that would measure changes in PCSK9 mRNA levels, which would determine whether the gene has been activated. Western blot analysis would detect a corresponding increase in PCSK9 protein levels. A cholesterol assay would measure LDL-C levels to indicate PCSK9 activity and confirm successful outcomes of the therapy.

Results

N/A

Conclusion

N/A

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