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Modified quad helix appliance –A case report

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Abstract

Deleterious oral habits like tongue thrusting and thumb sucking needs intervention at an early age. Absence of such an intervention will lead to complex malocclusions. One such malocclusion which is very difficult to treat is anterior open bite. Abnormal tongue thrusting habit can result in the development of anterior open bite. Correction of anterior open bite with fixed orthodontic treatment in patients with tongue thrusting has often been found to relapse because of the retained tongue thrust swallow pattern [1]. Thus, habit interception becomes an important part before planning for any form of orthodontic intervention. This case report describes a successful intervention of tongue thrusting habit along with associated correction of anterior open bite and a differential arch expansion in 9-year-old patient with simple tongue thrusting habit, anterior open bite and narrow anterior maxilla. This case report focuses on correcting the tongue posture along with interception of associated malocclusions.

Keywords: Modified, Quad helix, tongue thrusting. Anterior open bite.

Introduction

Oral Habits are among the most common etiological factors for the development of malocclusions ,especially anterior open bite(AOB).Tulley(1969) defines tongue thrusting as —the forward movement of the tongue tip between the teeth to meet the lower lip during deglutition and in sounds of speech so that the tongue becomes interdental[3] .It has been often related to the persistence of infantile swallowing pattern into childhood and adolescence, producing anterior open bite

and protrusion of anterior segments of maxilla. Tongue thrusting is also seen associated with other habits like thumb sucking or mouth breathing where tongue protrudes to complete the lip seal. In Tongue thrusting habit tongue often occupies a lower position during rest and thus a reduction in maxillary transverse dimension and narrow maxillary arch with or without posterior crossbite may also be noted [4]. Most often there is a dilemma in diagnosing whether tongue thrusting is a cause or an effect of anterior open bite. While it has been noted that tongue thrusting habit does result in an anterior open bite, there are also evidences which support the theory that tongue thrusting develops as a way of completing the anterior lip seal in a patient with anterior open bite [5]. Cessation of deleterious oral habits and subsequent re- establishment of normal occlusion is considered an important goal of Interceptive orthodontics. Anterior open bite being a difficult malocclusion to treat, if associated habit like finger sucking or tongue thrusting if not intercepted –it is often found to relapse after orthodontic intervention. It has been found that anterior open bite found in association with oral habits tend to self-correct themselves when habit interception is performed effectively. Literature describes several innovative appliances as a part of reminder therapy meant to intercept tongue thrusting habit – the basic appliance being a palatal crib [6]. But children often tend to perceive the crib as a punishment rather than a reminder. Moreover, often more than two appliances are required to intercept the habit and associated malocclusion.

Thus this case report describes the use of a modified quad helix in a 9 year old boy for the interception of tongue thrusting habit. along with successful correction of anterior open bite and expansion of narrow anterior maxilla.

Case Description

A 9-year-old boy patient reported to the Department of Pediatric and Preventive Dentistry with the chief complaint reported by them as “the upper and lower front teeth remaining far apart and also proclination of upper front teeth”. Parents didn’t report any history of thumb sucking. Parents gave history of mouth breathing and adenoidectomy 3 months back. Extra orally patient appeared to have decreased upper lip length and typical adenoid facies (Figure 1a). On clinical examination patient had simple tongue thrusting at rest and at swallow. Intraoral examination revealed mixed dentition, with narrow ‘V’ shaped maxillary arch, lower anterior crowding, proclined maxillary incisors, a negative open bite of 5mm, overjet of 7, a mild unilateral posterior crossbite on right side and also there was lack of space for the eruption of right and left lateral incisors (Figure 1b). Cephalometric analysis showed normal growth pattern thus ruling out skeletal reasons for open bite.

