Submitted: 03 June, 2024 Accepted: 28 February, 2025 Published: 03 July, 2025 DOI:10.22514/jocpd.2025.070

REVIEW

Journal of Clinical Pediatric Dentistry

Missing teeth—revisiting evidence and treatment guide

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Abstract

Missing teeth prevalence presents a multifaceted challenge determined by environmental, evolutionary and genetic factors. If untreated, this condition significantly impacts both psychological well-being and functional abilities. Treatment options include removable and fixed dentures, dental implants and orthodontic space closure. Long-term follow-up and potential repeat interventions impose varying financial burdens. In this article, we reviewed the diagnosis and terminologies essential for effective communication among healthcare providers, alongside an understanding of treatment modalities specific to missing teeth and the patient's age. We emphasize the importance of team approaches for optimal patient care. To better understand the advantages and disadvantages of various treatment options and management strategies for specific missing teeth at different ages, we resorted to presenting relevant literature.

Keywords

Hypodontia; Anodontia; Oligodontia; Tooth-agenesis; Orthodontic space closure; Implant restorations; Fixed partial dentures; Removable partial dentures

1. Introduction

During normal dental development, one would expect a patient to have 20 primary teeth and 32 permanent teeth. If the number of teeth is less than expected for a given dental or chronological stage, one may diagnose that a tooth or several teeth are missing. Several etiological factors could help explain why an individual is missing teeth, including but not limited to: (1) history of extractions, (2) loss due to trauma, (3) impacted and hence not visible in a dental arch, (4) translocated—not preferred location, giving an impression of missing teeth, (5) pathology—many syndromes are associated with a decreased number of teeth, and (6) congenitally missing—missing teeth due to unknown reasons.

The diagnosis of "congenitally missing teeth" may be considered misleading and inaccurate as "congenitally" implies that the condition is present at birth [1]. While some teeth begin their development before birth, most teeth initiate and complete this process after birth. Therefore, the presence of most tooth germs can only be confirmed during childhood. The term "tooth agenesis" [2] refers to the developmental failure to form a tooth. While diagnosing for tooth agenesis, one must keep in mind to consider not just the dental and chronological ages, but also the expected eruption age range, and possibility of late or delayed dental development. The differences in dental age vary with ethnic backgrounds, gender and even within a family [3].

In 1960, Nolla [4] described the stages of tooth calcification. The dentition development starts during the 2nd month of embryogenesis and continues into the early 20's when the 3rd molar erupts. For the primary dentition, mineralization starts prenatally, while for the first permanent molars, mineralization initiates perinatally [4]. All primary teeth erupt by 3 years of age. All permanent teeth (except 3rd molars) erupt by 12–14 years of age. Second premolars may begin forming as late as 9–10 years of age. This delayed mineralization can lead to a false-positive diagnosis of tooth agenesis even at 6 years of age [5]. A clinical examination and radiographic assessment are needed for later confirmation. Dental age and chronological age variation mandates late conformation for correct diagnosis [3].

2. Methodology

A search was conducted in UC Library Search, UCLA Library's discovery and catalog platform, for the term "hypodontia". This initial search returned 13,236 results. The results were limited to materials published between 2010 and 2025 and in English. Three additional rounds of filtering were done. The first limited the results to books, book chapters and reviews. The second limited the results to materials contacting the terms human beings, dentistry, hypodontia and dental therapeutics. The final round excluded duplicates, case-reports and chapters specific to a pathology or syndromes. The final results included five books and ten book chapters. A hand search was then conducted for the references in the included publications. Both authors selected the most pertinent articles independently, then consulted with each other to include the most pertinent publications.

A second search was conducted in PubMed utilizing the following search strategy: (missing teeth) AND (treatment OR removable partial dentures OR fixed partial dentures OR

implant restorations OR orthodontic space closure). This search yielded 18,799 results. The results were reviewed by the authors with articles focusing on the diagnosis and treatment of missing teeth in growing patients included. A review of the references in selected articles identified additional articles on clinical indications for the diagnosis and treatment of missing teeth.

3. Terminology

Anodontia refers to the absence of teeth in the oral cavity. It can be classified as: True—teeth are naturally missing, False—teeth are missing due to extractions or pseudo—indicating the presence of unerupted teeth. True anodontia can be further divided into partial and total anodontia. Total anodontia indicates that all teeth are missing and may involve the primary and/or permanent dentition [6, 7]. Partial anodontia refers to the absence of one or more teeth, but not all. It is further categorized into hypodontia, where one to five teeth are missing (excluding the third molars) and oligodontia, where six or more teeth are absent (excluding third molars) (Fig. 1, Ref. [3, 7]).

