



## Case Report

# Correction of brodie bite with an innovative Hyrax Dysjuncator appliance – A case report

Juily Kalyan Kulkarni<sup>1\*</sup>, Amit Ajmera<sup>1</sup>, Suchita Sadashiv<sup>1</sup>, Nilesh Dilip More<sup>1</sup>, Daokar<sup>1</sup>, Shubhada Ashok Bedse<sup>1</sup>, Akshay Kokate<sup>1</sup>

<sup>1</sup>CSMSS Dental College and Hospital, Chhatrapati Sambhajanagar, Maharashtra, India

## Abstract

**Introduction:** "Brodie Syndrome" is a rare form of transverse malocclusion characterised by excessive occlusion of lateral zone, named after Allen G Brodie. To correct the brodie bite present on the right molar region using a non-surgical approach with an innovative Hyrax Dysjuncator appliance.

**Case Report:** A 20 years old female patient, presented with a chief complaint of irregularly placed upper front teeth. She presented with Class II skeletal base with mandibular retrognathism, Angle's Class I molar relation on left side, Brodie bite on right side and CLASS II canine relation on both sides. The patient was treated by using a Hyrax Dysjuncator followed by MBT mechanotherapy.

**Results:** Brodie bite was corrected with deep bite correction bringing the canine relation in CLASS I and molars in Angle's CLASS II relationship.

**Conclusion:** Brodie bite can be corrected using a non-surgical innovative approach using Hyrax Dysjuncator appliance.

**Keywords:** Case report, Brodie bite, Hyrax Dysjuncator appliance.

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## 1. Introduction

Transverse mandibular deficiency poses a significant challenge in orthodontics. Traditionally, treatment involved orthognathic surgery, dental arch compensations, or extractions. A transverse mandibular deficit may result in unilateral or bilateral buccal crossbite, termed Brodie bite.<sup>1</sup>

Brodie first described this condition in 1943, where the mandibular arch is telescoped within the maxillary arch.<sup>2</sup> Brodie syndrome involves an abnormal transverse occlusal relationship in which the palatal cusps of the upper molars lie buccal to the buccal cusps of the mandibular molars.

A malocclusion known as "crossbite" occurs when one or more teeth are positioned more buccally or lingually than the adjacent teeth. "Scissor-bite" is a more severe type of crossbite in which the mandibular dentition is confined in the maxillary arch due to habitual occlusal movement. A maxillary buccal or mandibular lingual crossbite can evolve into a scissor-bite. A malocclusion known as "Brodie bite"

occurs when a transverse skeletal difference causes scissor-bite on numerous molars. It could seem bilateral or unilateral.

Approximately 1.0% to 1.5% of people have severe types of scissor bite, also known as Brodie syndrome, which is an uncommon orthodontic malocclusion.<sup>3</sup> From the perspectives of dentistry, skeletal anatomy, and soft tissue, a number of techniques have been described to achieve a correction.

The treatment of this severe malocclusion has been described in the literature using a variety of methods, including extractions, orthopaedic functional devices, jaw osteotomies, surgery first, and fixed multibracket orthodontics with miniscrews for skeletal anchorage.

This report discusses the correction of a unilateral Brodie bite using an innovative Hyrax Dysjuncator appliance followed by fixed mechanotherapy.

\*Corresponding author: Juily Kalyan Kulkarni  
Email: [juily.kulkarni1@gmail.com](mailto:juily.kulkarni1@gmail.com)

## 2. Case Report

### 2.1. Diagnosis and treatment planning

A 20-year-old female patient reported with irregular upper front teeth. She exhibited a leptoprosopic facial type, convex profile, competent lips, a Class II skeletal base with mandibular retrognathism, and a horizontal growth pattern. She had Angle's Class I molar relation on the left and a Brodie bite with Class II canine relation on the right. Mild anterior crowding and deep bite were observed.

### 2.2. Treatment phases

1. Phase I: Correction of transverse malocclusion on the right using the Hyrax Dysjuncter, followed by vertical correction.
2. Phase II: Fixed appliance therapy (MBT technique) with extractions of upper first premolars, one lower incisor, and the upper right third molar.

### 2.3. Section I: Pretreatment assessment details

Initials: SB

Sex: Female

Age: 20

Patient's Complaint- A 20 years old female patient reported with a chief complaint of irregularly placed upper front teeth. No significant medical, family and dental history.

### 2.4. Clinical examination: Extraoral features

Extra-oral examination revealed good general health of patient with ectomorphic body type and leptoprosopic facial type. Patient was having orthognathic maxilla, retrognathic mandible, average mandibular plane angle, convex facial profile, competent lips. Mento-labial sulcus and chin was found average. Pre-treatment extra-oral photographs are shown in **Figure 1**.



