

Review Article

Speech Delay Due To Various Dental Anomalies And Their Management

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ABSTRACT:

Speech development is a complicated process requiring adequately controlled actions of oral structures, i.e., teeth, tongue, lips, and jaws. Dental anomalies, i.e., deviations from the normal development of teeth, have substantial effects on articulation and phonation, which either delay the child's speech or distort sound production. This paper describes how dental anomalies are involved in speech delay, including malocclusion, missing teeth, supernumerary teeth, and ankyloglossia. It discusses how anomalies and disrupt speech production and points out the need for early identification and concurrent treatment with pediatric dentists, orthodontists, and speech-language pathologist. Treatment is likely to be efficient when dental anomalies are identified and corrected and the speech pathologist introduces targeted speech therapy for optimum communicative effect.

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INTRODUCTION

The acquisition of speech and language serves as a crucial developmental landmark in childhood (Putri et al., 2024). Clear sound articulation depends on the rather complicated, precise, and purposeful interaction of several physiological systems: the respiratory system, the larynx, and, very importantly, the articulators inside the oral cavity. Among the articulators are the tongue, lips, palate, and teeth (Lubis et al., 2025). Any abnormality or deviation in these oral components can hamper the normal air flow, the manner in which the tongue performs precise placement, or how the lips close properly. All these can equally hinder the formation of certain sounds, a condition which is generally termed as a speech sound disorder (SSD) or, sometimes, speech delay (Rvachew & Matthews, 2024). The importance of these oral mechanisms in setting the acoustic criteria for speech cannot be overstated; they must be well formed and functional if the articulation is to be intelligible.

Dental anomalies, which can be defined as an atypical number, size, shape, or position of teeth, are considered to be fairly common in children. Much has been made about the implications of dental anomalies on oral function, esthetic, and chewing function, but an increasing volume of scientific literature suggests

a greater concern exists in regard to the impact of dental anomalies on the process of speech development. The dental arches' structure and function, as well as the development of proper bite (occlusal relationship) are crucial to establish points of contact and barriers with the tongue and lips. These considerations allow for airflow to be manipulated and controlled for precise movements for phonetic and non-phonetic speech (Rokaya et al, 2024). When the necessary components are impaired due to anomalies, children may demonstrate compensatory oral movements or altered airflow patterns. These may accommodate the expected and intended sound to be produced in the children minimally but also typically represent distorted speech. A comprehensive understanding of the interdependencies between dental morphology and phonological development is essential in pediatric practice (Costanzo et al, 2024).

This paper will provide an overview of the complex type of dental irregularities, with salient references to the manner in which they mechanically disrupt the mechanical processes of speech production that are inherently complex. Moreover, an important goal of this work will be to explore viable intervention and management of speech delays attributed to dental irregularities. Ultimately, this paper will emphasize a multimodal approach requiring coordination between

dental services (i.e., pedodontists, orthodontists) and speech-language pathologists where early identification and intervention are paramount to communication success for children diagnosed with these speech delay issues. The information included in this paper aims to better inform and equip healthcare providers to be more informed about how oral structural integrity supports intelligible vocalization so they can conduct more effective interventions.

DENTAL ANOMALIES AFFECTING SPEECH DEVELOPMENT

Arrays of dental disorders have been repeatedly correlated with issues in speech development and articulation. One of the most common types is malocclusion, defined as any variation from the ideal relationship of the teeth and the the balanced position of the upper and lower dental arches. There are many types of malocclusion and all types will impact different aspects and severity of speech production. For example, an anterior open bite; an anterior open bite is the vertical distance between the upper and lower anterior teeth in occlusion- where the jaws are closed, an anterior gap is created. This presents a specific structural dilemma in speech production by making the production of sibilants like /s/, /z/, /ʃ/ (sh), /ʒ/ (zh), and fricatives /f/, /v/, /θ/ (th), and /ð/ (voiced th) very difficult. The challenge is the open bite affects the air seal needed for these sounds and reduces lateral tongue-to-palate contact. Therefore, the air escapes out the front producing a classic sounding lisp (Aprile et al., 2025).

Class II malocclusion, commonly referred to as an overbite or protrusion, is described in the literature as a condition where the upper jaw and teeth are positioned too far forward in relation to the lower jaw. Conversely, that severe overbite is sometimes a hindrance to the articulation of labiodental sounds (/f/, /v/) due to little contact between lips and teeth. A third informant about this type of malocclusion is the effect on sibilants if the tongue does not have enough space to execute the movement properly (Tashkandi et al., 2025). In another way, Class III malocclusion, often known as an underbite or prognathism, takes place when the lower jaw and teeth surpass the upper teeth. This anterior displacement considerably hinders the realization of bilabial sounds (/p/, /b/, /m/) and many lingual-palatal ones. The tongue is usually forced into compensation positions to allow for sound production, leading to distorted speech (Tran et al., 2024).