4. Prevalence

One of the most common developmental anomalies in humans is tooth agenesis [8], however, it varies geographically. Tooth agenesis is most prevalent in Southeast Asians (20.9%), followed by Europeans (14.5%) and least common in sub-Saharan African (0.5%) [9].

Anodontia is present in 0.01% of the population [7]. When anodontia is associated with syndromes like ectodermal dysplasia syndrome [3], it is referred to as Syndromic anodontia. Non-Syndromic anodontia is very rare [3]. Oligodontia is a term used when 6 or more teeth (excluding third molars) are missing with the prevalence of 0.1% [3]–0.2% [7]. Hypodontia reflects 1 to 5 absent teeth (excluding third molars) with a 5% prevalence [7]. About 20% of individuals (1 out 5) have a third molar that is missing [3, 10]. Females are 1.37 times more likely to have missing teeth than males [3, 7]. The maxillary dentition is 36% more affected than the mandibular dentition [9]. Tooth agenesis is seen more commonly in the permanent dentition when compared with the primary dentition [7]. Deciduous maxillary lateral incisors and deciduous mandibular central incisors account for 50% to 90% of affected deciduous teeth, usually followed by the absence of the corresponding permanent teeth [2, 3]. It is most common for 1–2 teeth to be missing and most often presents unilaterally [2, 3].

Butler's Field theory [11] suggests that the tooth that develops last in its dental group is most likely to be missing. Following this concept, the most affected teeth would include the lateral incisors, second premolars and third molars [3] (Fig. 2). In Caucasian populations, the mandibular second premolar is the most frequently missing tooth, followed by maxillary lateral incisors, maxillary second premolars and mandibular incisors [3]. In Chinese, Japanese and Korean populations, the mandibular incisor is the most commonly missing tooth [10]. Mandibular second premolar agenesis mostly presents as unilateral agenesis, while with maxillary lateral incisors the occurrence is mostly bilateral agenesis [2]. Conversely, permanent maxillary central incisors, mandibular canines and first molars are the least affected teeth [10] (Fig. 3).

5. Etiology

There are four theories which seek to explain the possible cause of missing teeth due to agenesis [2]:

(a) Human evolution—This theory suggests that the intermaxillary complex becomes shorter and the number of teeth

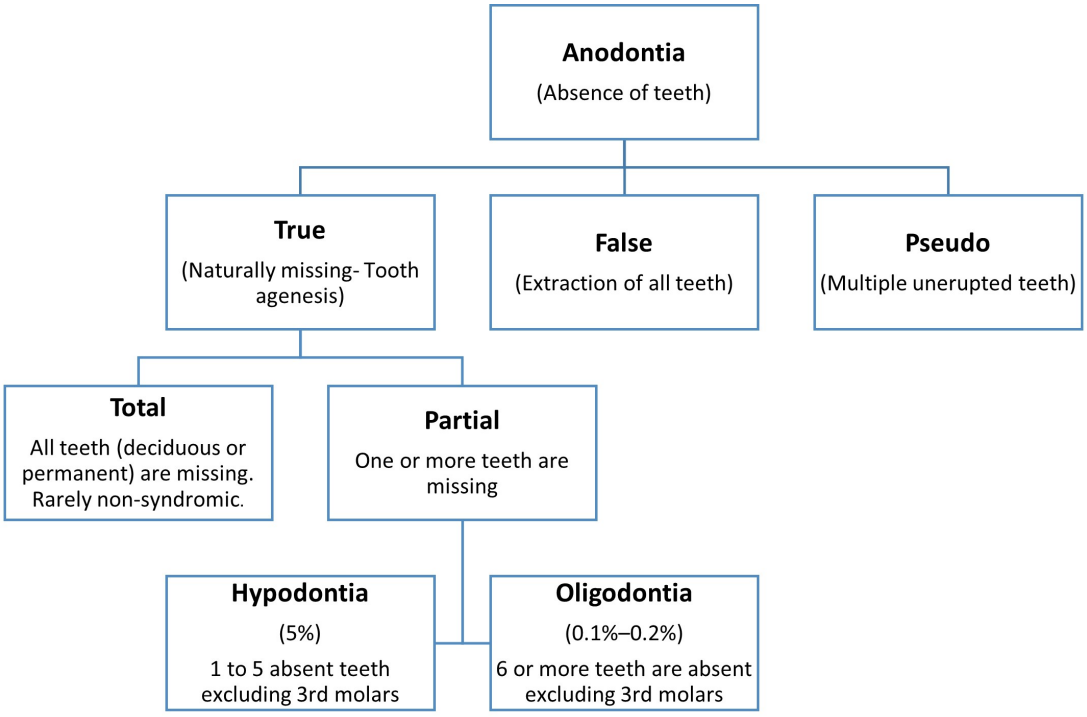

FIGURE 1. Terminology for missing teeth [3, 7].