Since the patient had underwent surgery for adenoids (obstruction treated), parents reported that patient didn’t resort to mouth breathing as he had done earlier. Thus it was decided to correct the tongue thrusting habit first. A modified quad helix was planned in order to train the tongue as well as to attain differential expansion of the maxillary arch. Parents were informed about the need for a comprehensive fixed orthodontic treatment in the future. They were informed about the advantages and disadvantages of using the appliance. Following their consent upper and lower impressions were made

Since myofunctional exercises play a significant role in any habit interception it was decided to place the child on myofunctional exercises for at least two weeks. Child was taught the 4 S exercise – tongue was taken to a ‘spot’ behind the maxillary incisors, hold in position till

he salivates followed by squeezing the spot and then swallowing with the teeth brought together while maintaining tongue in position (Figure 2(a) and 2(b)). Child was asked to perform the same at least 40 times day.

Appliance Design

Maxillary right and left permanent first molars were banded. A modified quad helix with beads in the anterior bridge was planned. Beads were used since they didn't take up much space in the oral cavity and were inconspicuous, so didn't cause any discomfort. They were positioned high in the palate behind the central incisors. This act as a guide to position the tongue correctly during myofunctional exercises (Figure 3)

Treatment objectives: 1) Correction of tongue posture 2) Expected closure of anterior open bite following habit cessation 3) Expansion of V shaped maxillary arch

Before cementation of the appliance intercanine width and intermolar width were measured from diagnostic casts which were 24 mm and 42 mm respectively.

The appliance was cemented in the oral cavity (Figure 4)

Appliance activation for the purpose of arch expansion was done after one month of cementation by taking it out of the oral cavity and recementing it again. This was to allow time for the child to acclitimize to the new appliance and get used to the habit breaking part of the appliance first. During this time child was trained to position the tongue and perform tongue exercises by positioning tongue on the beads on the anterior arm and rolling them –this establishes a new non-harmful habit of playing with the beads (Figure 5). Also, child was asked to perform swallowing exercise five times a day with ten swallow each and practicing the 4 Ss – Spot (position tongue on the roller), wait till salivation, then squeeze the tongue by holding in position and then swallow. During activation after one month the appliance was activated by opening the posterior helices so that outer arms expand and will cause the expansion of anterior maxillary arch from canine-to-canine region. On the right-side anterior helix was opened slightly just enough to increase the intermolar width by 2-3 mm to attain correction of the existing mild posterior crossbite. Myofunctional exercises were reinforced.

The anterior open bite was corrected almost within 3 months with a new overbite of 1 mm, clinically inter canine width had increased, right and left lateral incisors normally erupted into the arch, posteriorly cross bite had corrected (Figure 6). An Impression was made with alginate and cast was poured. On the cast obtained it was noted that the intercanine width had improved from 24mm to 34 mm and the intermolar width had improved from 42 mm to 45 mm. So there was considerable increase in the intercanine width and slight increase in intermolar width which was enough to correct the posterior crossbite.

Pre and post extraoral and intra oral features were compared (Figure 7)

It was decided to leave the appliance in place for another 6 months before removing it to retain the corrections in coronal plane and also to reinforce the new tongue position.

Parent was informed about the need for a future fixed orthodontic treatment.

Discussion

During the transitional dentition there are variety of appliances which have been used for intercepting deleterious habits. Conventional management of tongue thrusting include use of palatal crib appliance. The main disadvantage with these appliances are that they are often considered as a form of punishment. The therapy advocated should act as an aid for the child rather than as a punishment [7]. Thus, the current appliance was

designed which incorporates beads which actually seem quite amusing and playful for the child while doing the tongue exercises. Myofunctional exercises have a role in the management of tongue thrust and thus should be included as a part of the comprehensive treatment plan for any patient with a tongue thrusting habit [8]. It makes the patient aware of the faulty rest position and dynamic positions of the tongue and helps to learn the physiological myofunctional behaviour [8]. The use of beads is based on the principles of positive reinforcement which works through a counter conditioning response to the original conditioned stimulus for tongue thrusting {9}. These beads have an advantage that they can be additionally used to intercept sucking habits.

