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Old is Gold- A case report

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Abstract
Introduction: Anterior open bite is considered a malocclusion that still defies correction, especially in terms of stability. The literature reports numerous studies on the subject but with controversial and conflicting information. Disagreement revolves around the definition of open bite, its etiological factors and available treatments. It is probably due to a lack of consensus over the etiology of anterior open bite between the upper and lower incisors that a wide range of treatments has emerged, which may explain the high rate of instability following the treatment of this malocclusion. **Objective:** This case report reviews the concept of treatment of anterior open bite(5-8mm), tongue thrusting, posterior unilateral crossbite and speech problem using the conventional tongue restrainer within a span of 2 weeks thus proving the contention "Old is Gold".

Keywords: Anterior Open bite (AOB), Etiology, Treatment, Stability.

1. Introduction

The term "open bite" was coined by Caravelli in 1842 as a distinct classification of malocclusion [1] and can be defined in different manners [2]. Some authors have determined that open bite, or a tendency toward open bite, occurs when overbite is smaller than what is considered normal. Others argue that open bite is characterized by edge to edge incisal relationships. For semantic reasons, and because it is in agreement with most definitions in the literature, [2, 3, 4, 5] anterior open bite (AOB) is herein defined as the lack of incisal contact between upper and lower anterior teeth in centric relation.

Given these different definitions for AOB, its prevalence varies considerably among studies depending on how authors define it. Prevalence in the population ranges from 1.5% to 11% [6]. The age factor, however, affects prevalence, since sucking habits decrease and oral function matures with age. At six years old 4.2% present with AOB whereas at age 14 the prevalence decreases to 2% [5]. Despite its low prevalence, the demand for treatment of this malocclusion is very common as approximately 17% of orthodontic patients have AOB, [6] which means that professionals should treat it in an effective and stable manner.

Teeth and alveolar bones are exposed to antagonistic forces and pressures stemming mostly from muscle function, which may partly determine the position of the teeth. On the other hand, the intrinsic forces of the lips and tongue at rest generate the balance required to position the teeth. By definition, balance occurs when a body at rest is subjected to forces in various directions but does not undergo acceleration or — in the case of teeth — is not displaced [7] Every time this balance is altered, changes occur, such as for example contraction of the dental arches in animals subjected to glossectomy when compared to control animals [8]. Thus, when a tooth is extracted its antagonist continues the process of passive eruption, indicating that the mechanism of eruption remains basically unchanged throughout life and that the tooth seeks occlusal or incisal contact until balance is reached [7].

Based on this idea of balance several etiological factors related to oral function have been associated with AOB. For example, sucking habits, presence of hypertrophic lymphoid tissues, mouth breathing, atypical phonation and swallowing, and anterior posture of the tongue at rest [2, 3, 9, 10, 11].

It should be noted, however, that not all of these etiological factors exhibit a perfectly clear cause and effect relationship.

The causal relationship between AOB and nonnutritive sucking habits, such as the sucking of fingers and pacifiers, has been very well established [12]. In such cases, AOB self-corrects consistently after removal of the sucking habit, provided that no other secondary dysfunctions

have set in [13]. These secondary dysfunctions may develop from maxillary incisor protrusion generated by the sucking habit, thereby hindering the lip seal required for swallowing, and causing the tongue to be abnormally positioned, especially at rest [11].

During childhood the tongue is proportionally larger than the oral cavity and it therefore protrudes beyond the alveolar ridges. The jaw bones grow faster than the tongue during childhood and eventually the size of the oral cavity adapts to tongue size [10]. In fact, longitudinal studies in children showed that the prevalence of tongue protrusion in speech and swallowing is significantly reduced starting at 8 years of age. It is approximately 51.7% at 4 years of age and 38.9% at age 12 [14].

Some authors believe that the forces generated during swallowing and phonation can cause changes in the shape of the dental arches [4]. Although these disorders are associated in the literature with AOB etiology, other studies show that these functions are short lived and not sufficient to cause dental changes [7, 11]. Frequency of atypical speech and swallowing is much higher than AOB prevalence, which may explain the tenuous causal link between the presence of atypical speech and swallowing, and the presence of this malocclusion [11].

Hypertrophic adenoids and tonsils are the most common cause of nasal obstruction and, consequently, mouth breathing in children [4]. The effect of airway obstruction on the occlusion was demonstrated by Harvold *et al.* [16] who, after placing acrylic blocks in the posterior region of the palate of rhesus monkeys, found that AOB had developed. Induced nasal obstruction was also performed using nasal splints in rhesus monkeys, which, in an attempt to secure an oral air passage, developed open mouth posture and protruded tongue [17].

Therefore, hypertrophic lymphoid tissues and nasal obstruction may force the tongue to remain in a position designed to allow breathing to occur through the oropharyngeal rather than nasopharyngeal space [12]. In general, lymphoid tissues undergo involution during puberty, allowing the tongue to adopt a position more posterior than what is deemed normal [2]. However, Linder-Aronson *et al.* found that dentoalveolar response to adenoidectomy is highly variable and therefore should not be considered as a prophylactic procedure for the development of AOB. Indeed, not all patients with mouth breathing due to partial nasal blockage develop AOB [4].

Most investigations of AOB etiology agree on the existence of secondary dysfunctions, which remain after the correction of an abnormal function, such as, especially, poor tongue posture at rest [4, 7, 12]. It is believed that a gentle but continuous pressure exerted by the tongue against the teeth can move such teeth, yielding significant effects. If a patient has a previous posture in which they have positioned their tongue, the duration of this pressure — even if very light — can affect the eruption process, or move anterior teeth, resulting in an open bite [10, 11].