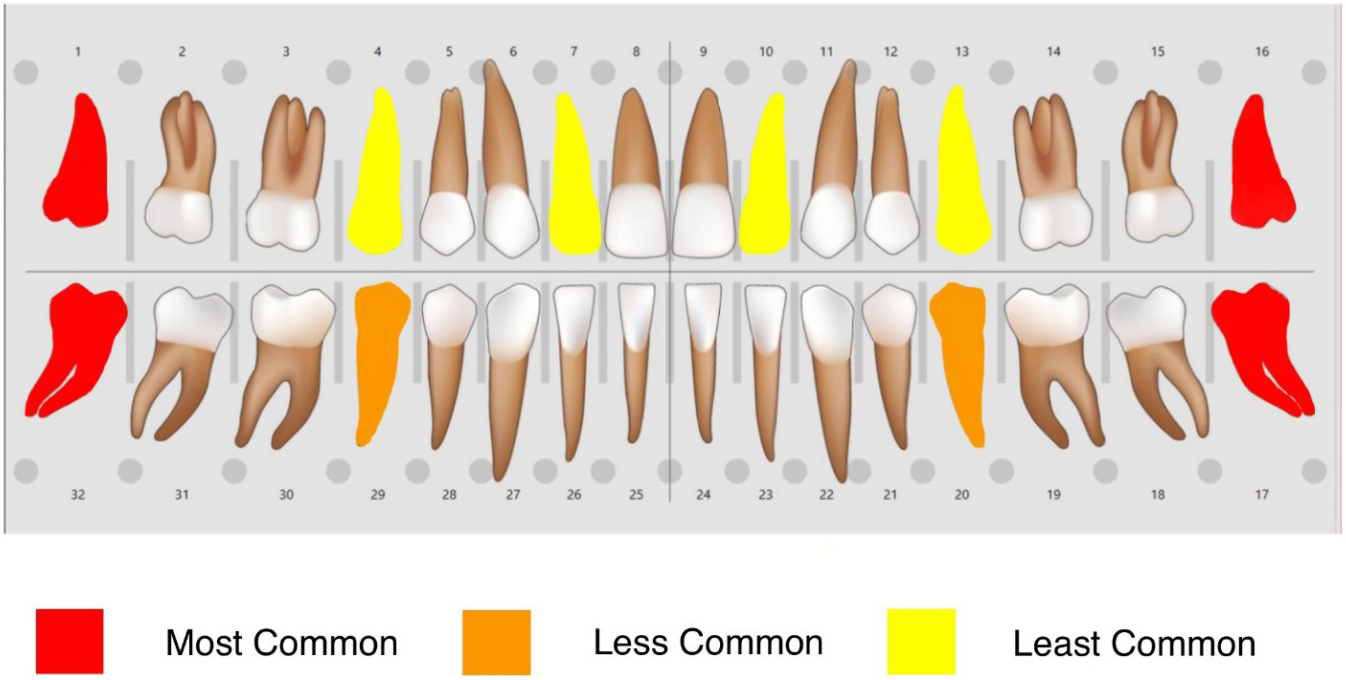

FIGURE 2. Prevalence of missing teeth.

