

Review Article

Restorative approaches for managing dental anomalies

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ABSTRACT

Dental anomalies, which stem from a complex interplay of genetic and environmental factors during the phases of tooth development, can have multifaceted effects on the appearance, function, and alignment of teeth within the upper and lower jaw. These anomalies are primarily categorized into four main types based on the variations in the number, size, shape, and eruption timing of teeth. They manifest in diverse forms, such as missing teeth, supernumerary teeth, malformed teeth, and irregular tooth positioning. Restorative dentistry serves as a crucial avenue to rectify these anomalies, aiming to not only enhance the functionality but also the aesthetics of affected teeth, thus bolstering the overall oral health and quality of life of patients. It is of particular significance to consider temporary restorative treatments for children with dento-facial abnormalities, not only to address physical concerns but also to mitigate potential psychological trauma and bullying. Additionally, dental anomalies can heighten the susceptibility to dental caries, periodontal diseases, and occlusal irregularities, potentially necessitating intricate and costly dental interventions over time. The research project, initiated on October 12th, 2023, stems from a comprehensive exploration of existing academic literature, encompassing databases such as PubMed, web of science, and Cochrane. Restorative treatment options in modern dentistry offer a comprehensive approach to addressing structural, functional, and aesthetic irregularities in teeth. Prosthodontic solutions, including crowns, bridges, dental implants, and veneers, restore form and function while enhancing aesthetics. Endodontic and operative procedures, such as root canal therapy and dental fillings, preserve teeth, alleviate discomfort, and prevent complications. Orthodontic treatments like braces and Invisalign correct misalignments, improving both function and aesthetics. Surgical approaches, such as orthognathic surgery and impacted tooth removal, are reserved for severe cases. Treatment choices depend on the specific anomaly, emphasizing early intervention for improved oral health and overall well-being.

Keywords: Dental anomalies, Prosthodontic, Endodontic, Orthodontic, Eruption

INTRODUCTION

Dental anomalies, also known as dental abnormalities or dental irregularities, refer to variations in the structure, size, shape, number, or positioning of teeth.¹ These anomalies can occur due to genetic factors, developmental issues during tooth formation, trauma, or other unknown causes.² Dental anomalies, which are developmental, are usually the result of genetic and environmental interactions during the histodifferentiation or morpho-differentiation phase of tooth development.³ Dental anomalies affect the appearance, function, and alignment of teeth present in both the maxilla and mandible.⁴ Majorly, dental anomalies are divided into four types. They can be classified based on anomalies related to the number of teeth, size of teeth, shape of teeth, and eruption time.^{1,5} The incidence of dental anomalies varies globally. The incidence of these anomalies was found to be highest among Asians, intermediate among Caucasians and lowest among Africans.⁶ Whereas, an estimated 10% global prevalence of dental anomalies has been reported by the dental aesthetic index.⁷ Evidence regarding the prevalence of dental anomalies in Africa, Latin America, the Middle East, and Eastern Europe is not comprehensive.⁸ The prevalence of dental anomalies in India was reported to be approximately 36.7%.⁹ Multiple studies from Saudi Arabia estimated that the prevalence of dental anomalies in the population ranged between 25-41%.^{10,11} The most common anomalies were hypodontia, impacted teeth, and congenitally missing teeth, whereas other anomalies such as root dilacerations, taurodontism, dentinogenesis imperfecta, and supernumerary teeth were rare occurrences.^{10,11}

Dental anomalies can have various impacts on patients, including physical, psychological, and functional effects. The nature and severity of these impacts depend on the specific anomaly and how it affects an individual's oral health and overall well-being. Dental anomalies often affect the appearance of a person's smile. The appearance of a person's smile can significantly affect their self-esteem and social interactions.¹² This can lead to self-esteem and confidence issues, especially in cases of irregularly shaped, missing, or extra teeth. In addition to that, several cases of bullying in schools were also reported due to the presence of a non-esthetic tooth condition in children.^{4,12} Anomalies like missing or misshapen teeth can make it challenging to chew food properly or may affect speech clarity.^{13,14} Moreover, certain anomalies, such as dental fusion or malformation, may lead to functional limitations, making it difficult to maintain proper oral hygiene or causing pain when eating or drinking.¹⁵ Early childhood caries were found to be more prevalent and common in children with dental anomalies.¹⁵ Dental anomalies can increase the risk of dental problems, such as decay, gum disease, and cavities, as irregularly shaped or misaligned teeth can be harder to clean effectively. These oral hygiene issues can also be due to misalignment of teeth and jaws. Some anomalies

