Case Report
Journal of Pierre Fauchard Academy (India Section), *Vol 34(3), DOI: 10.18311/jpfa/2020/25519, September 2020, p. 96-98*
ISSN (Print) : 0970-2199
ISSN (Online) : 2405-772X

Structurally Modified Non-Compliant Transpalatal Arch to Correct an Anterior Open Bite with Fused Mandibular Right Incisors

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Abstract

During molar intrusion some of the problems commonly encountered are buccal tipping of the molars and relative anterior extrusion which may lead to a more gingival smile. Both of these can be effectively countered by the use of a low-placed Transpalatal arch. The patient reported to the clinic with an anterior open bite and fused mandibular right anterior central and lateral incisors. Utilizing the finite element model made using the patient's scan, a pick-up impression of the maxillary arch was recorded with the bands in place on the maxillary first molars. The appliance was designed using the conventional .036 mm wire but the design was modified to include a moderately large U-loop in the middle to enhance the surface area in contact with the tongue and bring about intrusion. The palatal clearance was kept at 5mm and the U-loop was positioned anteriorly instead of the traditional posterior facing design. Maxillary molar intrusion was achieved leading to anti-clockwise rotation of the mandible causing the anterior open bite to close.

Keywords: Anterior Open Bite, Finite Element Analysis, Goshgarian, Molar Intrusion, Transpalatal Arch

1. Introduction

The Transpalatal arch since its inception by Goshgarian has undergone many variations in design and fabrication and is immensely useful as orthodontic anchorage. Over the years many designs have come up but a very popular design is the Low-placed design that can bring about effective molar intrusion[1]. During molar intrusion some of the problems commonly encountered are buccal tipping of the molars and relative anterior extrusion which may lead to a more gingival smile. Both of these can be effectively countered by the use of a low-placed Transpalatal arch. While it can lead to indentation on the tongue with prolonged use and sometimes even pain it is still a non-invasive modality that should be preferred over an invasive one. After the desired intrusion is achieved the appliance can be removed and the molars banded or bonded normally to continue treatment as planned.

Variations of the Goshgarian design commonly used are for carrying out molar distalization, correction of molar rotations or maintenance of the transverse arch width[2]. Sometimes the appliance may contain more than one loop to aid in tooth movement. In this case it was planned to have a single loop with increased dimensions to have an increased surface area of the tongue in contact with the appliance to bring about molar intrusion and help correct the anterior open bite. The appliance design was modified after using Finite element models to plan the precise design as well as placement of the Transpalatal arch for Maxillary molar intrusion.

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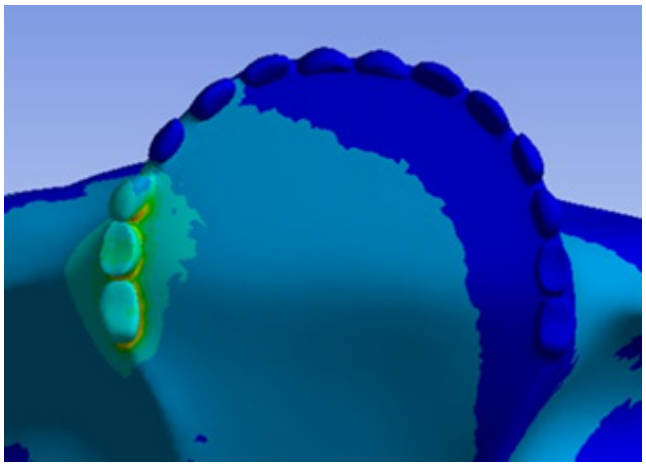


Figure 1. Depicts the evaluation of the stresses on planned molar intrusion using the finite element model. The Transpalatal arch was placed at different positions in relation to the palate to plan the most suitable height and design of the appliance.



Figure 2. Shows the design of the modified Transpalatal arch used with the Coffin loop facing anteriorly.



Figure. 3(a) Depicts the pre-treatment anterior open bite. **3(b)** Depicts the progression after 3 months of treatment. **3(c)** Shows the complete closure of the anterior open bite after 6 months. **3(d)** Shows the occlusion after the lower 6 was bonded following completion of endodontic treatment.



Figure. 4(a) Depicts the anterior open bite pre-treatment. Also, can be seen in the image are the fused lower right incisors. **4(b)** Depicts the closure of the anterior open bite following 6 months of placement of the modified Transpalatal arch. **4(c)** demonstrates the occlusion after bonding the lower right mandibular molar.



Figure. **5(a)** Depicts the lateral cephalometric presentation of the anterior open bite. **5(b)** depicts the closure of the anterior open bite. Also seen are changes in the lower lip position and up-righting of the mandibular incisors.

2. Technique

The patient reported to the clinic with an anterior open bite and fused lower right anterior central and lateral incisors. Since the patient's tongue was positioned more anteriorly a decision was made to use a Transpalatal arch since the presence of an appliance in the posterior region of the palate would also improve the rest-position of the tongue. A Cone beam scan of the patient was recorded and subsequently a three-dimensional model was prepared to plan out the design of the appliance as well as to plan the palatal clearance for optimal molar intrusion. It was seen that when the appliance was placed at 5 mm clearance from the palate it resulted in optimal maxillary molar intrusive forces.

Utilizing the finite element model a pick-up impression of the maxillary arch was recorded with the bands in place on the maxillary first molars (Figure 1). The appliance was designed using the conventional .036 mm wire but the design was modified to include a moderately large U-loop in the middle to enhance the surface area in contact with the tongue and bring about intrusion (Figure 2). The palatal clearance was kept at 5mm and the U-loop was positioned anteriorly instead of the traditional posterior facing design.

After the cementation of the modified Transpalatal arch brackets were bonded and leveling of the arches was started with light thermal .014 Niti wires. In subsequent appointments the patient was checked for any pain or discomfort but there was no concern reported. The wires were transitioned to .016 Thermal Niti and then .016x.016 Niti wires (Figure 3a, 3b, 3c, 3d). Once the teeth were aligned the wires were changed to more rigid stainless-steel wires and full closure of the anterior open bite occurred with .016X.022 stainless steel wires without the use of any anterior elastic so as to avoid anterior extrusion (Figure 4a, 4b, 4c). As can be seen from the lateral cephalographs maxillary molar intrusion was achieved leading to anti-clockwise rotation of the mandible causing the anterior open bite to close (Figure 5a, 5b). The progress pictures depict change in the depth of the Curve of Spee and improvement in the labial profile of the patient. One of the problems faced during treatment was the crown present in tooth number 46 which was endodontically treated before the start of orthodontic treatment so for the initial duration of the treatment the tooth was not banded.

3. References

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