A crossbite is when the upper teeth bite inside the lower teeth, usually in the anterior or posterior area of the mouth. Anterior and posterior crossbites can affect normal tongue movement and jaw symmetry which impacts the precise production of multiple sounds, especially sibilants or sounds requiring lateral tongue placement (Rashid et al., 2024). In addition to specific types of crossbites, dental alignment

problems also contribute to these issues. Severely crowded teeth can physically limit the tongue's movement and reduce its ability to create the shapes that are essential to clear articulation. Alternatively, lots of spacing, or diastema, present between teeth can lead to uncontrolled air leaking which also affects clear articulation, especially sounds that require a tight seal in the oral cavity for proper production (Palakolanu et al., 2024). The multitudes of dental anomalies support the important relationship between oral structure and clarity in speech.

The health of teeth is an important aspect of clear speech, and any alterations can produce serious problems in articulation. The lack of teeth can be referred to medically (as in either hypodontia or anodontia) and it can have a significant effect on the anterior incisors, as they are often the ones that help the tongue to direct and control airflow for producing sounds, such as /s/, /z/, /t/, /d/, and /n/. The tongue will direct airflow in a specified direction, but teeth also help, by having a point of reference, to allow the tongue to block upward or lateral airflow only as it relates to a sound productively. When teeth are missing, the controlling air is allowed to escape uncontrollably, often leading to dense production of sibilance, or indistinct pronunciation. Temporary loses of primary (deciduous) teeth can be tolerated by children but when there is a permanent loss, or congenital lack (hypodontia), and the teeth are absent for lengthy periods of time, it can lead to speech ineffectiveness that is often slower to remedy and more pronounced (Kramarczyk et al., 2024). Conversely, the presence of an overabundance of teeth, often referred to as supernumerary teeth and hyperdontia in adults, can also create barriers in the validity of speech. In this case, the added teeth are believed to generate crowding, thus displacing normally parallel teeth and acts as physical barriers to the movement of the tongue. This is like the medical condition of severely crowded teeth that could limit the individual with regard to the adequate room required for articulating in a valid manner. It follows that in every occurred distorted speech sound looks like the normal sound, but has no accuracy regarding tongue position (Fabus et al., 2024).

While the number of teeth is important, different forms of teeth matter as well. Differences in shape include variations in tooth set-up, such as peg laterals (the little, cone-shaped incisors) or unusually large (macrodontia) or small (microdontia) teeth can slightly change and affect the positioning of your mouth structure. These changes may affect where your tongue naturally rests or moves and the flow of air according to your speech (Balakrishnan & Srinivasan, 2024). Even slight shifts could upset the balance which allows for understandable speech. Additionally, it may not be a dental concern, but ankyloglossia aka tongue tie, which is when the band of tissue which binds the tongue to the floor of the mouth is too short or tight and can severely limit the

tongue's mobility. These limitations can have implications for possible use and production of sounds, where the tongue would have to lift, stick out, or laterally move; such as /l/, /r/, /t/, /d/, /n/, /s/, and /z/ (DOĞAN, 2024).

MECHANISMS OF SPEECH IMPAIRMENT

Malocclusions and missing teeth are dental anomalies that interfere with speech production through multiple channels. The malocclusions and missing teeth change the natural reference points where the tongue and lips make contact for optimal articulation. In response to these changes, the articulators make compensatory movements that may ultimately fail to produce the intended speech sounds. In addition to articular reference points that contribute to speech accuracy, successful articulation requires controlled airflow through the oral cavity (Shahid et al., 2024). The controlled airflow is reduced when gaps occur (when teeth are missing), if there is an open bite, or if dentition has extra spaces. In these situations, air can escape too easily, resulting in speech sound characteristics, such as lisping or vague or indistinct speech. The ineffective formation of an oral seal, for certain speech sounds, directly influences the accuracy of the sounds through compromise.

Additionally, the movement of the tongue or lips can be severely restricted because of physical barriers from conditions such as crowding, or ankyloglossia (tongue tie). These restrictions stop the articulators from making specific movements or combinations of movements needed to reliably produce certain phonemes. For example, a tied tongue cannot raise its tongue high enough to produce the /l/ or /r/ sounds. In the face of these structural limitations, a child may unconsciously develop abnormal compensatory movements to produce sounds, and these learnt patterns may become so ingrained that they not only continue to exist when the original tooth malformation is corrected, but also contribute to the client having disordered speech, albeit to some extent the learning facilitated some type of communication (Siniša Franjić, 2024). This conceptualizes the significance of remediating learnt speech patterns, with speech pathology interventions as well as dental treatment.