**Figure 1:** Showing side and frontal pre-treatment extraoral photographs.

### 2.5. Clinical examination: Intraoral features

Pre-treatment intraoral photographs are shown in **Figure 2**.



**Figure 2:** Showing pre-treatment intra-oral records

1. Soft tissues: No abnormality detected.
2. Oral hygiene: Good
3. Erupted teeth present: All permanent teeth present.
4. General dental condition: Satisfactory dental and periodontal health.

### 2.6. Crowding /Spacing

1. Maxillary arch
  - a. Squarish and asymmetrical.
  - b. Retroclined central incisors.
  - c. Mild crowding present anteriorly.
2. Mandibular arch
  - a. Squarish and Asymmetrical.
  - b. Crowded lower anteriors.

### 2.7. Occlusal Features

1. Overjet (mm): 1 mm
2. Overbite: 5 mm
3. Centre lines: Lower dental midline shifted toward right side.
4. Left buccal segment relationship: Class I molar relation, Class II canine relation.
5. Right buccal segment relationship: (BRODIE BITE IN MOLAR REGION), Class II canine relation.
6. Brodie bite: 15,16,17 with 45,46,47
7. Curve of Spee: exaggerated
8. Model Analysis: Ashley Howe's analysis indicated that this was an extraction case; Carey's analysis and Nance Index indicated proximal stripping; Pont's analysis indicated that expansion was not required

	Space required	Space available
<b>Maxilla</b>	Crowding= 6mm	De-rotation of posteriors=2mm Proclination of incisors teeth=4mm
<b>Total</b>	6mm	6mm
<b>Mandible</b>	Crowding = 8mm Curve of spee = 4mm	Extraction of incisor= 5mm PS= 4mm Expansion= 3mm

Total	12mm	12mm
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2.8. General radiographic examination

Pre-treatment radiographs taken.  
Orthopantomogram on 20<sup>th</sup> June 2019 (Figure 3).  
Lateral Cephalogram on 20<sup>th</sup> June 2019 (Figure 4)  
Study model photos (Figure 5)

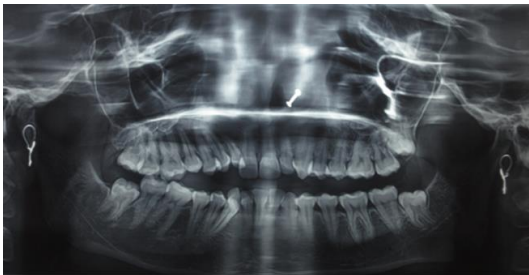


Figure 3: Pretreatment orthopantomogram



Figure 4: Pre-treatment lateral cephalogram.



Figure 5: Pre-treatment study models.

2.9. Relevant radiographic findings

The normal complement of permanent teeth was present with no abnormalities of the surrounding structures and regions; additionally, there were no abnormalities in the tooth form. The third molars were unerupted in mandibular arch including maxillary left 3<sup>rd</sup> molar, whereas in maxillary arch, right 3<sup>rd</sup> molar was erupted. The alveolar crestal bone level of the teeth present was within the normal limits of the cemento-enamel junction (CEJ).

2.10. Cephalometric interpretations

Table 1: Antero-posterior plane

Angel	Mean	Pre	Post
SNA	82	81.5	80
SNB	80	75.5	75
SND	76	73	72
ANB	2	6	5
Wits	BO is 2mm behind AO	BO is 5mm behind AO	BO is 2mm behind Ao
B angel	27-34	33	34
W angle	51-55	51	52
Facial angle	87.8	86	86
Angel of convexity	0	-13	-6
AB plane angle	-4.6	-10	-3

Table 2: Vertical plane

Particulars	Mean	Pre	Post
SN-MP	32	31	32
FH-MP	21.9	22	23
FMPA	25	20	25
Y AXIS	59.4	62	61
SN-OP	14	9	22
FH-OP	9.3	-1	11
Base plane angle	25	18	23
PP-OP	11	0	9
OP-MP	14	18	18
Jarabacks Ratio	62-65%	72	70
LAFH		57mm	59mm
Location of maxilla	Mean	Pre	Post
Inclination angle	85	83	85
Location of mandible			
Saddle angle	123	127	128
Articular angle	143	141	139
Gonial angle	128	125	126
Upper	52-55	49	47
Lower	70-75	75	75
Maxillary base length		75mm	73mm
Mandibular base length		87mm	87mm

Table 3: Dental parametees

Linear measurement	Normal	Pre	Post
U1-NA	22 4mm	41° 5mm	20 6mm
U1-SN	102°±2°	118	82
U1-A Pog	2.7mm	7mm	7mm
L1 NB	25° 4mm	26° 4mm	34 6mm
L1 A Pog	1-3mm	2mm	5mm

IMPA	90°	101°	104
Interincisal angle	135.4	112°	125
S Line –upper lip	0mm	1mm	0mm
S Line-lower lip	0mm	1mm	1mm

### 2.11. Inference

Suggestive of skeletal Class II relation, Horizontal growth pattern with posterior position of mandible and retroclined upper and proclined lower incisors.