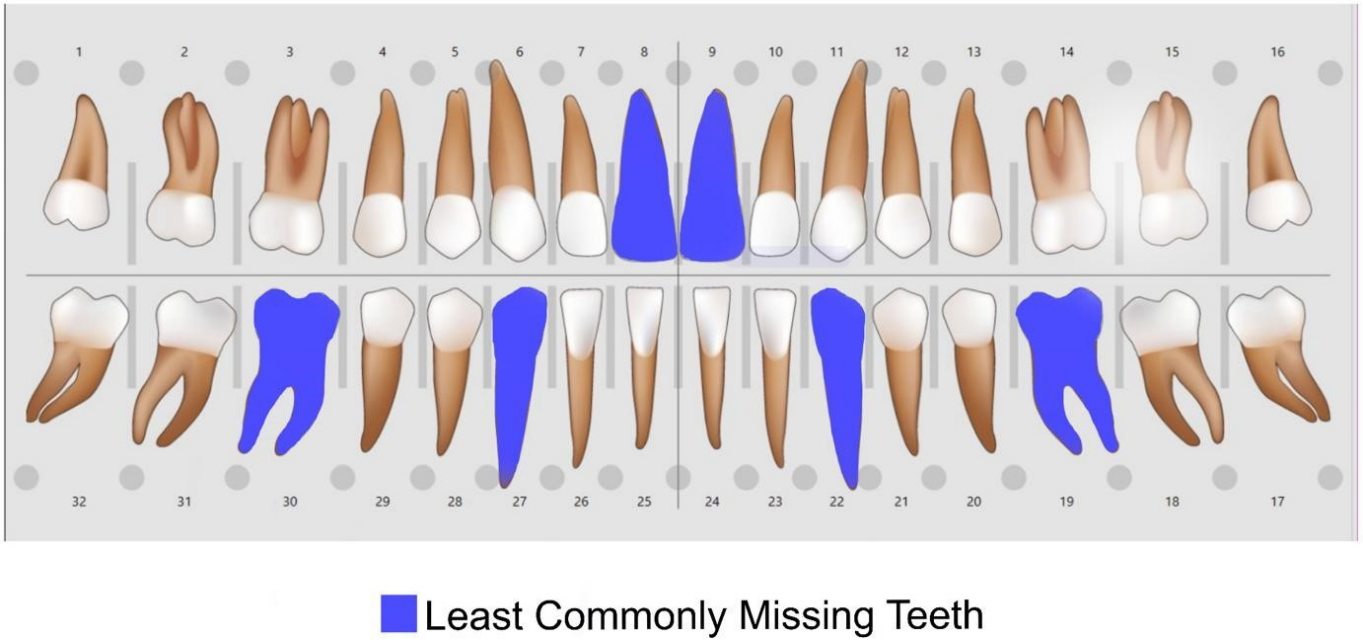

FIGURE 3. Prevalence of missing teeth.

decreases because of reduced arch length [2, 8]. The tooth at the end of each region is less stable (incisors, canines, premolars, molars) [12] and susceptible to agenesis.

(b) Anatomical—States that specific areas of the dental lamina are prone to environmental effects throughout tooth maturation [2, 13]. The teeth that develop in areas of initial fusion (incisors) of the jaw and the region where development of innervation is last (premolars) is the most sensitive and lead to agenesis.

(c) Environmental—The environmental theory purports that external factors affect the position and physical development of teeth including trauma [2, 3, 14, 15], smoking [2, 14], alcohol consumption, infections during pregnancy (severe intrauterine disturbances, rubella [2, 3, 12], rickets [15], syphilis [15], German measles [15], local infection affecting tooth buds [15]), pollutants, dioxins [3], surgical intervention [14], Glandular dysfunction [15], cancer treatment (Thalidomide, embryopathy [2], hematopoietic stem cell transplantation [14], radiation [2, 3, 14, 15], combination chemotherapy) [2, 3, 14].

(d) Genetics—The genetics theory claims that tooth development involves a series of genetically controlled successive interactions. At least 200 genes (including *AXIN2*, *MSX1*, *PAX9*, *EDA*) are expressed and involved in tooth development [2, 8, 12, 14]. More than 50 syndromes exhibit hypodontia as a

major feature including ectodermal dysplasia [10, 14], Down's syndrome, and Incontinentia pigmenti [10, 14]. Polygenetic theory explains that mutations in one or more genes affect dental development and cause tooth agenesis [16]. Multifactorial theory explains that most of the craniofacial characteristics are influenced by both environmental and genetic factors through complex interactions. Environmental factors affect genetic regulation and trigger genetic anomalies [2].

6. Impact of missing teeth

Missing a single tooth or multiple teeth can have a functional, psychosocial and/or financial impact on an individual. From a functional perspective, missing teeth can lead to spacing between teeth, which decreases the size of the occlusal table making chewing difficult. Missing posterior teeth often cause the opposing teeth to over erupt, poor gingival contours, non-working interferences and deepening of the bite [17].

The retrospective study by Hobkirk *et al.* [12] observed that patients with hypodontia frequently reported issues such as gaps between teeth, unsatisfactory aesthetics and noticeable missing teeth. The group concluded that postponing patient referrals can adversely affect their social and educational growth [10, 12]. The extent of the complaints was directly proportional to the number of missing permanent teeth. There were no complaints if there were retained primary teeth [17]. Al-Bitar *et al.* [18] reported that spacing between the teeth or missing teeth in children was the second most common reason for the children to face bullying in schools.

The financial impact of missing teeth is substantial. It may involve multiple counseling appointments with an experienced team of dental specialists, to determine and address short- and long-term treatments, followed by long-term maintenance [5].

7. Treatment

The treatment options for missing teeth vary widely. Possible treatment approaches could include no treatment, use of space maintainers, removable options (Essix, partial dentures, complete dentures, overdentures), fixed restorations (composite build-ups, resin bonded bridge, Maryland bridge, fixed partial dentures, implant retained), hybrid (fixed—removable) or auto-transplantation. To select the best treatment option, it is crucial to consider the dental and skeletal characteristics linked to missing teeth, the specific location of the missing teeth, the patient's age and their preferences regarding aesthetics and cost.