Zameer et al [10] in 2015 designed a similar appliance where he used the appliance for the intercepting of thumb sucking habit and associated dentofacial deformities

K Mithun et al [11] described a positive reinforcing approach using modified blue grass appliance for the interception of tongue thrusting and anterior open bite.

This case report describes the use of modified quad helix for the interception of tongue thrusting and associated malocclusions.

Tongue thrusting can be primary or secondary. Primary tongue thrusting is a learned behaviour resulting from prolonged thumb sucking or nasal congestion. Secondary tongue thrusting usually results from extraction of multiple teeth or anterior open bite. In the current case history of adenoidectomy suggests a learned pattern of tongue thrusting which might have arisen due to mouth breathing. Since the child had an open bite and already underwent adenoidectomy it was decided to go for the interception of tongue thrusting habit first. The management of tongue thrusting usually involves the use of an appliance to intercept tongue thrusting and then sequentially use other appliances for other dento- facial deformities. In the present case the child had anterior open bite, with narrow 'V' shaped maxillary arch, lower anterior crowding, proclined maxillary incisors, a negative open bite of 5mm, overjet of 7, a mild unilateral posterior crossbite on right side and also there was lack of space for the eruption of right and left lateral incisors. The use of thus modified quad helix allowed for differential expansion of anterior maxilla providing space for the eruption of lateral incisors, and also allowed for differential correction of posterior crossbite on right side.

When we consider the management of anterior open bite it is of utmost importance to carefully differentiate a pure dental open bite from a skeletal open bite. In the present case although patient exhibited an anterior open bite of 5 mm, initial cephalometric analysis showed that vertical growth was within normal limits. This helped to prioritise our treatment plan and it was inferred that habit interception was mandatory. This proved to be effective, since within three months of the therapy not only habit interception was attained, but also the open bite had resolved since the habit interception helped to re-establish the physiologic incisor eruption.

Another advantage of using beads is that this alternative innocuous and gentle habit of playing with the beads help to change the neuromuscular activity and harmonise the tongue position {10}.

Even though results were obtained within 3 months, it was decided to continue the appliance for additional 6 more months before removing it. This was according to findings of Hayrett et al. where it was suggested that roller in the habit breaking appliance should be place for at least 6 months after habit cessation to ensure that habit doesn't resume {11}.

Certain consequences noted from the use of the appliance were, as with any orthodontic appliance such as temporary discomfort, and difficulty with oral hygiene. Since the beads were smaller and placed in the most superior aspect of the palate it did not cause obstruction with eating, caused minimal emotional problems and also minimal speech difficulties.

Parent was informed about the possibilities of these consequences in advance.

They were also educated on the need for a future fixed orthodontic treatment for final alignment in the upper arch and correction of crowding in the lower arch.

Conclusion

This case presents a modification of quad helix appliance with a rollers which successfully intercepted patient's tongue thrusting habit as well as associated malocclusions including anterior open bite. When the patient was taught to play with the beads it created a new habit, thus breaking the old one as well as it trained the child to correctly position the tongue in the palate physiologically by changing the neuromuscular activity. This appliance proved to be effective not only in physiologically training the child to position the tongue but also provided added benefits of correction of associated malocclusions especially anterior open bite which considerably improved the child's self-confidence.

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Legends for figures

Figure 1 (a): Pre-treatment Extra oral view

Figure 1(b): Pre-treatment Intra oral view

Figure 1: Pretreatment Extra oral and Intra oral View.

Figure 2(a): 4 S's: Spot, Squeeze.

Figure 2(b): 4 S's: Salivate, Swallow with teeth in contact

Figure 3: Modified quad helix Fabricated

Figure 4: Modified quad helix cemented in oral cavity.

Figure 5: Tongue position advised with the beads

Figure 6: Post operative Intra oral view

Figure 7: Comparison of Pre-treatment and post treatment extraoral and intraoral views, Considerable increase in intercanine width noted.