can lead to misalignment of the teeth and jaws, requiring orthodontic treatment to correct issues such as overbites, underbites, or crowded teeth.¹⁶ Restorative approaches within the realm of dental anomalies encompass a wide array of techniques and procedures that dental professionals employ to rectify and rehabilitate teeth displaying developmental abnormalities or irregularities. Dental anomalies, in their various manifestations, include conditions such as missing teeth, supernumerary teeth, malformed teeth, and unconventional tooth positioning. The overarching goal of restorative dentistry is to reinstate both the function and aesthetics of these teeth, thereby enhancing the oral health and overall quality of life for the patient. In cases involving children with dento-facial abnormalities, temporary restorative treatments are not only recommended but often deemed crucial, as they serve as a protective measure to shield against potential psychological trauma and instances of bullying while also charting a path towards more permanent solutions that optimize aesthetics.¹² Additionally, the literature suggests the viability of orthodontic treatment options, specifically the utilization of fixed appliances, as a potential avenue for managing these dental anomalies.¹⁷ These diverse treatment modalities span across the domains of prosthodontics, endodontics, operative dentistry, orthodontics, and surgical interventions. In essence, restorative dentistry plays an indispensable role in reestablishing not only the functionality but also the aesthetics of the dentition, effectively addressing the complex landscape of dental anomalies.

The study rationale for exploring restorative approaches in managing dental anomalies is rooted in the critical importance of addressing these oral irregularities to enhance the overall health, well-being, and quality of life of affected individuals. Dental anomalies encompass a wide spectrum of structural, functional, and aesthetic deviations in tooth development and alignment. These anomalies not only impact the physical health of patients, affecting mastication, speech, and overall oral function, but they also carry substantial psychological and social consequences, including diminished self-esteem and reduced quality of life due to aesthetic concerns. Furthermore, dental anomalies may lead to a higher risk of dental caries, periodontal diseases, and occlusal issues, potentially increasing the need for complex and costly dental interventions over time. Understanding and researching restorative approaches to managing dental anomalies is pivotal, as it aligns with the broader objectives of preventive and rehabilitative dentistry. By exploring the most effective and patient-tailored restorative techniques, this study aims to improve the prognosis for individuals with dental anomalies, thereby contributing to enhanced oral health and overall well-being. Additionally, it aligns with contemporary trends in personalized medicine, acknowledging the unique needs of each patient and providing tailored solutions that consider factors like age, gender, genetic predisposition, and lifestyle. The study will delve into various restorative

techniques such as dental fillings, crowns, bridges, dental implants, and orthodontic treatments, evaluating their effectiveness in different cases of dental anomalies. Ultimately, the research aims to enhance our understanding of dental anomalies and their management, not only from a clinical perspective but also from a patient-centered one. By providing evidence-based insights into the most suitable restorative approaches, this study aspires to contribute to the development of comprehensive treatment guidelines that can improve oral health, function, and overall quality of life for individuals affected by dental anomalies.

LITERATURE SEARCH

The research project was initiated on October 12th, 2023, following an extensive review of existing academic literature. This review involved searching well-established databases like PubMed, web of science, and Cochrane, where a wide range of medical terminology combinations were employed to identify relevant articles. Additionally, Google Scholar was manually explored for pertinent research terminology. The primary objective of this literature review was to cover several critical areas, including dental anomalies and their classification, the role of dental restorations in managing dental anomalies, endodontic and orthodontic treatments, as well as surgical interventions. It's important to emphasize that the articles selected for inclusion in this study were subjected to a rigorous evaluation process, adhering to specific criteria to ensure a comprehensive and robust foundation for the research project.

