CASE REPORT

Role of Reflex Releasing Splint in Unilateral Crossbite: Case Report

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ABSTRACT

Posterior crossbite can result from skeletal, dental, and/or neuromuscular causes. Reflex releasing splint plays an important diagnostic tool in understanding the role of neuromusculature in these malocclusions which becomes central for treatment planning, treatment outcome and long-term stability. The current paper presents a case report which suggests how reflex releasing splint can be a vital diagnostic tool without which classifying of malocclusion and treatment plan would never be successful based on static records.

Key words: Reflex releasing splint, unilateral crossbite, maxillary arch width

INTRODUCTION

Posterior crossbite is reported to occur in 8–22% of the malocclusions and most commonly unilateral crossbite.[1-4] Posterior crossbites are broadly classified as skeletal, dental, and/or neuromuscular. In review of literature by Allen e*t al.* the potential etiological factors for posterior crossbite were prolonged retention and premature loss of deciduous teeth, crowding, palatal cleft, genetic control, arch deficiencies, abnormal tooth anomalies or eruption sequence, oral digit habits, oral respiration, and temporomandibular joint (TMJ) anomalies during growth.[5] These malocclusions are amenable at an early age, as with age advancement the treatment modalities become increasingly complex and invasive. The most common cause for unilateral posterior crossbite is maxillary constriction and can be corrected by maxillary expansion; dental crossbites can result from over retained deciduous teeth which may require a dental expansion and neuromuscular crossbite may result from maxillary and mandibular transverse discrepancy, crowding, tooth anomalies, premature loss of deciduous teeth, etc.[4] It is popularly believed that these neuromuscular mediated forced guidance causing the lateral deviation of the mandible in unilateral posterior crossbites shifts are mechanically forced displacements of mandible due to interfering teeth but are not so. It is observed that many of these patients' mandibular shifts begin much earlier than the point of first tooth contact.[6] The concept of the structural position (SP) of the mandible was introduced by Moller[7] to characterize the position that provides an optimal functional condition for the muscles of mastication and the TMJ. The SP does not coincide with maximally obtainable intercuspation, and it has been argued that the discrepancy between intercuspal position (ICP) and SP may induce physical strain in muscles and joints.[6] Moreover, unilateral posterior crossbite has been shown statistically to be associated with temporomandibular disorders.[7-9] To assess whether such a neuromuscularly controlled displacement of mandible is present in a patient, a reflex releasing stabilizing splint can be employed.[7,10]

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Reflex releasing splint

It has a flat occlusal plane without any transverse or sagittal guidance and is said to eliminate the specific asymmetric stimuli from the ICP by an evenly distributed neural feedback in all positions of occlusal contacts. If the ICP deviates from SP, the mandibular position on the splint will

then be expected to gradually change and eventually attain the SP.[11] The appliance is used exclusively as a reflex stabilizing splint or in combination with a jack screw [Figure 1].

Phase I - Diagnostic splint

In this phase, the appliance is used exclusively as a reflex releasing stabilizing splint to identify the mandibular displacement and to determine the sagittal and transverse location of the SP. The contact points are marked o the splint and copied onto transparent foil to provide a graphical record. The adaptation and graphical registration on the foil were repeated monthly follow-up visits until the location of contact points no longer changed. Then, Phase I is terminated.

Phase II - Orthodontic treatment and retention

During this phase expansion of arch is done by activating the screw twice a week and followed by retention after trimming the occlusal surface away.

Phase III - Post retention period

It is the observation period and to determine SPL and SP a new reflex releasing splint is made and rechecked for the same.[12]

CASE REPORT

A 14-year-old female reported with crowded upper and lower teeth. Extraoral examination revealed harmonious face with slightly deviated chin; functional examination revealed mandibular functional shift. On intraoral examination crossbite with 12,14,15, and 16; and there was severe crowding of the upper and lower arches with unerupted 13 and buccally placed 33 [Figure 1]. Skeletal and dental midlines were shifted from the center line. Cephalometric analysis showed Class III skeletal bases with retroclined lower incisors, and OPG revealed impacted 13 [Figure 2].

Treatment plan

Treatment objective was to correct the functional shift of the mandible and decrowding of upper and lower arches with extraction of all first premolars and alignment of the dental midlines to the skeletal midlines. Reflex is releasing splint on the lower arch to correct the mandibular functional shift and to correct palatal placed 12.

