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Case Report

Management of a case with brodie bite – A novel approach

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Abstract

An early adolescent female patient reported with convex profile, bilateral brodie bite malocclusion presenting with expanded maxillary arch and constricted mandibular arch, bimaxillary protrusion and incompetent lips. She was treated with a novel approach involving fixed mechanotherapy (MBT prescription of 0.022"X 0.028" slot) with adjuncts. Hygienic Rapid Expander screw activated in a reverse direction was used to constrict the maxillary arch and a jockey arch wire was used to expand the mandibular arch. The vertical problems were addressed by using miniscrews to intrude the supraerupted 17, 16. On correction of the Brodie bite, extraction of all 4 first premolars were performed and retraction under maximum anchorage was done. The entire treatment took about 40 months. Upper essix retainer and lower bonded lingual retainer in addition to lower essix retainer was given for full time wear till 1 year, followed by night time wear.

Keywords: Bimaxillary, Miniscrews, Mechanotherapy

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1. Introduction

A complete bilateral buccal crossbite, is referred to as a Brodie bite, and is caused by a combination of excessive maxillary width and a narrow mandibular alveolar process, although the width of the mandibular skeletal base is usually normal.[1] Brodie bite malocclusion was first described by BRODIE in 1943. Sim 1977[2] used the term "bilateral buccal crossbite". The prevalence of a Brodie bite is approximately 1.0% to 1.5%. This rare form of malocclusion does not harm the esthetics much.[3] It causes reduced contacts of the occlusal surfaces and excessive vertical overlapping of the posterior teeth. Moreover, normal growth and development of the mandible are hampered, resulting in major skeletal abnormalities in adults, and affects the mastication. The biomechanical challenges in correcting such a malocclusion are insufficient clearance to place orthodontic appliances on the palatal side of the maxillary molar and buccal side of the mandibular molar. Many cases reported in literature have used Le Fort I osteotomy of the maxilla with retraction and rotation, while bilateral sagittal osteotomies were performed in the mandible.[4-5] There is scarce literature on this complex problem being treated by orthodontics alone. A few case reports in literature that have given various modalities of orthodontic correction of brodie bite malocclusion include, Jockey arch wire to expand the mandible, Bonded constriction quad helix, Intraoral elastics/ through the bite elastics, Modified RME, TransForce bite corrector and modified twin block appliance, Miniplates to upright the lower posteriors.[6-10]

2. Diagnosis and Etiology

An early adolescent female patient presented with a complaint of forwardly placed teeth and difficulty to chew. Her medical and dental histories were not contributory. On extraoral examination patient had an apparently symmetrical face, convex profile, incompetent lips. Functional examination revealed no functional shift. On intraoral assessment, the patient presented a bilateral scissor bite (BRODIE BITE) where the upper posteriors were in buccal non-occlusion and extruded, causing the mandible to get

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locked with in the upper arch and lingually rolled in lower posteriors. Further the patient presented an expanded maxillary arch, constricted mandibular arch, proclined upper and lower anteriors, Class I canine and Angle's Class I molar relationship bilaterally with Class I incisor relationship. (**Figure 1**). Pre and post treatment Orthopantomogram and lateral cephalogram with tracing and superimpositions (**Figure 2** & **Figure 3**). The orthopantomogram showed presence of 32 teeth with extrusion of 16 & 17, 47&48. The cephalometric analysis showed a Skeletal Class I with a horizontal growth pattern and a bimaxillary protrusion (Table 1).

