Unusual treatment of bimaxillary dentoalveolar protrusion via miniscrews and molar extraction

Ahmad Al-Fraidi and Ahmed R. Afify

ABSTRACT

This case report describes the treatment of a Saudi female patient, aged 13 years 8 months at the start of treatment, with a Class I bimaxillary dentoalveolar protrusion and extracted maxillary first molars. Miniscrews were placed bilaterally in the interdental space between both the upper and the lower posterior teeth. The treatment plan consisted of extraction of both lower first permanent molars, distalization of upper and lower premolars using miniscrews followed by en masse retraction of the upper and lower six anterior teeth. The active treatment period was 2 years 8 months. Arch retention was done using upper wrap-around retainer and lower fixed 3-3 retainer. The use of miniscrews helped to resolve the bimaxillary protrusion regardless of extraction pattern used.

Key words: Bimaxillary protrusion, en masse retraction, miniscrews

INTRODUCTION

Bimaxillary dentoalveolar protrusion is a condition characterized by protrusion of maxillary and mandibular incisors with increased procumbency of the lips.\(^1\) Bimaxillary protrusion is a common finding among different populations.\(^2-8\) The usual objective of orthodontic treatment of such condition is retraction of maxillary and mandibular incisors which is reflected on the lips as a decrease in its procumbency.\(^9\) Extraction of four first premolars and retraction of incisors is usually used to allow for maximum retraction of incisors using maximum anchorage. Unfortunately, the treatment plan becomes more complicated when the patients have other teeth already extracted. The use of miniscrews in modern orthodontics enabled the orthodontist to achieve skeletal anchorage allowing them to more freely move teeth.

During the last two decades miniscrews were introduced to achieve absolute skeletal anchorage. Currently, miniscrews are commonly used on daily orthodontic practice. Many cases were reported to be successfully treated when miniscrews were appropriately used.\(^10-14\)

This case report describes a Saudi female patient with bimaxillary dentoalveolar protrusion, and extracted maxillary first molars, treated with extraction of lower first molars and distalization of the upper and lower premolars using miniscrews.

CASE REPORT

Diagnosis and Treatment Planning

A 13-year 8-month-old female presented to our orthodontic clinic, with a chief complaint of “a labially positioned upper right canine”. The patient had a nonrelevant medical history, her dental history showed extraction of upper right first permanent molar and remaining roots of upper left first permanent molar.

Extraoral examination revealed that the patient had a fairly symmetrical face; her upper midline was shifted to the right 2 mm in relation to the facial midline. She had normal incisor show during smiling. The patient showed a convex profile with a retruded chin, decreased lower face height, protrusive and incompetent lips.

Intraoral examination revealed that the patient had a poor oral hygiene, with some carious teeth. All permanent teeth were present through second molars except for the extracted upper right first molar and the upper left first molar which was in a nonrestorable status. Upper right canine was labially positioned, upper right second premolar was rotated, and upper left second premolar was in a crossbite. Canine was in Class II relationship on the left side. Right molar relationship could not be determined because of the missing upper right and left
first molars. Canine relationship could not be determined on the right side due to the labially positioned upper canine. The overjet was 4 mm with 20-40% overbite. The lower midline was shifted 1 mm to the right in relation to facial midline. There was 3-mm crowding in the lower arch. There was no crowding in the upper with most of the space of extracted upper right first molar lost before starting treatment. Bolton analysis revealed 1.5-mm anterior mandibular excess [Figures 1 and 2].

Radiographic Examination
The Panoramic radiograph revealed normal morphology of the condyles, no bone pathologies. All permanent teeth are present, including the four wisdom teeth, except for the extracted upper right first permanent molar and the nonrestorable upper left first permanent molar [Figure 3].

Cephalometric analysis showed a skeletal Class II relationship, hyperdivergent mandibular plane, slightly decreased lower facial height. Upper and lower incisors were proclined and protruded. Upper and lower lips were protrusive in relation to E line of Ricketts[15] with a normal nasolabial angle [Figure 4 and Table 1].