The dental and skeletal conditions associated with the missing teeth lead to various abnormalities in tooth development and alignment, as well as skeletal structures, which can impact dental health and orthodontic treatment.

Dental features can include the infra-occlusion of retained primary teeth and reduced alveolar development, which complicate both prosthodontic management and orthodontic tooth movement [5]. Additionally, there is typically a delay of about 1.5 years in the eruption of permanent teeth, postponing the start of orthodontic treatment [5]. Microdontia, whether localized or generalized, affects the crowns and roots, contributing to spaces [5]. Conical teeth can be a localized (peg laterals) or generalized feature [5]. Ectopic maxillary canines, which may erupt into the lateral incisor space with a palatal inclination [2], becoming impacted or transpositioned [5]. Retroclined and over-erupted lower incisors can lead to an increased overbite [2].

Skeletal features include reduced lengths of the maxilla and mandible [2] a tendency towards Class III malocclusion [5] and reduced anterior facial height [5].

7.1 Treatment strategies for missing mandibular incisors

No treatment is indicated if gaps are closed [10]. The midlines may not match but it is normally not a functional or esthetic concern. If gaps or primary teeth are present without permanent successors, the primary teeth should be maintained for alveolar ridge preservation until the appropriate time to restore the site or execute orthodontic space closure.

7.2 Treatment strategies for missing permanent lateral incisors

Primary lateral incisor is retained as a substitute until it exfoliates. Orthodontic treatment is typically necessary to align the adjacent teeth, ensuring proper coronal and apical spacing for the chosen restorative plan. If the primary lateral incisor is lost before facial growth is complete, an interim tooth replacement is required [10].

Prior to orthodontic intervention, a removable appliance with a prosthetic incisor such as an Essix retainer with a pontic or a temporary partial denture can be fabricated to provide improved esthetics [19]. Following orthodontic retention, if removable appliances are used, the roots of the central incisors and canines may converge, making future implant placement more challenging. A fixed retention approach with a resin bonded bridge, Maryland bridge or fixed partial denture could be utilized until facial growth is completed [10].

Placing an implant-retained restoration before facial growth is complete can lead to occlusal, periodontal and esthetic complications [20]. Implants and implant retained restorations are best after growth cessation, which is typically about 16–17 years of age for females and 20–21 years of age for males. The most dependable way to determine the end of significant facial growth is by superimposing serial cephalometric radiographs, taken at intervals of 6 months to 1 year [10].

Implants may not be feasible if the patient is unwilling to undergo orthodontic treatment or necessary ridge augmentation, or if an ideal site for implant placement cannot be achieved. A resin-bonded fixed partial denture is the least invasive tooth replacement but debonding is common complications with this treatment approach, often due to a deep bite, proclined teeth or bruxism [10].

When a canine is moved into the space of a missing lateral incisor it is called a canine substitution. The difference in the size, shape, color, root volume and height of the gingival margin of the canine requires the canine(s) to be reshaped, bleached or restored with composite-build-up, or veneers or full coverage restorations. When conducting canine substations, the first premolar could be moved into the position of the canine. However, this presents some unique esthetic

challenges. First premolars are shorter and narrower than the canines that they are replacing and may require veneers or extraction [10]. A systematic review of studies comparing functional, periodontal and esthetic outcomes of prosthetic treatment versus canine substitution concluded that orthodontic space closure is preferable to prosthetic replacement [21].

7.3 Treatment strategies for missing canines

The absence of a canine in the dental arch beyond its normal eruption age can be diagnostically attributed to four potential causes: (1) recent or previous extraction, (2) agenesis of the canine, (3) over-retention or (4) impaction. Canine agenesis occurs less frequently when compared to other teeth. Canines rank 8th in the list of agenetic teeth with a frequency of 1.3% for maxillary canines and of 0.3% for mandibular canines [22].

Depending on the available space in the arch and its manipulation, three scenarios are possible. Firstly, orthodontic treatment can compensate for the absence of a canine by moving the first premolar into its position as part of the overall malocclusion correction. Next, if adequate space is available and no crowding exists elsewhere in the dental arches, then the missing canine can be replaced prosthetically without prior orthodontic treatment. Finally, orthodontic treatment can establish and optimize the coronal and apical space needed for the placement of an implant or a fixed/removable dental prosthesis, either as a standalone procedure or while addressing other aspects of malocclusion if present.