Figure 1: Pre-treatment photographs

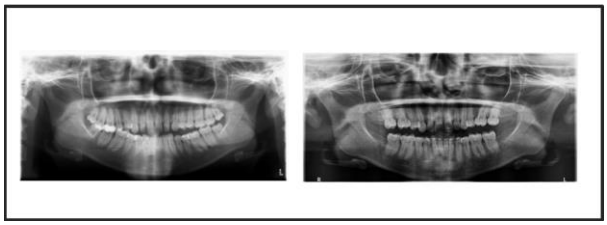

Figure 2: Pre & post treatment orthopantomogram

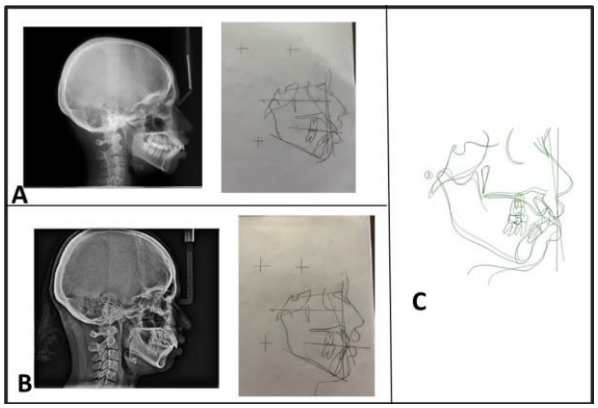

Figure 3: A: Pre-treatment lateral cephalogram with tracing B: Post treatment lateral cephalogram with tracing C: Tracing superimposition (Color code- Pre-Treatment: Black ; Post- Treatment-Green)

Figure 4: Hyrax screw placed for constriction with lower posterior bite plane

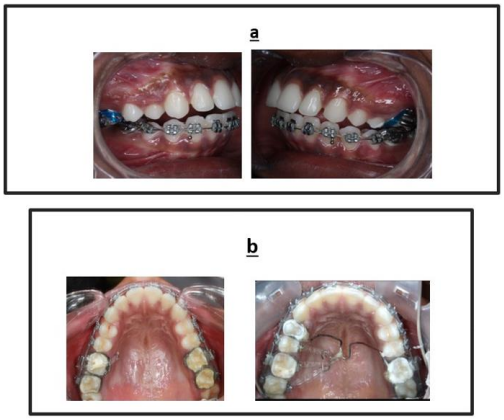

Figure 5: a. Lower arch bonding with cross arch elastics, b. sequential mechanics (Mini-Implant for intrusion of 16, Modified Transpalatal arch for constriction)