DISCUSSION

Types of dental anomalies

Dental anomalies, also known as dental abnormalities or dental irregularities, refer to variations in the structure, size, shape, number, or positioning of teeth. These anomalies can occur due to genetic factors, developmental issues during tooth formation, trauma, or other unknown causes.¹ They can be classified based on anomalies related to the number of teeth, size of teeth, shape of teeth, and eruption time. Anomalies involving the number of teeth present in a dentition can present as either hyperdontia; presence of extra, or supernumerary teeth (Figure 1), or hypodontia, which is the absence of one or more permanent teeth.¹ Dental anomalies affecting the size of teeth make them look either bigger, such as taurodontism, where the body of the tooth is enlarged, causing the roots to be shorter and the pulp chamber to be elongated, or smaller, like peg laterals, commonly known as microdontia.⁵ Irregular shaped teeth can also be included in types of dental anomalies, with common examples such as dental fusion, dens invaginatus, dens evaginatus, or gemination.⁵ Anomalies related to the eruption time of teeth usually involve teeth that have either erupted before their given time or have been delayed, such as impacted teeth.¹ Lastly, other anomalies

involving the oral mucosa, palate, maxillary, or mandibular bone can also be included under the umbrella of dental anomalies. A commonly occurring example of such is cleft lip and palate in children.¹ The management and treatment of dental anomalies vary depending on the specific condition and its impact on oral health and aesthetics. Early diagnosis and intervention are often key to managing dental anomalies effectively and preventing complications.

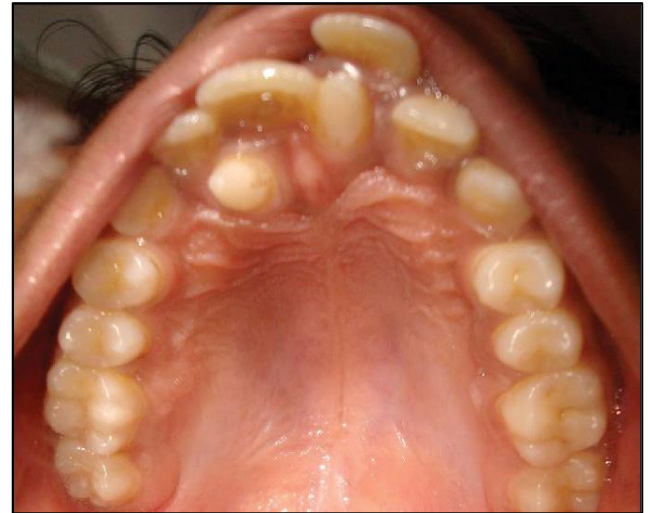


Figure 1: Hyperdontia/ supernumerary teeth in permanent dentition.²⁴



Figure 2: Gemination of maxillary lateral incisors.²⁵

Restorative treatment options

Restorative treatment options in the context of dental anomalies encompass a broad spectrum of techniques and procedures employed by dental professionals to address various developmental irregularities and anomalies that may affect a patient's oral health and overall well-being. The primary objective of restorative dentistry is to rehabilitate teeth that have structural or aesthetic issues, thereby improving both their function and appearance.

This comprehensive approach is essential for enhancing the patient's oral health and their overall quality of life.

Prosthodontic

Ideally, in cases where practitioners are needed to restore the normal form, function, and appearance of the malformed tooth, direct composite restorations and veneers play an important role.¹⁸ Direct composite restorations are a vital component of restorative dentistry. This technique involves the skilled application of composite resin to repair and reshape damaged or malformed teeth. The composite material can be colour-matched to the patient's natural teeth, ensuring a seamless and aesthetic result. Dental veneers are thin shells of porcelain or composite resin that are bonded to the front surface of teeth to improve their appearance. In addition to that, individual crowns and bridges have also been preferred. Crowns and bridges are restorative options that are often chosen when the patient requires both aesthetic improvement and enhanced tooth strength. They can improve the appearance and strength of the tooth. They can be made from materials like porcelain, metal, or a combination of both. Dental bridges are used to replace missing teeth by anchoring artificial teeth (pontics) to the adjacent natural teeth (abutments). This is a restorative approach for patients with congenitally missing teeth or other tooth loss issues.^{18,19} However, there is a risk of pulpal exposure during crown cutting in cases where the pulp chamber is abnormally near the cuspal wall. It usually happens in taurodontism, microdontia, and other irregularly shaped tooth conditions.¹⁸ Dental implants and dentures are widely utilized options for the replacement of missing teeth. Dental implants involve the surgical placement of artificial tooth roots into the jawbone, allowing for the attachment of prosthetic teeth. Dentures, on the other hand, are removable prosthetic devices that replace multiple missing teeth. However, it is essential to note that dental implants and dentures should only be considered when the growth of the mandible has been completed to ensure their long-term effectiveness.^{18,19} In cases where dental anomalies are characterized by structural irregularities, such as missing or extra teeth, malformed teeth, or size discrepancies, prosthodontic interventions play a crucial role in restoring both form and function, ultimately enhancing the patient's oral health and overall quality of life.

