Review Article

Malocclusion Traits and Speech Disorders

Shahbaa AbduGhafoor Mohammed, Jinan Eliewy Saloom, Dina Hamid Obaid, Akram Faisal Alhuwaizi
Department of Orthodontics, College of Dentistry, University of Baghdad, Baghdad, Iraq

Abstract

Speech is the ability of communication or expression of thoughts among people in spoken words. Human communication via speech is essential since any impairment in this process may have serious social and occupational consequences. Malocclusion is a possible cause of speech impairment in addition to many other etiological factors like hearing loss, neurological disorders, physical disorders, and drug abuse. This article throws light upon the association between speech disorders and malocclusion.

Keywords: Malocclusion, phonetics, speech

Introduction

Speech disorders or abnormal articulating of one or more sounds have a complex multifactorial origin; however, the genetic component is the most well-documented as a basis of speech disorder.[1] The neural circuitry responsible for controlling the tongue, jaw, teeth, lips, alveolus, and other vocal organs must be finely tuned in order to generate a spoken language. Thus, the ability to form sound waves that travel through the air "a" vibration of the eardrum is a necessary physiological prerequisite for spoken language, as is the speech apparatus, which includes the lung, the larynx, and the upper tract, which includes the throat, the mouth, the palate, and the nose.[2] Vowels are created by vibrating the vocal cords without obstructing the air stream, whereas consonants are created by introducing an obstacle into the airflow. Other sounds are produced by tongue movement within the mouth, like the "r" sound, which is characterized by the way the tongue is positioned in relation to the air stream.[2,3]

The teeth and the skeletal arches (the dental arches) that are considered structural boundaries for tongue-lip movement contribute significantly to the production of consonant sounds by blocking and altering airflow.[4] Almost 90% of all consonant sounds inherently involve articulation in the anterior oral cavity,[5-8] indicating that abnormal speech may develop when a malformed mouth cavity necessitates or compensates for a distorted pronunciation.[9,10] A deviation in dental arches or malalignment of teeth may affect typical air pressure and flow, as well as the positioning of the lips and tongue, all of which have an impact on the creation of speech sounds.[11]

Harvold[12] suggested three mechanisms by which malocclusion and speech are interrelated: There may be an occlusal or skeletal problem and coincidently an articulating problem.

There may be a genetic or metabolic disorder that affects the central nervous system, leading to poor motor control and possible malformed morphogenesis.

1. There may be true cause–effect where occlusal or structural anomalies could affect the articulating skills.

Potentially, speech disorders could be an indication for orthodontic and other specialists' intervention concerning speech correction as a primary aim. However, many individuals develop normal speech despite their abnormal teeth position and alignment, which suggests a potential compensatory mechanism.[13] The orthodontic intervention aimed at building a healthy and beautiful smile that supports the patient's confidence and is directed

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Address for correspondence: Dr. Dina Hamid Obaid, Department of Orthodontics, College of Dentistry, University of Baghdad, Baghdad, Iraq.
E-mail: dina.h@codental.uobaghdad.edu.iq

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toward improving esthetics and could extend more beyond straightening of teeth to involve addressing the problems related to function through a wide knowledge of physiologic interrelation of all craniofacial system.[14,15]

Common speech problems

Lisping, lisp, frontal lisping, and tongue thrust

Misarticulations involving protrusion of the tongue are represented by these phrases, which are used to describe the sound distortion that occurs during the production of linguo alveolar fricative consonants.[16] The "s" and "z" sounds are mispronounced as "th" in a person with interdental lisping, which is usual for youngsters up to 4–4.5 years of age because the tongue is forced forward between the front teeth, forcing the air to flow forward.[16]

Lateral lisp

Because the air is being forced out via the sides of the mouth, the speaker frequently comes off as having a moist mouth.[16]

Palatal lisp

Due to the center of the tongue making contact with the soft palate, the speaker produces a consonant with a distorted sound.[17]

Anterior open bite, increased overjet, lateral crossbite, jaw deviation on opening, and bruxism are only some of the dental malocclusions that have been connected to lisping in the medical literature.[17-19]