#### 2.11.1. Diagnostic summary

1. Patient exhibits a Class II Skeletal base with mandibular retrognathism & a horizontal growth pattern.
2. It is a case of Angle's class I molar relation on the left side & Brodie Bite on right molar region with retroclination of the maxillary anteriors and crowding in mandibular anteriors.
3. Patient has a convex profile with acute NLA, normal mento-labial sulcus and competent lips.

#### 2.11.2. Problem list

1. Soft tissue problems:
  - a. Convex profile
  - b. Acute NLA
2. Skeletal problems:
  - a. Skeletal Class II pattern with mandibular retrognathism.
3. Dental problems:
  - a. Brodie bite on right molar region.
  - b. Retroclination with upper incisors.
  - c. Crowding with lower anteriors.
  - d. Increased overbite.

#### 2.11.3. Aims and objective of treatment

1. Soft tissue
  - a. To correct the convex profile
  - b. To correct the acute NLA
2. Skeletal
  - a. To correct class II skeletal pattern.
3. Dental
  - a. To correct molar relation
  - b. To correct brodie bite
  - c. To correct Retroclination of anteriors
  - d. To correct crowding of lower anteriors.
  - e. To correct the deep overbite.

#### 2.11.4. Treatment plan

1. Pre orthodontic phase: scaling and polishing.
2. Orthodontic phase:
  - a. Phase I – Correction of transverse malocclusion of right side by hyrax dysjunctor followed by vertical correction
  - b. Phase II – Fixed appliance therapy with MBT mechanotherapy with extraction of upper 1<sup>st</sup> premolars.

- c. Levelling & Alignment
- d. Closure of Extraction spaces with group B anchorage
- e. Finishing & Detailing

Retention with Hawley's retainer.

Mid treatment photographs are shown in the **Figure 6-Figure 9**.



**Figure 6:** Mid-Treatment extra-oral photographs.



**Figure 7:** Mid-treatment intraoral photographs after transverse correction.



**Figure 8:** Mid-Treatment intraoral photographs after vertical corrections.



**Figure 9:** Mid-treatment study models.



### 2.12. Key stage in treatment progress

Correction of brodie bite with Hyrax Dysjunctor Appliance is the key step for the treatment. Right side of the screw were engaged to the acrylic block which covered the posterior teeth, whereas left side of the screw were cut from the acrylic block and those free arms were engaged in mini- implants placed on the palate. Thereby, a brodie bite on right side was corrected in 9 months by contraction caused by reverse turning of HYRAX screw. Patient was then shifted to fixed mechanotherapy with MBT 0.022 appliance. Lastly cross elastics were given on the right side for overcorrection of Brodie bite. Case finished in functional occlusion with Angle's Class II Molar relationship and Class I canine relationship.

Hyrax Dysjunctor is shown in **Figure 10** which is the occlusal photograph before starting the treatment. We can compare it with figure 12 to see the impact of the Hyrax Dysjunctor appliance.



**Figure 10:** Intra-oral photograph showing hyrax dysjunctor.

### 2.13. Post treatment analysis

Post-treatment extra-oral, intra-oral and study model photographs are shown in **Figure 11-Figure 13**.



**Figure 11:** Post-treatment extraoral records



**Figure 12:** Intra-oral Post-Treatment Records



**Figure 13:** Post-treatment study model records.

### 2.14. Occlusal features

1. Incisor relationship: Class I
2. Overjet (mm): 2 mm
3. Overbite: 2 mm
4. Left buccal segment relationship: Canine class I and molar CLASS II relation
5. Right buccal segment relationship: Canine class I and molar CLASS II relation.
6. Crossbites: Brodie bite with 16, 36 corrected.
7. Functional occlusal features: No functional Shift and TMJ functions with full range of mandibular movements
8. Other occlusal features: Curve of Spee levelled.

### 2.15. Complications encountered during treatment

No complications were encountered during the entire treatment.

