ANALYZING SPECIFIC CANDIDATE GENES IMPLICATED IN THE DEVELOPMENT OF A JAW UNDERBITE

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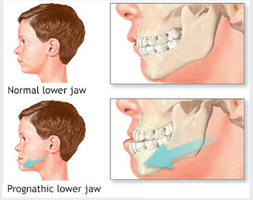
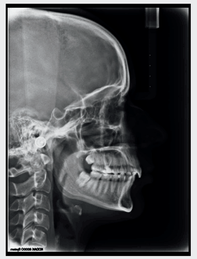
Introduction

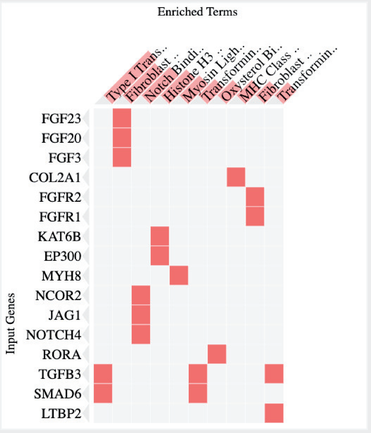
Jaw malocclusion: Misalignment between the upper and lower jaws that presents challenges such as difficulty in chewing, speech issues, and aesthetic concerns. My study focuses on Class III skeletal malocclusion, specifically mandibular prognathism, by identifying and analyzing candidate genes from genetic databases.

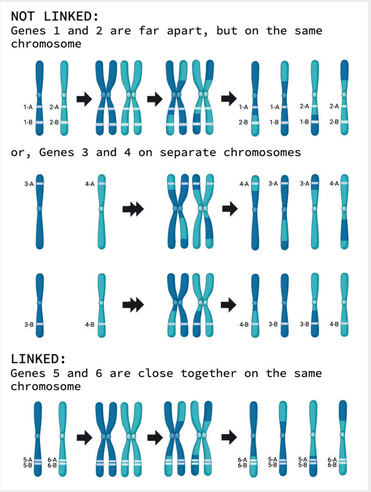




Methods

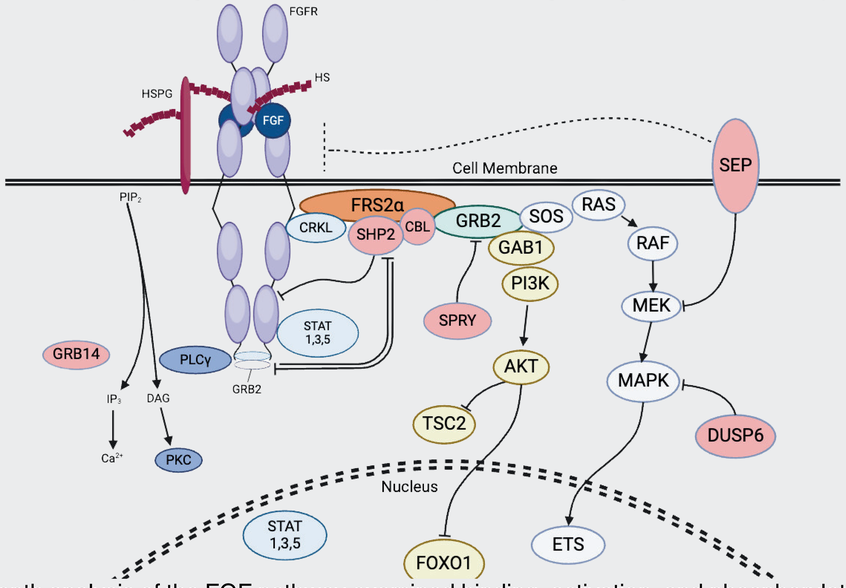
I first reviewed existing studies and explored genetic databases to find genes linked to facial development, tooth formation, and bone growth. Then, I used aEnrichR to perform a Gene Ontology (GO) analysis to find which biological processes or functions were most connected to my genes.





Discussion

My research dentified a significant link between the genes ***FGF1, FGF2, FGF4, FGF5, FGF8, FGF12,*** and an underbite. The Gene Ontology (GO) Analysis revealed high enrichment scores for terms related to receptor-ligand activity, FGF receptor binding, and growth factor activity.



An in-depth analysis of the FGF pathway examined binding, activation, and phosphorylation, as well as intracellular pathways like RAS-MAPK, PI3K-AKT, PLCγ, and STAT.
This analysis shows that one of these pathways, whether through genetic mutation or environmental factors, contributes to maloclussions. Additionally, the concept of crossing over emphasizes the difference between linked and unlinked genes, showing how genome-wide linkage analysis can identify regions associated with an underbite. The implications of this study suggest that personalized therapeutic interventions can be developed by tailoring treatments to individuals' genetic profiles.

Implications

These findings support the development of personalized treatments that target genetic causes, improving outcomes beyond traditional orthodontics. By tailoring treatments based on individual genetic profiles, therapies can be optimized for improved outcomes, minimizing the trial-and-error approach of standardized treatments. This also helps with early detection of the condition, promoting preventive measures. However, malocclusions are multifactorial, involving a complex interplay of genetic, environmental, and developmental factors. Further research is essential to expand genetic knowledge and fully unlock the potential of precision medicine in orthodontic care.

Future Plans

Future research should focus on exploring the interactions between FGF family genes and other genetic factors involved in jaw development, tooth formation, and facial alignment. Comprehensive studies are needed to catalog enough data and analyses for precision medicine to optimize treatment outcomes based on genetic predispositions. Additionally, investigating the environmental and developmental factors contributing to malocclusions will provide a holistic understanding of the condition. Longitudinal studies and larger sample sizes could enhance the understanding of the genetic and environmental interplay in malocclusion development.