7.4 Treatment strategies for missing premolars

Retained primary molars in the absence of premolars can be submerged when compared with adjacent teeth. Additionally, retained primary molars are generally 1–2 mm wider than their successor premolars. Mesio-distal width disking can be performed to optimize space for future restorations. Primary molars may remain for extended periods, necessitating regular alveolar status checks with periapical radiographs to ensure adequate horizontal bone levels. Delays in exfoliation or extraction and vertical growth of bone can lead to vertical defects. Occlusal composites can prevent the super-eruption of opposing teeth, maintaining occlusal balance. Stainless steel and zirconia crowns enhance occlusal height and correct mesiodistal width, beneficial for future implants. Following the eruption of the permanent first molar, extraction of the primary molar, along with space maintenance or orthodontic space closure, are recommended [10].

7.5 Treatment strategies for missing molars

Third molar agenesis is the most common tooth agenesis and is seen in about 20% (1 out 5) of the population [2, 3, 10]. Missing third molars does not affect oral function or esthetics and thus does not require any treatment.

7.5.1 Shortened dental arch (SDA)

SDA is a term used by Käyser [23] to describe a dentition where most of the posterior teeth are missing, yet the dentition is able to support a normal masticatory system, providing sufficient oral comfort, without increasing attrition on the remaining teeth. SDA is characterized by the absence of molar support [23].

In a 6-year follow-up study on oral function in SDA, Witter *et al*. [24] reported that the lack of molar support does not pose a risk for cranio-mandibular dysfunction and provides adequate oral function in the long term.

7.5.2 Orthodontic treatment

The molars may be missing due to agenesis or extraction. Molar extraction is recommended for patients with extensive caries, hypoplasia, large restorations, apical pathoses or root canal treatment, excessive extrusion, ankylosis, posterior crowding, a hyperdivergent pattern and anterior open bite [25, 26]. Potential problems associated with a missing molar includes mesial tipping of the adjacent (distal) molar(s), distally drifted premolars, extrusion of opposing molars, sinus pneumatization, gingival invagination, edentulous alveolar ridge constriction, infra-bony periodontal pockets mesial to tipped molars, marginal ridge discrepancies, food impaction, and posterior collapsed bite are conditions that are more severe in the mandible than in the maxilla [27].

Orthodontic treatment can address these spaces in two ways: (1) regaining space by uprighting adjacent teeth, followed by prosthetic treatment, or (2) closing the space orthodontically without the need for additional prostheses [28].

Brown [29] suggested that uprighting mesially tipped molars significantly reduces the depth of existing periodontal pockets and increases the length of the clinical crown. The alveolar bone levels decrease between 0.5 and 1 mm. Graber [30] recommends uprighting the second molar to its normal position and stabilizing it with a fixed or removable prosthesis.

Stepovich [31] showed that the space from missing teeth can be closed even if the buccolingual width of the molar is wider than the edentulous space. In teenagers, the alveolar bone easily followed the tooth as it moved into a narrower edentulous space [31]. In contrast, half of the adult patients showed resistance to new bone formation during space closure, while the other half developed only minimal new bone. Both groups exhibited crestal bone loss mesial to the second molar, with the adult group experiencing twice as much loss. Root resorption was absent in the teenage group but occurred in two out of eight adult patients. Stepovich [31] concluded that spaces of 10 mm or more can be closed without tipping in both teenage and adult patients. However, maintaining closed spaces proved challenging in adult patients.

Hom and Turley [32] advocated space closure as a viable solution for missing mandibular first permanent molars. The adult patient who achieved the most significant space closure and minimal molar bone loss met the following criteria: (1) a mesiodistal space of around 6 mm or less, (2) a buccolingual ridge width of approximately 7 mm, and (3) a mesial molar bone level about 1 mm apical to the cementoenamel junction [32]. Reed *et al.* [33] concluded that the long-term periodontal health remains unaffected by the orthodontic movement of molars into edentulous sites.

Closing space through the maxillary sinus pneumatization caused by missing maxillary molars is challenging. There is

no evidence-based protocol to guide tooth movement through the maxillary sinus. Instead, the empirical application of light and constant forces for slow orthodontic tooth movement into the maxillary sinus is recommended [29]. For cases of significant maxillary sinus pneumatization, it's advisable to consider a sinus lift and bone graft before proceeding with implant placement, molar uprighting or tooth movement into the maxillary sinus. The recommended optimal timing for applying orthodontic force is 4 to 8 weeks post bone grafting [29].

In many instances, temporary anchorage device (TADs) assisted mechanics have not only made substantial second molar protraction possible, but also more complicated orthodontic movements including the up righting of horizontally impacted third molar and repositioning of these teeth into good occlusion. This approach has proven to be an effective alternative, substituting implants and bridges for the replacement of missing posterior teeth [27, 28].

