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Review Article

Complete Crossbite- A Different Perspective

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Abstract

Scissor bite is the buccal displacement of maxillary posterior tooth, with or without contact between the palatal surface of the maxillary palatal cusp and the buccal surface of mandibular antagonist's buccal cusp. A complete buccal cross bite, known as Brodie bite, is severe transverse skeletal discrepancy when all buccal cusps of the mandibular molars are telescoped within the palatal cusps of the maxillary molars. It is a rare form of malocclusion seen in primary and mixed dentition. It can be bilateral, unilateral, or localized and is due to multiple etiologies. It is caused by a combination of excessive maxillary width and a narrow mandibular alveolar process. This article focuses on types, etiology, features and management modalities of brodie bite.

Keywords: *Brodie Bite; Scissors Bite; William-Beuren Syndrome; Herbst Appliance; Cross Elastics; Schwartz Plate; Osteotomy*

Introduction

Crossbite is a condition in which single tooth or multiple teeth are abnormally positioned either buccally or lingually with reference to the opposing tooth. Scissors-bite applies to total maxillary buccal (or mandibular lingual) crossbite, with the mandibular dentition completely contained in the maxillary dentition in habitual occlusion. Scissors bite found on several teeth due to transverse skeletal deficiency is termed Brodie bite [1,2]. It is caused by the combination of a narrow mandibular arch within an wide maxillary arch [3]. In 1943 Allan G Brodie described a type of malocclusion in which a mandibular dental arch was telescoped within the maxillary dental arch known as the Brodie syndrome [4]. It was named after him who presented this case in 1952 [5]. It is entity of its own due to structural and anatomical changes [6]. It has various terminologies such as telescopic bite, exaggerated occlusion, scissors crossbite, in-locking, buccal nonocclusion. Sim (1977) used the term "bilateral buccal crossbite" whereas Van der linden and Boersma (1987) defined as "endo occlusion" [4].

Prevalence

Brodie bite occurs in 1.0 - 1.5% of the general population [1]. Prevalence rate of scissors bite is 1.6% in primary dentition [7], 0.4 - 1.0% in mixed dentition and 1.0 - 1.6% in permanent dentition [8]. Higher rate of 9.6% found among Indian group [9], 4.4% in an adolescent group in a South Indian population [10]. Anterior crossbite is relatively high in Japanese children [11,12] and is 8.7% to 23% in children with unilateral posterior crossbite [3,13]. In Australian aborigines, a tendency toward maxillary buccal crossbite is found, which is named as X Occlusion by Barrett [14].

Etiology

Multiple etiologies have been proposed in which the base of the malocclusion may be maxillary, resulting in transverse basal excess (maxillary exognathia) [15] or alveolar excess (maxillary exoalveolie), which result in mandibular transverse constriction.

Genetic etiology

Ramsay [16], Garcia [17] reported similar malocclusion among cousins and siblings. Brodie occlusion was found in patients with William-Beuren syndrome or Robin syndrome [18].

Functional etiology

High posture of the tongue [19], excess volume [20] and lingual habits [21,22] can lead to brodie syndrome. Dahan [17,22] put forwarded combination of a volume abnormality, change in posture of tongue, and/or a lingual mobility disorder.

Increased resistance of mandibular levator muscles lead to supraocclusive dentoalveolar relationship. Further in long term progress to blockage of the occlusion, mandibular complex and Facial growth [23,24].

Skeletal etiology

Retruded mandibular position allows the maxillary arch to confined within the mandibular arch completely [25]. It constitutes an occlusal lock which inhibits the growth of mandible leading to class II [26]. Absence of contacts between the anterior segments prevents alveolar bone stimulation, leading to slowing down of the eruption resulting in brodie bite [25].

Dental etiology

Eruption anomalies, trauma or even ankylosis of primary tooth can cause exaggerated occlusion in permanent teeth [18].

Organic etiology

Vascular abnormalities, in particular hypertrophic port wine stains have been proposed [27].

Iatrogenic etiology

Treatment for uncontrolled maxillary expansion may promote development of brodie syndrome [18].

Clinical forms

It exhibits in various clinical forms such as discussed below.

Bilateral brodie occlusion

The patient presents with convex profile [13,28], mandibular retrognathism [28], increased overjet, deepbite [29], occlusal class II relationship with incisive and lateral supraclusion and midline deviation [18]. Model analysis showed an excessive maxillary coronal arch width and narrow mandibular arch width at molar region, excessive maxillary basal arch width and narrow mandibular basal arch width [28].