Figure 6: Jockey archwire to expand the lower arch

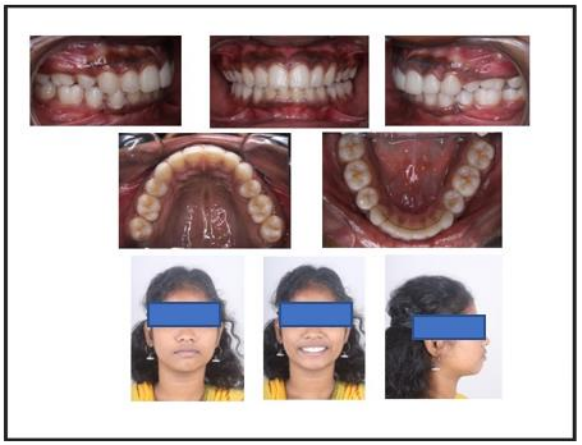

Figure 7: Post-treatment photographs

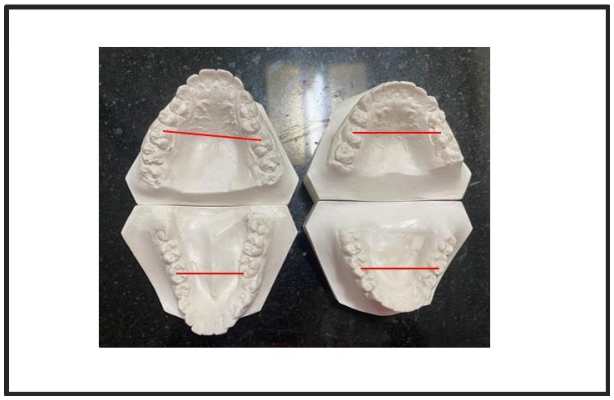

Figure 8: Intermolar width assessment

Table 1: Cephalometric summary

Skeletal analysis				
	Normal (SD)*	**Pre treatment**	**Post treatment**	**Difference**
SNA	82° ±2°	84°	83°	1°
SNB	80° ±2°	80°	80°	0°
ANB	2°± 2°	4°	3°	1°
WITS Appraisal	-1mm	Ao ahead of Bo by 1 mm	Ao ahead of Bo by 1 mm	Nil
SN-MP	32°	32°	32°	0°
Dental analysis				
	Normal (SD)*	**Pre treatment**	**Post treatment**	**Difference**
U1 to NA	4mm	8 mm	4mm	4mm
U1 to SN	104°	118°	102°	16°
L1 to NB	4 mm	8 mm	5 mm	3 mm
L1 to MP	90°	110°	96°	14°
Facial analysis				
	Normal (SD)*	**Pre treatment**	**Post treatment**	**Difference**
Upper lip to E-line	-1mm	0mm	-2mm	2mm
Lower lip to E-line	0 mm	3mm	1mm	2mm

3. Treatment Objectives

The treatment objectives were (1) to correct scissor bite and achieve buccal occlusion bilaterally, (2) to intrude 16,17, (3) to improve profile, lip competency,(4) to correct the bimaxillary protrusion, (5) achieve a settled occlusion with a Class I canine and molar relationship bilaterally.

3.1. Treatment alternatives

The alternative treatment options we considered were to undergo orthognathic surgery by Le Fort I osteotomy of the maxilla with retraction and rotation. The patient did not wish to undergo orthognathic surgery and we had to correct the complexity with orthodontic treatment.

4. Treatment Progress

The first objective was to constrict the maxillary arch and the mechanics employed was a banded Hyrax screw of 12mm. The Hyrax screw used conventionally for expansion was fabricated after complete opening and once the appliance was cemented, the screw was closed at a rate of 1 turn per day intending to cause a constriction of the maxillary arch. A lower posterior bite plane was also cemented to cause disocclusion. The screw was activated for constriction twice with the appliance refabricated (**Figure 4**).

After 2 schedules of constriction, fixed mechanotherapy was started by bonding MBT prescription (0.022” ×0.028” slot) brackets to the mandibular arch and cross arch elastics were engaged in the posteriors bilaterally. The upper arch was also bonded subsequently and in order to correct supraerupted., mini-implants of 1.3X 7mm diameter (Absoanchor, Dentos, Daegu, South Korea) were placed on the buccal and palatal aspect between 16 and 17 and engaged for intrusion of 16 & 17. Upper posterior bite plane with cross arch elastics was used to further correct the scissor bite on 16 & 17. A hook on the transpalatal arch was soldered and elastomeric chains were connected to 17, 16 &15 to constrict the right-side buccal segment (**Figure 5**). Lower arch expansion was effected by using a lower jockey arch wire made of 0.038” inch Elgiloy, into the auxillary slot of the buccal tube of 36 and 46 (Figure **6**). Once the transverse problem was corrected and ideal transverse occlusion was achieved, the patient was assessed for proclination and soft tissue profile. All first premolars were extracted to address the proclination. As this was a maximum anchorage case, transpalatal arch in the upper arch and lingual holding in the lower arch was given for anchorage preservation. Mini implant (1.3*7mm diameter Absoanchor, Dentos,Daegu, South Korea) were used as anchorage unit for retraction of the maxillary and mandibular anteriors using 12 mm closed coil NiTi spring on a 0.019” ×0.025” stainless steel archwire. In the upper and lower arch the extraction space was utilised for correction of proclination. Finally finishing and detailing were carried out and vertical settling elastics were used.(**Figure 7**)