For many patients, orthodontic intervention to close the space associated with missing teeth may not be practical. For these individuals, a more traditional restorative approach to reestablish esthetics and function may be more ideal. In 2017, Kumar *et al*. [26] found no significant difference in masticatory efficiency and performance between implant restorations and fixed partial dentures (FPD). Patients favored the shorter treatment duration of FPD restorations, but overall satisfaction was notably higher with implant-retained molar restorations.

Orthodontists often play a significant role in periodontic and prosthodontic treatments. In 2008 Mihram and Murphy [34] referred to Orthodontic treatment done to aid prosthodontic objectives as "Facilitative Orthodontics" [34]. Proper dental alignment of the arches not only facilitates a path of insertion of a prosthesis, but it also creates a physiological alveolar crest topography, often minimizing or eliminating the need for excessive periodontal surgery [34].

7.5.3 Facilitative orthodontic treatment

Orthodontic treatment may assist (facilitate) in optimizing the amount of space needed for a prosthetic solution. It may change the restorative option from an implant restoration for a missing upper lateral to a composite build-up or ceramic veneer in case of canine substitution. Orthodontic mesializing of second and third molars to close the space due to a missing first molar, will eliminate the need for any restoration.

Factors to consider for space closure or opening or optimizing space for restorations include [35]:

1. Patient's age (Table 1, Ref. [5]).
2. Extent of inherent crowding.
3. Condition of deciduous teeth.
4. Type of malocclusion.
5. Patient-specific factors (financial situation, available time, attitude towards treatment).

The influence of these variables can dramatically increase or decrease the complexity of managing a patient with missing teeth. They can also aid clinicians in determining if the inclusion of orthodontic therapy is needed to obtain a satisfactory clinical outcome. It is more likely that orthodontic treatment will be required when a patient is older and has a high degree of crowding, deciduous teeth in a compromised state, a Class II or III malocclusion and several suboptimal patient related factors. Conversely, orthodontic intervention will be less likely when the opposite variables are present. Clinicians are encouraged to be meticulous as they acquire and consider both clinical and demographic variables that could impact their ability to select and execute the most appropriate treatment for their patients.

8. Discussion

A complete set of teeth is crucial for proper jaw growth (form), chewing and speaking (function), self-esteem (psycho-social) and overall nutrition (health). When children have missing teeth, it presents a challenge for dentists. The causes of missing teeth are diverse, encompassing human evolution, genetic predispositions and environmental influences like trauma, periodontal disease and dental decay.

Creating a standard treatment plan for patients with missing teeth is challenging due to the varied causes and impacts of tooth loss across individuals and cultures. Teeth are often replaced not only for physical health reasons but also to address functional, social and psychological needs. Therefore, understanding what tooth loss means to patients and their expectations for the outcomes of various replacement methods is essential.

Effective communication between pediatric dentists and other healthcare providers is essential. This collaboration allows for a deeper understanding of each child's situation and the development of personalized treatment plans to address the specific missing tooth. There are several ways to replace a missing or lost tooth.

Removable partial dentures (RPD) have the advantage of being the most economical alternative to replace missing teeth. RPDs tend to be bulky, may not look or function as natural as fixed options and are associated with initial discomfort or irritation. There is an increase in plaque accumulation around the abutment teeth, leading to issues like bad breath, tooth decay and gum disease. The pressure and movement of the partial denture can cause trauma to the abutment teeth and gums [36].

Fixed Partial Denture (FPD) used to replace one or more missing teeth by anchoring to adjacent natural teeth. Considering that this option needs some tooth preparation (Reduction) to accommodate the framework thickness, some patients will refuse this treatment. The major reasons for suggesting the fixed partial denture are its clinical ease and reduced time and cost [37].

Implant restorations have gained wide popularity over the years as they can restore the function to near normal in both partial and completely edentulous arches. The advantage of the single-tooth implant lies in the fact that the adjacent teeth are not prepared. The adjacent teeth have a better prognosis, as they are not subject to a higher incidence of endodontic therapy and decay because of tooth preparation [38].

For the replacement of multiple teeth, dental implant prostheses were associated with higher initial costs but better improvements in oral health-related quality of life compared with fixed partial dentures and removable partial dentures [39].

The most common technical complications of fixed implant-retained single crowns are crown fractures, abutment fractures

TABLE 1. Age-appropriate treatment recommendations for missing teeth [5].