Tongue posture at rest is long lasting (several hours a day), which makes it clinically important as it can prevent the eruption of incisors, thereby causing and maintaining AOB. In addition, a low tongue posture may encourage the eruption of posterior teeth and constrict the upper arch since the tongue does not touch the palate [7]. This etiological factor has not been studied enough and is generally overlooked during AOB treatment. Failure to eliminate this factor may be the primary reason of AOB relapse [10].

Over the years, vertical facial pattern was ultimately considered as the main risk factor for AOB and its treatment instability. However, other studies [10] have reported that most hyperdivergent patients exhibit a normal or excessive overbite while patients with normal facial patterns display a "persistent open bite" [4].

One can therefore infer that skeletal pattern per se cannot be the cause of AOB [7]. In revisiting the aforementioned idea of balance of forces between teeth, the presence of a physical barrier prevents the incisors from coming into occlusal contact. Since an abnormal posture of the tongue at rest may occur in different situations, [4, 10] this may be the key etiological factor in AOB.

2. Case report

A patient aged 8 years, female reported to the Department of Pedodontics and Preventive Dentistry, JSSDCH, Mysore with a chief complaint of gap in the front teeth with tongue display since 5 years and unable to speak properly especially the consonants. [Fig. 4, 5, 7, 9] On examination, patient displayed tongue thrusting with severe contraction of mentalis muscle. Open bite of approximately 4-5 mm was seen with flat curve of spee in mandible. [Fig. 4, 5] Potentially competent lips seen. Right side posterior unilateral crossbite seen. [Fig. 11] H/O snoring at night. No enlargement of tonsils seen, No DNS.

Pre treatment and post treatment Cephalometric tracings were performed on the lateral cephalograms, using the following cephalometric measurements: SN.PlO, 1.1, 1.NA, 1.NB, 1-NA and 1-NB.

Cephalometric measurements	Anterior open bite			Post treatment (Normal)			p
	Median	Min	Max	Median	Min	Max	
SN.PlO	18.0	10.0	24.5	18.75	9.0	26.0	n.s
1.1	129.5	117.0	140.0	122.0	108.0	127.0	*
1.NA	21.5	17.0	29.5	28.5	20.5	44.0	*
1.NB	25.0	18.5	32.0	30.0	23.0	38.5	*
1-NA	4.0	2.5	8.5	5.5	3.5	12.0	n.s.
1-NB.	4.0	1.5	7.5	5.0	2.5	11.0	n.s.

n.s. = non-significant; * = significant at 5% ($p<0.05$)

3. Diagnosis

Open bite due to severe tongue thrusting.

4. Treatment planning

Conventional fixed tongue restrainer. [Fig.1, 2, 3]

5. Discussion

Tongue thrust, or reverse swallow, is an atypical swallow in which the tongue pushes into the palatal side of the upper teeth. Since humans characteristically swallow close to 1500 times a day, the repetition of this habit may cause or contribute to misalignment of the teeth, impede speech, cause mouth breathing, and other problems. The tongue is the strongest muscle in the body. Since orthodontic treatment utilizes pressure to move teeth, contra lateral pressure from the tongue may inhibit its effectiveness.

A tongue thrust commonly causes an anterior open bite, or the open bite may contribute to tongue thrust. There is a direct

interplay between these conditions. Tongue thrusts may be forward or lateral (to the side), which may prevent the back teeth from touching.

Since the tongue is used for speech, it may cause problems enunciating certain sounds. Because the tongue is not functioning ideally, a patient may not be able to swallow correctly. Patients may develop TMJ disorder, headaches, breathing problems and nasal allergies. Some develop thumb sucking habits, often causing or related to an open bite. When a dentist or orthodontist attempts to close an open bite, the tongue re-opens it. The tongue exerts more pressure on the back of the teeth than orthodontic wires.

Tongue thrust therapy is particularly challenging on patients who are mouth breathers. In these cases, the patient must first visit an allergist to eliminate the cause (sometimes, swollen nasal turbinates due to allergies). Some patients may improve with nasal surgery by an ear, nose and throat (ENT) specialist to clear the breathing passage. If the patient can better utilize nasal breathing, there is no need to keep the tongue positioned low in the mouth and the tongue thrust may often be eliminated.

Swallowing therapy is often multifaceted, utilizing tongue exercises and retraining speech patterns. The placement of cleats behind the upper teeth may be effective in restraining and retraining tongue movements during swallowing, prior to the completion of orthodontic treatment. The cribs bond to the back of the front teeth and help the patient remember not to force the tongue forward.

Speech therapists may use tongue and speech exercises as a therapy to retrain the tongue. Normally, the tongue pushes onto the palate when swallowing. A person who has an anterior tongue thrust pushes the tongue forward instead of placing it upward on the palate.

If tongue thrust therapy does not successfully eliminate the tongue thrust before completing orthodontic treatment, the patient's teeth will not remain where they were orthodontically positioned. This often causes relapse. Small orthodontic palatal cribs may be placed on the back of the top two front teeth after completion of orthodontics to help patients know when they are thrusting. The cribs along with tongue thrust therapy exercises often help patients minimize or eliminate their tongue thrust habit.

6. Conclusion

Tongue restrainer though the simple appliance establishes promising and quick results leading to good patient motivation and psychological benefit. Single appliance intercepting 3 defects: AOB, tongue thrusting and speech problems; along with posterior crossbite (requiring few more days)

Fig 1: Occlusal view

Fig 2: Posterior view

Fig 3: Palatal view

Fig 4: Frontal view

Fig 7: Left lateral view (preoperative)

Fig 5: Frontal view (preoperative)

Fig 8: Left lateral view (postoperative after 2 weeks)

Fig 6: Frontal view (postoperative after 2 weeks)

Fig 9: Right lateral view (preoperative)

Fig 10: Right lateral view (postoperative after 2 weeks)

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