MANAGEMENT OF SPEECH DELAY DUE TO DENTAL ANOMALIES

Proper management of speech delay as a result of dental anomalies requires a trans-disciplinary approach with dental professionals (pediatric dentists and orthodontists) and speech-language pathologists (SLPs). Timely identification and treatment can be crucial for management of speech delay and overall benefit.

Dental and orthodontic treatments: Ideally, speech delay as the result dental anomalies can be properly managed with precise dental and orthodontic

treatment. In orthodontic treatment, as with our previous examples, children can receive care using traditional braces, clear aligners, or functional appliances, which seek to correct misaligned teeth and improve malrelationships of the jaw. In the case of orthodontic management, early treatment could avoid severe malocclusions from being established and negatively affecting speech development (Melo et al., 2021). If the child is missing teeth, preserving the dental arch is vital, thus offering a space maintainer or prosthetic devices (such as pediatric partial dentures) will restore an essential structural basis for the tongue and lips in speaking. Meanwhile, the presence of supernumerary teeth (extra teeth) or significant dental crowding may require extractions in order to develop sufficient space for normal tooth alignment and tongue space needed to speak clearly (Goswami & Chauhan, 2023).

In cases like ankyloglossia (more commonly referred to as tongue-tie), a surgical procedure called frenectomy (the surgical release of the lingual frenulum) can positively affect tongue movement. An immediate functional and meaningful improvement in tongue movement and function translates directly into much better articulation. Surgical intervention not only relates to tongue function but it can also be appropriate in obtaining surgical correction options for severe skeletal discrepancies that need orthodontic intervention to further any intended relationship. (Carnino et al., 2024). Last but not least, the treatment of detrimental oral habits, such as thumb sucking or prolonged pacifier use, is of utmost importance. Such habits can literally cause certain malocclusions (like anterior open bites) that detrimentally affect speech clarity (Adriano et al., 2023). Having a well-rounded response to oral health, therefore, is a necessary approach for the promotion of optimal speech development.

Speech-language pathology (SLP):Speech-Language Pathologists (SLPs) are vital for the treatment of speech delays associated with dental anomalies. The first step is a full evaluation to determine what specific speech sound errors and speech sound production patterns are in place. Importantly, the SLP must arrive at a conclusion about how the dental anomaly influences speech production. There are obligatory distortions that are due to structural limitations, and there are learned compensatory errors that are maladaptive aspects of speech the child learned when the dental anomaly occur (Freed, 2023). Distinguishing between the two types of distortions is critical for intervention. After the dental professional addresses structural limitations that work to resolve the obligatory distortions, and necessary speech therapy, the child should only have the learned compensatory patterns or residual errors. The SLP will provide the individual an individualized articulation therapy including activities that help the child improve oral motor musculature, adjust tongue

placement, and support the patient as they learn to correctly produce the phonemes (Schepp et al., 2025). The children are then able to about old habits and learn a correct articulatory behaviour.

Collaboration, or working together, is at the center of successful management of a child's oral care. It is considered best practice for SLPs and dentists or orthodontists to work together (Van der Straeten et al., 2025). The SLP can provide the dentist with feedback related to a child's articulation after dental work is done, this is useful in making decision about possible speech influences in going forward with other recommended procedures. Educating caregivers is also within the SLP's management action plan. From an SLP perspective, it is helpful to provide caregivers with comments about the relationship between dental health and the child's speech development, and ways to help support speech development at home (Zhao et al., 2023). They each have a joint holistic approach which works towards the goal of treating the child as whole.

CONCLUSION

Dental anomalies play a significant, and often under-appreciated, role in children's speech delays and speech articulation disorders. Maloccluded teeth, missing teeth, supernumerary or extra teeth, and restricted tongue movements such as with ankyloglossia all hinder the children's oral motor movements and airflow required for speech clarity. Healthcare providers must be aware of and understand the connection between dental issues and speech delays. To effectively remediate speech delays that have dental anomalies as an underlying cause, dental and orthodontic treatment targeted by Speech Language Pathologists and audiologists will be required given the need for a co-operative approach. In order to ensure speech delays due to dental anomalies are optimally remediated, all parties must be made aware, recognize the problem early, and communicate effectively. Intervention should be tailored to the child, with early diagnosis of the dental anomaly, timely dental treatment, and concluding with speech-language therapy. These co-operative approaches help build, maximize and improve children's communication abilities and dramatically improve their quality of life. In addition, it will be important for studies to begin to look longitudinally to connect dental anomalies, specific dental treatment, and improvement in speech articulation, and then communicate the long term impacts of these improvements on communication abilities and quality of life.

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