	Primary/Mixed dentition Stage Less than 12 years	Permanent dentition Stage 12–16 years	Permanent dentition Stage 16–20 years
Treatment recommendations	● Removable dentures for psychological and functional reasons. Retention and stability can be problematic and will need regular adjustment. ● Composite build-ups to improve esthetics and worn-out teeth to reduce spacing. ● If the patient is highly concerned about spacing, simple orthodontic treatment to close spaces. ● Extraction of primary canines if permanent canines are palatally positioned, as well as the extraction of severely infra-occluded molars.	● Maintain primary predecessor. ● Transplantation. ● Pontics can be placed on the fixed appliance and the retainer as a temporary measure. ● Composite build-ups of microdont and hypoplastic teeth. ● Overdentures (severe hypodontia)—abutments help maintain alveolar bone, improve retention and stability and provide proprioception.	● Single tooth implants or implants retained fixed or removal prosthesis —placed when most of the growth is complete. ● Orthodontics in combination with orthodontic surgery—for patients with severe skeletal discrepancies.

and aesthetic concerns. In multiple-unit, implant-retained fixed dental prostheses, the primary complication is the fracture or chipping of the veneering ceramic. For implant-retained overdentures, common problems include fractures or chipping of the overdenture and mechanical issues such as implant fractures, attachment failures and complications with attachment housing or inserts [40].

Biological failures associated with implant restorations include bacterial infections, microbial plaque buildup, progressive bone loss and sensory disruptions [41].

Compensatory eruption is a natural process of continuous eruption of natural dentition that maintains occlusion of teeth throughout life. Implants, just like ankylosed teeth, remain fixed in the bone and do not erupt along with natural dentition, leading to infraocclusion (the implant is apical to adjacent teeth) or implant infraposition. This issue is particularly apparent in actively growing patients but has also been reported in patients who receive implants during adulthood.

Treatment options addressing infraocclusion, based on severity, include simple retention; adjusting or replacing the implant restoration, possibly with adjacent teeth; surgical repositioning via segmental osteotomy with Osseo-distraction; submerging or removing the implant. Understanding the challenges associated with implant restorations, alternative treatments for missing teeth, such as autotransplantation, orthodontic space closure or resin-bonded fixed dental prostheses, should be considered [42].

Orthodontic treatment—When considering treatment options to address missing teeth, the first step is to decide whether to optimize the space for a restoration(s) or to close the space. Considering that orthodontic closure of the space may eliminate the need for restorations or decrease the number and complexity of restorations needed, it is preferable, but not always feasible or desirable.

Orthodontic treatment is planned using occluso-grams, visualized treatment objective and sectioned diagnostic waxing for movement of teeth, according to the prosthodontic treatment plan [43].

Facilitative Orthodontic treatment corrects occlusal, axial, rotational and space discrepancies facilitates tooth preparation, path of insertion, optimum oral hygiene, and a better pontic and abutment design, while occlusal forces can be directed against the long axes of the teeth for a more predictable prognosis.

Orthodontic—Prosthodontic interdisciplinary approach can be cost-effective to patients and their treating dentists from the standpoint of producing more stable, durable and esthetic restorations [44].

Dental Implants and FPDs were preferred, and high costs would be the major reason for refusal. For a variety of reasons, orthodontic intervention is often overlooked as a viable modality to correct occlusal, axial, rotational and space discrepancies before undertaking fixed prosthodontic rehabilitation. Orthodontic space closure is preferred over prosthodontic replacement for missing teeth [45].

9. Conclusions

Missing teeth can lead to significant emotional and physical challenges. To prevent these, early diagnosis and the creation of a clear treatment plan are essential. Treating missing teeth often requires a multidisciplinary approach, involving coordination among an interdisciplinary dental team. Balancing patient needs, managing expectations, considering financial constraints, leveraging the dentist's technical skills, and involving various specialists in a timely manner can be challenging, even for seasoned practitioners.

Various treatment options are available for addressing missing teeth, such as removable and fixed dentures, dental implants and orthodontic space closure. Clinicians play a crucial role in educating patients about these treatment alternatives.

It is important to highlight potential problems and limitations before beginning treatment to ensure patients have realistic expectations. The final treatment plan should result from evaluating both short- and long-term biological and esthetic considerations. Each of these options requires long-term follow-up and may involve multiple procedures throughout a patient's lifetime, potentially leading to varying financial burdens. By addressing missing teeth early on with age-appropriate treatment, pediatric dentists can help children develop healthy smiles.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

KDSS and KTS—formatted the review structure; performed the literature search independently, then consulted with each other to include the most pertinent publications. KDSS—wrote the manuscript. Both authors contributed to editorial changes in the manuscript. Both authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

ACKNOWLEDGMENT

Authors thank Adit Singh Sachdeva for developing illustrations and Jason Burton at UCLA Biomedical Library for consulting on the manuscript. Lastly, thanks to the peer reviewers for their opinions and suggestions.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Kanwar Deep Singh Sachdeva, Kelton T. Stewart. Missing teeth—revisiting evidence and treatment guide. Journal of Clinical Pediatric Dentistry. 2025; 49(4): 1-9. doi: 10.22514/jocpd.2025.070.