Treatment progress

Before the start of the orthodontic treatment, lower reflex-releasing splint was fabricated which will also help correct the anterior crossbite 12 [Figure 3]. Posterior bite was raised beyond the freeway space, and bilateral tooth contacts were assessed and checked for uniform contacts. Upper arch was strapped up, 14 and 24 were extracted for alignment of the upper arch teeth and to correct palatally placed 12. During the upper alignment lower contacts were rechecked at each appointment and occlusal contacts were equilibrated. 6 months into treatment upper arch was aligned and splint was removed. The unilateral crossbite was eliminated. Lower extraction of 34 and 44 was done, crowding and midline shift were corrected. Upper and lower bonded retainers were given, and patient recalled after 1 year and after 8 years.

Figure 1: Clinical picture is showing crossbite with 12, 14, 15, and 16; and there was severe crowding of the upper and lower arches with unerupted 13 and buccally placed 33

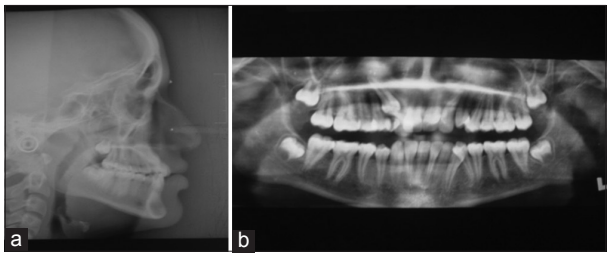

Figure 2: (a and b) Cephalometric analysis showing Class III skeletal bases with retroclined lower incisors and OPG revealed impacted 13

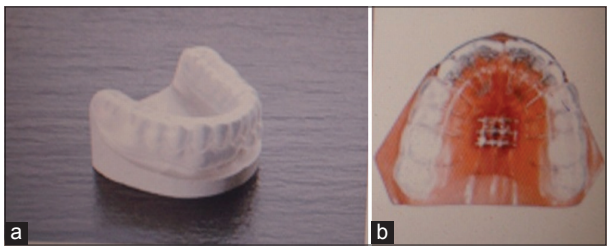

Figure 3: (a and b) Reflex releasing splint

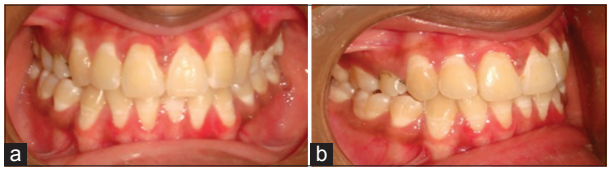

Figure 4: (a and b) Post-treatment showing the elimination of unilateral crossbite with no expansion required for the maxillary arch and the treatment results were quite stable

Post-treatment Cephalometric analysis showed that ANB angle changed from Class III skeletal to Class I (ANB - 1–2 degrees) and WITS appraisal also changed 2 mm (5–3 mm). Lower incisors were upright (IMPA 79–89 degrees) superimposition of pre- and post-treatment cephalograms asserted the changes.

Post-treatment photographs and models showed the unilateral crossbite was eliminated with no expansion required for the maxillary arch. The treatment outcome was monitored 1 year post-treatment and 8 years post-treatment. The treatment results were quite stable [Figure 4].

DISCUSSION

Unilateral crossbite can pose a significant challenge in diagnosis and treatment planning as these malocclusion results from skeletal, dental, and/or neuromuscular causes. Static records such as study models, lateral cephalogram, and patient photographs can give limited insight for diagnosis and planning treatment, especially in such cases. Malocclusion always leaves a trait with it and helps the prudent orthodontist to evaluate it clinically with a thorough functional examination. Patient SN showed a deviated chin to the right, on functional examination during the closure of mouth the mandible shifted to the right from skeletal midline before the point of first contact. In general, in most of the unilateral crossbite may require maxillary expansion as the prime cause for mandibular shift would be transverse discrepancy between maxilla and mandible but in the above case report the patient had both lateral and anterior shift due to palatally placed 12, and it was evident after the alignment of the upper arch and removal of reflex releasing splint on the lower the crossbite was eliminated.[4] The treatment results were followed up on a long-term there was a minor lower incisor rotation otherwise orthodontics treatment goals esthetics, function and long-term stability were achieved.

CONCLUSION

Reflex releasing splint can be vital diagnostic tool which can help in progressive treatment planning by deprogramming the muscles of mastication and allowing the mandible to attain SP thereby unraveling the true nature of malocclusion which can be the key to long-term stability.

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