### 2.16. Radiographs taken toward/at the end of treatment

Orthopantomogram (**Figure 14**)

Lateral cephalogram (**Figure 15**)

### 2.17. Post-treatment chephalometric interpretation

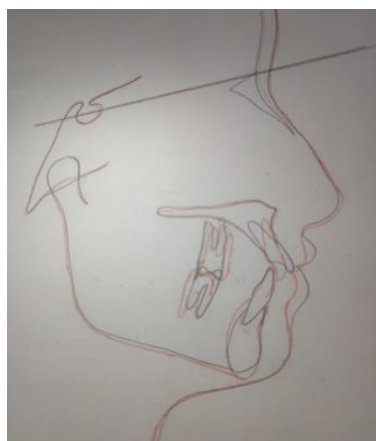
1. Skeletal Effects: Maxillary-mandibular relation was improved.
2. Dental effects: Ideal overjet and overbite were achieved.
3. Class I canine relationship was achieved.
4. Soft tissue effects: Profile showed a marked improvement.



**Figure 14:** Post-Treatment Orthopantomogram



**Figure 15:** Post-treatment lateral cephalogram



**Figure 16:** Superimposition of Pre- and post-treatment Cephalogram.

### 3. Discussion

Microglossia and hypoglossia, skeletal Class II variables, aberrant tooth germ location or eruption direction, and the involvement of neurological and muscular mechanisms creating oral habits are all potential causes of Brodie bite.<sup>3</sup> Since the patient in this instance had deep bite, mandibular retrognathism, and brodie bite, non-functional or organic factors were noted. Therefore, it's probable that the illness was brought on by a combination of skeletal factors, such as excessive maxillary growth and insufficient mandibular growth.

In terms of therapeutic planning, Brodie bite often encompasses vertical and anteroposterior abnormalities in addition to horizontal ones, as in this instance. Horizontal improvement should be prioritised in the treatment process, followed by the correction of vertical and anteroposterior issues.

The correction of significant skeletal anomalies in adult patients required orthodontic treatment using intricate treatment mechanisms, orthognathic surgery, and mandibular widening by distraction osteogenesis.<sup>4</sup> In addition to requiring a great deal of patient participation, many therapy techniques place a significant physical and psychological load on the patient. Therefore, it is advised to correct the Brodie bite as soon as possible.

A bite plate was used to open the bite in the majority of primary and mixed dentition patient reports, and a lingual arch or detachable lower lateral expansion plate was used to expand the mandibular arch laterally.<sup>5</sup> To enhance therapeutic outcomes, occlusal interference is removed and the molar occlusion is separated using a bite plate. Additionally, some studies have used modified fixed-type and detachable equipment for constriction in order to decrease the width of the maxillary arch.<sup>6</sup> However, because they may result in molar interference, these techniques were not advised in this particular instance. If the problem is of dentoalveolar origin, without a severe skeletal asymmetry, maxillary constriction plates, intermaxillary cross elastics, "dragon helix appliance", and functional appliances have been suggested.<sup>7</sup> Fortunately, this malocclusion is rare and often undiagnosed during the mixed dentition or early permanent dentition stage because it is asymptomatic.<sup>8</sup>

To reduce maxillary arch width in this case a Hyrax disjunctor was used in which right side of the screw were engaged to the acrylic block which covered the posterior teeth, whereas left side of the screw were cut from the acrylic block and those free arms were engaged in mini-implants placed on the palate. Thereby, a brodie bite on right side was corrected in 9 months by contraction caused by reverse turning of HYRAX screw. Patient was then shifted to fixed mechanotherapy with MBT 0.022 appliance. Lastly cross elastics were given on the right side for overcorrection of Brodie bite. Settling elastics were given to correct the remaining vertical discrepancy. Case finished in functional occlusion with Angle's Class II Molar relationship and Class I canine relationship.

### 4. Conclusion

The successful correction of a unilateral Brodie bite in this adult patient highlights the effectiveness of a non-surgical, innovative biomechanical approach using a Hyrax Dysjunctor appliance followed by fixed mechanotherapy. The unique adaptation of the Hyrax device, engaging mini-implants on the left side and anchorage from the acrylic block on the right, allowed for controlled contraction of the

maxillary arch to address the transverse discrepancy efficiently. Over a span of 9 months, this technique not only resolved the Brodie bite but also minimized the need for more invasive surgical alternatives.

Subsequent fixed orthodontic treatment using the MBT technique with appropriate extractions and anchorage control facilitated ideal incisor inclination, alignment, and leveling of the curve of Spee. The occlusal outcomes post-treatment demonstrated a well-balanced and functional occlusion with Class I canine and Class II molar relationships bilaterally, along with improved facial profile and dental esthetics.

This case exemplifies how careful diagnosis, biomechanical planning, and innovative appliance design can provide effective results in complex transverse malocclusions, offering a valuable alternative to surgery, especially in adult patients seeking conservative treatment options.

## 5. Declaration of Patient Consent

The other clarify that they have obtained all appropriate patient forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patient understands that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## 7. Conflicting of Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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