Unilateral brodie occlusion

The patient has chewing dysfunction [30] and asymmetric face. Presence of convex profile with potentially competent lips [31], protrusive maxilla with normally positioned mandible [32], orthognathic maxilla with retrognathic mandible, short ramus height on the affected side, average to horizontal growth pattern, retruded chin, angle's class II subdivision on the contralateral side [31], class III molar and class I or class II canine relationship, mesial margin of the maxillary central incisor is deviated on the affected side, asymmetric maxillary

dentition [30], mild spacing in the upper arch and mild crowding in the lower arch, mild proclination of upper incisors, lateral overbite on the affected side due to severe maxillary supraeruption [32], terminal planes [33] on the unaffected side were of distal step type, increased maxillary 1st molar cross arch width [30].

Brodie occlusion localised to a tooth

Second molars are usually affected. Other teeth may also be involved [18].

Discussion

Malocclusion during the primary dentition period is often encounted [7,8]. If no treatment is given for scissors bite, unsuitable growth occur in the oro-facial region, and dysfunctional occlusion might develop in the mixed or permanent dentitions [25]. Deviation from the normal alignment compromises both function and esthetics. It also causes trauma to the dentition and TMJ with associated periodontal and alveolar problems. Therefore, it is important that the dental arches and teeth should be in harmonious relation to each other. Early identification, correct assessment and appropriate treatment planning of the case is important [29]. It is difficult to give effective preventive advice as etiology is multiple. It is advisable to extract temporary or ankylosed deciduous teeth. To prevent iatrogenic gestures, the use of maxillary expansion must be limited [18].

Management

Different treatment procedures involving orthodontics, orthopedics and segmental surgery have been advocated for correction of brodie bite.

The use of Schwartz plate (maxillary split contraction plate) for maxillary contraction is advocated [18].

Modified conventional expansion screw and modified quad-helix for occlusal guidance was used for unilateral scissors bite in primary dentition to reduce the width of the maxillary arch [25]. Treatment of bilateral Brodie bite in early mixed dentition was performed using bonded constriction quad helix appliance with resinous splints. Bite opening and reduction in the width of maxillary arch was obtained in a short time period independent of patient's cooperation's. In addition, to expand the mandibular arch a bihelix appliance was used [28]. Contracting quad helix on the maxilla and an expanding crozat device on the mandible for unilateral Brodie syndrome [18], hyrax disjunctor for bilateral maxillary contraction [34], removable mandibular plate with a median expansion actuator [35] to increase the width of the mandibular arch [36] have been tried. Kravitz [37] used mandibular Arnold expander with maxillary contraction (disjunctor in reverse position) in a case of bilateral brodie syndrome.

Ashish Agrawal treated a case of bilateral Brodie bite in a three phase-prefunction orthodontics (preadjusted edge wise appliance) for alignment and leveling, functional orthodontics (Herbst appliance) to correct skeletal class II, and post functional orthodontics to obtain proper interdigitation, ideal torque, and axial inclination of all teeth and a canine guided functional occlusion [29]. Chugh., *et al*. [13] recommended the use of removable bite plates for opening whereas others have recommended the use of cross elastics [1] as an adjunct to correct multiple cross bite. Though all these treatment modalities are beneficial in the treatment outcome, it needs patient cooperation.

Unilateral brodie syndrome was treated used molar wedges made of resin or cement on the contralateral side. Garcia., *et al*. [17] proposed using an elevation plate at the maxillary arch using a thicker plate on the normal occlusion side. Chugh., *et al*. [13] used a combination of high-traction mini screws and muscle chewing exercises.

In removable technique a maxillary resin device with vestibular band and adam's hook on first molar for palate version has been explained in the literature [18].

In fixed techniques, Kucher and Weiland [38] proposed the use of transpalatal arch in maxilla and Nakamura [39] used the same system in mandibular arch. Bone anchorages can be used directly by use of miniscrew. It is positioned at palate, usually between second premolar and first molar to avoid damaging the vasculonervous bundle present near the second molar. Elastomeric chain is stretched between miniscrew and vestibular tube of second molar [40].

Many types of surgeries have been reported to obtain maxillary basal contraction. They are Schuchard segmental osteotomy, Lefort I Osteotomy and posterior subapical osteotomy [18]. Garcia., *et al*. [17], in the treatment of unilateral Brodie syndrome proposed Lefort I osteotomy in conjunction with median contraction and superior osteotomy. Segmental surgery (posterior subapical osteotomy), mandibular expansion osteotomy and symphyseal bone distraction are used for mandibular expansion [18].

Conclusion

Crossbite on a long term can lead to problems with temporomandibular joint which is mainly because of compromised mastication. It not only adversely affects chewing and muscle functions, but also impairs normal growth and development of the mandible if left untreated, with the possibility of jaw deformities. Improvement of scissor bite in the primary dentition stage can prevent subsequent malocclusion in permanent dentition. Hence management of scissor bite or a cross bite is considered at a very early age.

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