Problem List and Treatment Objectives
The problem list included: skeletal Class II, left side Class II canine relationship, bimaxillary dentoalveolar protrusion, increased overjet (4 mm), crowding in lower anterior teeth (3 mm), deviated upper midline to the right (2 mm) and lower midline to the right of facial midline (1 mm), lower left second premolar is in crossbite, anterior Bolton excess in lower anterior teeth, protrusive and incompetent lips.

The treatment was aiming at correcting the inclination and position of upper and lower anterior teeth to resolve the bimaxillary dentoalveolar and lip protrusion, resolving mandibular crowding, achieving minimum overbite and overjet, correcting tooth mass discrepancy, achieving Class I buccal segment relationships, and correcting crossbite of lower left second premolar.

Treatment Plan
Extraction of lower first molars, distalization of the maxillary and mandibular premolars, the use of miniscrews for en-masse retraction of the upper and lower anterior teeth, finishing and detailing followed by retention.

Rationale of Treatment
Extraction option was important to resolve the bimaxillary dentoalveolar protrusion and crowding. The option of extracting the lower first molars and distalization in the upper arch will achieve better posterior interdigitation over extracting first premolars in the lower arch which will lead to lower molar opposing upper premolars.
Table 1: Cephalometric analysis

| Area of study          | Measurement       | Mean  | Pre-treatment | Post-treatment |
|------------------------|-------------------|-------|---------------|----------------|
| Sagittal relationship  | SNA               | 82°   | 83°           | 83°            |
|                        | SNB               | 80°   | 78°           | 79°            |
|                        | ANB               | 2°    | 5°            | 4°             |
|                        | N Pg / FH         | 87°   | 88°           | 89°            |
|                        | N Pg / SN         | 80°   | 77°           | 78°            |
|                        | NA / APg          | 0°    | 16°           | 12°            |
| Wits appraisal         |                   | -1 – 0 mm | 3 mm             | 2 mm         |
| Mand. length (Co-Gn)   |                   | 103 mm | 102mm           | 110 mm       |
| Max. length (Co-A)     |                   | 79 mm  | 82.5 mm       | 86 mm         |
| Max./Mand. deferential |                   | 25-28 mm | 19.5 mm            | 24 mm       |
| Pg to NB dist.         |                   | 2-3 mm | 0.5 mm         | 1 mm          |
| Vertical relationship  | Mand. Pl. to FH   | 25°   | 44°           | 46°            |
| (Divergency)           | Mand. Pl. to SN   | 32°   | 33°           | 35°            |
|                        | Occl. Pl. to SN   | 14°   | 18°           | 16°            |
|                        | Y axis S Gn / SN  | 60°-66° | 68°             | 69°          |
| Lower face height      |                   | 57 %  | 55 %          | 56 %           |
| Dental relationship    | U Inc. to SN      | 103°  | 113°          | 100°           |
| (Incisor Position)     | U Inc. to NA      | 22°   | 28°           | 18°            |
|                        | U Inc. to NA dist.| 4 mm  | 7 mm          | 3 mm           |
|                        | U Inc. to L Inc.  | 130°-132° | 107°            | 133°         |
|                        | L Inc. to Mand.   | 90°   | 95°           | 82°            |
|                        | L Inc. to NB      | 25°   | 36°           | 25°            |
|                        | L Inc. to NB      | 4 mm  | 12 mm         | 5 mm           |
|                        | L Inc. to A Pg    | 28°   | 28°           | 17°            |
|                        | L Inc. to A Pg dist.| 1 mm   | 8 mm          | 3 mm           |
| Soft tissue relationship| Upper lip to E-line | -4 mm | 3.5 mm   | -1 mm         |
|                        | Lower lip to E-line| -2 mm | 4 mm        | -1 mm         |
|                        | Naso-labial angle | 90°-110° | 95°             | 100°         |