Stuttering

Stuttering affects approximately 1% of the population and has unfavorable results, including diminished mental and emotional well-being as well as diminished employment and academic success. The neuroimaging researches reveal evident physiological and anatomical differences in speech neural networks in adults who stutter.[11]

Mispronunciations

When teeth aren't in their proper places, it's very challenging (if not impossible) to pronounce certain sounds properly. Fricative consonant sounds like "t," "s," and "ch," for instance, need direct tongue-to-tooth contact.[20]

The dental arches (dentition and skeletal arches) provide a physical limit to the movement of the tongue and lips, and hence play an essential role in the creation of speech.[21]

Occlusal traits and speech problems

One might anticipate labial segment tooth position-relationship to be the most likely to impact and influence articulations. However, buccal segments, both transverse and anteroposterior relationships, have been implicated, but precisely how these variations could affect speech is not fully understood.[22]

1. Class II relationship

The relationship between increased overjet and speech disorders was disagreed by many investigators due to allowing normal speech despite abnormal dental and anatomical relationships.[23]

Orthodontic and speech analysis concluded that skeletal morphology had little, if any impact on the production of interdental stigmatism as a result of compensation movements; the tongue position was adapted to compensate for class II div I malocclusion. However, other authors found a significant relationship between increased overjet and distortion of the "s" sound,[23] and labiolingual sound production of consonants like "p," "b," and "m" is affected because of the difficulty in making the necessary upper and lower lip contact due to the abnormal positioning of the top front teeth.[24]

2. Class III malocclusion

Several authors found significant associations between class III malocclusion and several articulation disorders due to lower and loose tongue posture, poor formation of the linguo alveolar valve, required for sibilants, and problems with creating labiodental and linguo alveolar consonants like "f" and "v" were seen during sibilant pronunciation "s," the tongue was retruded in an attempt to achieve normal tongue tip–upper incisal relationship.[25]

Speech disorders are seen 18 times more frequently in class III patients compared with the general population with vague causality. The severity of class III malocclusion is quantitatively correlated with the degree of speech disorder.[15]

3. Open bite

The most common occlusal anomaly, which classically has a negative impact on speech sound production of "s," "z," and "th" sounds, is an anterior open bite as there is an airstream distortion. Individuals with anterior open bite usually have problems with lisping and difficulty in pronunciation of sibilants "s," "z," and difficulty in producing consonants "t," "d," and "n" sounds,[26] with the tongue tip contacting the maxillary anterior teeth producing anterior lisp.[27]

4. Tongue thrust

A behavior pattern where the tongue protrudes anteriorly during swallowing, speech, and at rest.[28] Tongue thrusting occurred as an adaptation to speech when forming "s," "z," "t," "d," "n," "ch," and "sh" sounds to be a sound different than it usually does and come out as lisping. It is described as an endogenous or adaptive pattern with different etiologies.[29]

Although there are many studies that evaluate the relation between tongue position and speech problems, epidemiological studies are still rare and need to confirm

a strong association between tongue position and speech problems.[29–31]

5. Cleft lip and palate (CLP)

The most frequent kind of CLP, which causes both aesthetic and functional abnormalities, is the result of a traumatic birth defect; among the most important is the disruption of speech sound production.[32] Compensatory articulation disorders in speech are a possible outcome of velopharyngeal dysfunction, nasal air release, and hypernasality.[32,33] Midfacial growth deficiency in CLP individuals may result in distortion of linguo alveolar sounds due to a crossbite, maxillary deficiency, ectopic, missing, and misaligned teeth.[34,35] According to the literatures, lisping is not directly associated with the severity of dental anomalies; therefore, genetic factors and other factors need to be considered.[36]

Conclusion

Speech sound production has been considered to be very complex, and many variables affect its development. Speech disorders can be caused by certain malocclusion traits that prevent the tongue from being properly acting upon the roof of the mouth and, hence, prevent proper pronunciation. However, there is no direct relationship exist between the severity of malocclusion and the speech disorder.

Ethical approval

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Conflicts of interest

There are no conflicts of interest.

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