Endodontic and operative

Dental anomalies may extend to cases where damage to the dental pulp is evident. In such instances, endodontic and operative treatments are essential to salvage the affected tooth and prevent further complications. This procedure removes infected or damaged pulp tissue and seals the tooth to prevent further infection. Multiple case reports suggest that in several cases of dental anomalies such as taurodontism, gemination, and other shape related dental defects, endodontic therapy has been the treatment of choice.^{20,21} This intervention not only saves the

affected tooth but also alleviates associated pain and discomfort. Dental anomalies may include teeth with cavities or defects in the enamel. Dentists can use dental fillings, such as composite resin or amalgam, to restore the shape and function of these teeth.²² Fillings can be composed of materials like composite resin or amalgam, and they are customized to match the natural tooth colour, ensuring a seamless and aesthetically pleasing result. Dental bonding is another possible intervention which involves the application of a tooth-coloured resin to repair minor tooth defects, such as chips, cracks, or gaps. It is a conservative and cost-effective option for addressing dental anomalies.²² Dental bonding not only restores the tooth's structural integrity but also enhances its appearance, addressing dental anomalies effectively. Endodontic and operative treatments serve as indispensable components of restorative dentistry, offering tailored solutions for patients with dental anomalies that encompass structural issues, cavities, and minor defects. These procedures play a pivotal role in preserving oral health, function, and aesthetics.

Orthodontic

For dental anomalies associated with misalignment or malpositioning of teeth, orthodontic treatments are a primary consideration. Orthodontic treatment, which may include the use of traditional braces or more discreet alternatives like Invisalign, is employed to correct the misalignment or malpositioning of teeth. These treatments focus on repositioning the teeth within the oral arch, ultimately improving both their function and aesthetics. Orthodontic interventions are particularly beneficial in cases where dental anomalies affect tooth positioning, causing functional challenges and aesthetic concerns.¹⁷

Surgical

In severe cases of dental anomalies, surgical procedures may be necessary to achieve optimal outcomes. Orthognathic surgery is a surgical intervention employed to correct jaw alignment issues. Dental anomalies that involve significant jaw misalignment or irregularities in the position of the upper and lower jaws can benefit from this procedure. Orthognathic surgery aims to reposition the jaws, resulting in improved oral function and aesthetics.²³ Dental anomalies may also give rise to impacted teeth, which are teeth that cannot erupt into their proper position due to obstruction or lack of space. In such cases, surgical removal of impacted teeth is often required. This procedure not only alleviates associated discomfort but also prevents potential complications and supports overall oral health.²³

The specific restorative approach chosen for a dental anomaly depends on the nature and severity of the anomaly, as well as the patient's individual needs and preferences. Dentists and specialists usually assess each case individually and develop a customized treatment

plan to achieve the best possible outcome. Regular dental check-ups and early intervention are crucial for addressing dental anomalies effectively.

CONCLUSION

Restorative treatment options for dental anomalies are a vital component of modern dentistry, offering a comprehensive toolkit to address a wide range of structural, functional, and aesthetic irregularities in teeth. Prosthodontic solutions, such as crowns, bridges, dental implants, and veneers, provide effective means to restore form and function while enhancing aesthetics. Endodontic and operative procedures, including root canal therapy and dental fillings, are essential for salvaging teeth with damage to the dental pulp or defects in the enamel. These interventions not only preserve teeth but also alleviate discomfort and prevent further complications. Orthodontic treatments, such as braces and Invisalign, are instrumental in correcting misaligned or malpositioned teeth, improving both function and aesthetics. Surgical approaches, like orthognathic surgery and the removal of impacted teeth, are reserved for severe cases, addressing issues related to jaw alignment and impacted teeth. The choice of treatment depends on the specific anomaly and its impact on the patient's oral health and well-being. Early diagnosis and intervention are paramount, as they enable dental professionals to tailor treatment plans that address the unique needs of each patient, ultimately contributing to improved oral health, function, and overall quality of life.

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