Treatment Progress

The mandibular first molars were extracted. The patient received 0.018-inch Roth preadjusted edgewise appliance. Initial leveling was accomplished with 0.016-inch nickel-titanium (Ni-Ti) arch wires. After leveling and alignment, two orthodontic miniscrews (Dual Top; Rocky Mountain Orthodontics Inc, Denver, CO), 1.6 mm in diameter and 6 mm in length, were placed in the interdental space between the maxillary canines and the first premolars buccally. Active open NiTi coil spring (3M Unitek, Monrovia, CA) inserted between the canines and the first premolars, the two canines where then ligated to the miniscrews using 0.010-inch stainless steel ligature wire. In the lower arch a “V” bend was done in the 0.016 × 0.016-inch stainless steel arch wire just mesial to the lower second molars (tip back) for anchorage. A power chain was extended from the first and second premolars to the second molar on both sides [Figures 5 and 6].

After completion of distalization of upper and lower premolars, the miniscrews were removed and new miniscrews with the same specifications were inserted mesial to the second molars in the upper and lower arches.

En masse retraction was started in the upper and lower arches using 0.016 × 0.022-inch stainless steel arch wire, with a medium size NiTi closed coil spring (3M Unitek, Monrovia.).
The minscrews in the lower arch failed. New ones were inserted between the first and second premolars [Figure 7]. After the completion of retraction, 0.017 X 0.025-inch stainless steel finishing arch wires were used. During the finishing stage, the patient was instructed to use ¼-inch, 3.5-oz box elastics bilaterally to improve interdigitation.

The case was finished with normal overbite and overjet. The arches were well coordinated. The maxillary and mandibular dental midlines were coincident with the facial midline. The bimaxillary dentoalveolar protrusion was resolved [Figures 8-10]. Retention was done using upper wrap-around retainer and lower fixed 3-3 retainer.

**Figure 5:** Upper 0.016 x 0.022-inch stainless steel arch wire and lower 0.016 x 0.016-inch stainless steel arch wire, continuation of upper and lower premolars distalization

**Figure 6:** Upper 0.016 x 0.022-inch stainless steel arch wire and lower 0.016 x 0.016-inch stainless steel arch wire, completed upper and lower premolars distalization

**Figure 7:** Upper 0.016 x 0.022-inch stainless steel arch wire, lower 0.016 x 0.016-inch stainless steel arch wire, continuation of en masse retraction
DISCUSSION

The pattern of treating bimaxillary protrusion cases usually involves extraction of upper and lower first premolars to allow maximum retraction of incisors.[9] In orthodontic treatment, the selection of extracting first permanent molars to resolve bimaxillary protrusion is not widely accepted.[16]

Mills,[16] postulated that extraction of four first molars doubles the treatment time and reduce the prognosis by the half. In
In this case, extraction of the lower first permanent molars was performed as the patient had already extracted upper right first molar while the upper left one was in a non restorable status and indicated for extraction. Other treatment options exist such as the extraction of two lower premolars instead of first molars. We chose to extract first molars to match the already extracted upper first molars. In addition, having premolars against molars might not be a favorable occlusion.

Skeletal anchorage using miniscrews was essential to implement this treatment plan, especially in distalizing the upper buccal segments and maintaining posterior anchorage during en masse retraction of anterior teeth. In the present study, the anchorage was properly maintained with the miniscrews which enabled us to effectively retract upper and lower incisors and subsequently upper and lower lips to a more favorable position. The miniscrews were placed distal to the upper canines to which they were ligated, and active open NiTi coil springs of medium size (3M Unitek, Monrovia) were placed between the canines and the first premolars to distalize the two premolars and the second molar at the same time.

This indirect anchorage to distalize teeth is potentially risky as the miniscrew may fail, and in the presence of active coil spring, the canine might be pushed mesially. For this reason close follow-up was an essential part of treatment, especially during the first 2 weeks of distalization.