5. Treatment Results

The patient’s mastication and smile improved thereby restoring the Jackson’s triad. The treatment duration was 40 months owing to the complexity involved in correcting the occlusion. At the end of the treatment, a final overjet of 2 mm and overbite of 3 mm was achieved. The midlines were almost coincident. The maxillary incisor display on smiling improved. Examination of the dental casts demonstrated a nearly parallel positioning of the molars to the alveolar bone showing that the intermolar width of the maxillary posteriors reduced from 51 mm to 45 mm, while the intermolar width

of mandibular posteriors expanded from 33 mm to 38 mm. (**Figure 8**) Superimposition of pre and post treatment cephalometric tracings revealed the overall skeletal structure and mandibular plane angle remained remarkably similar through the treatment. Upper essix retainer and lower bonded lingual retainer in addition to lower essix retainer was given for full time wear till 1 year, followed by night time wear.

6. Discussion

There are several challenges to the orthodontist while treating a patient with a brodie bite. Depending on the severity and source of the problem, the decision must be made if the lower arch has to be expanded or the upper arch has to be constricted or both. If the quantum of movement required is great, an orthognathic surgery is indicated.

Although this was a severe transverse problem associated with vertical and AP issues, this patient was treated non-surgically with fixed orthodontic appliances since she was not not willing to undergo orthognathic surgery. Some case reports have adapted their modality of treatment in correcting the brodie bite.[11] The options with a fixed appliance are limited and available literature does not provide any standard operating protocol in treating this malocclusion. On a careful model assessment and clinical assessment of the path of closure and other parameters, it was obvious that the complex interlocking between the arches necessitated an approach that would focus on different arches. Thus the primary goal was to constrict and intrude the maxillary posterior buccal segments followed by expansion of mandibular posterior buccal segments once they were relieved from the pernicious bite.

Activating a hyrax screw in the reverse direction to effect constriction of the maxillary buccal segment achieved a constriction of 6 mm although it was fabricated and activated twice. The next best approach to intrude in an adult is to use an orthodontic mini-implant, which has been reported to provide stable units to enable molar intrusion.[12] Alongside, intrusion of the posterior teeth specifically 16 and 17 were intruded using mini implants of 1.3X 7mm diameter (Absoanchor, Dentos, Daegu, South Korea) that were engaged on the buccal and palatal aspect between 16 and 17 for intrusion. Once adequate lower arch clearance was obtained, lower arch expansion was effected with cross arch elastics followed by a jockey arch wire made of 0.038” inch Elgiloy. Simultaneously, a modified transpalatal arch to constrict the maxillary right buccal segment was also used. Extractions were required owing to the bimaxillary protrusion, soft tissue convexity, acute nasolabial angle that which was done after elimination of the transverse and vertical problems. Patient compliance is an important contributing factor to the success of this protocol specially in light of the duration of treatment which was 40 months. The covid pandemic further contributed to the extension of treatment duration with only 27 months of active treatment. A few more months of treatment would have achieved a more perfect buccal occlusion but the patient was keen to discontinue treatment and was happy with the outcome. A functional occlusion was established which was a dramatic transformation from the initial presentation.

The changes effected in the transverse dimensions did not cause any adverse effects to the gingival and periodontal health and a healthy occlusion with supporting structures was established achieving the objectives of esthetics, functional occlusion and structural integrity. This case report demonstrates the efficacy of a novel mechanotherapy with fixed appliances using a non-surgical approach featuring combination of constricting maxillary arch and expanding mandibular arch to correct the bilateral scissor bite.

7. Conclusion

Transverse malocclusions affect the vertical and antero-posterior dimensions also. With complex three dimensional malocclusions, sequential staged planning and execution is mandatory. Though Brodie bite is a complex malocclusion it can be managed orthodontically with various approaches.

This case report highlights the various novel methods to counter this complex problem.

8. Statement of Informed Consent

Informed consent was obtained from the patient for using her photographs, radiographs, and other case details in a scientific publication

9. Source of Funding

None.

10. Conflict of Interest

None.

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