After distalization was completed, the miniscrews were removed and new miniscrews were inserted, mesial to the second molars to start the en masse retraction. This could have been avoided if the miniscrews were inserted palatally away from the teeth to allow distalization and then retraction of the teeth without changing miniscrews position. However, the use of miniscrews palatally with any appliance is bulky and might be irritating to the patient and could be less acceptable to the patient. The use of en masse retraction provided better esthetic for the patient during treatment as no spaces were created anteriorly as usually seen in two-step retraction treatment, and also treatment duration is shorter.\(^{[17]}\)

**CONCLUSIONS**

The use of miniscrews - in this case – has provided absolute anchorage for distalization of posterior teeth and en masse retraction of the anterior teeth.

Regardless of extraction pattern used, the use of miniscrews facilitated the treatment of bimaxillary protrusion effectively.

**REFERENCES**

1. Proffit WR, Fields HW, Sarver DM. Contemporary orthodontics. 4th ed. St. Louis, Mo.: Mosby Elsevier; 2007
2. Tan TJ. Profile changes following orthodontic correction of bimaxillary protrusion with a preadjusted edgewise appliance. Int J Adult Orthod Orthognath Surg 1996;11:239-51.
3. Lew K. Profile changes following orthodontic treatment of bimaxillary protrusion in adults with the Begg appliance. Eur J Orthod 1989;11:375-81.
4. Lamberton CM, Reichart PA, Triratananimit P. Bimaxillary protrusion as a pathologic problem in the Thai. Am J Orthod 1980;77:320-9.
5. Rosa RA, Arvystas BA. An epidemiologic survey of malocclusions among American Negroes and American Hispanics. Am J Orthod 1978;73:258-73.
6. Farrow AK, Zarrinnia K, Azizi K. Bimaxillary protrusion in black Americans—an esthetic evaluation and the treatment considerations. Am J Orthod Dentofacial Orthop 1993;104:240-50.
7. Scott SH, Johnston LE. The perceived impact of extraction and nonextraction treatments on matched samples of African American patients. Am J Orthod Dentofacial Orthop 1999;116:352-8.
8. Carter NE, Slattery DA. Bimaxillary proclination in patients of Afro-Caribbean origin. Br J Orthod 1988;15:175-84.
9. Dandajena TC, Nanda RS. Bialveolar protrusion in a Zimbabwean
sample. Am J Orthod Dentofacial Orthop 2003;123:133-7.

10. Bills DA, Handelman CS, BeGole EA. Bimaxillary dentoalveolar protrusion: traits and orthodontic correction. Angle Orthod 2005;75:333-9.

11. Sugawara J, Daimaruya T, Umemori M, Nagasaka H, Takahashi I, Kawamura H, et al. Distal movement of mandibular molars in adult patients with the skeletal anchorage system. Am J Orthod Dentofacial Orthop 2004;125:130-8.

12. Choi BH, Zhu JS, Kim HY. A clinical evaluation of titanium miniplates as anchors for orthodontic treatment. Am J Orthod Dentofacial Orthop 2005;128:382-4.

13. Park HS, Kwon TG. Sliding mechanics with microscrew implant anchorage. Angle Orthod 2004;74:703-10.

14. Ricketts RM. Esthetics, environment, and the law of lip relations. Am J Orthod 1968;54:272-89.

15. Park HS, Yoon DY, Park CS, Jeoung SH. Treatment effects and anchorage potential of sliding mechanics with titanium screws compared with the Tweed-Merrifield technique. Am J Orthod Dentofacial Orthop 2008;133:593-600.

16. Mills JR. The stability of the lower labial segment. A cephalometric survey. Dent Pract Dent Rec 1968;18:293-306.

17. Erverdia N, Acarb A. Zygomatic Anchorage for En Masse Retraction in the Treatment of Severe Class II Division 1. Angle Orthod 2005;75:483-90.

How to cite this article: Al-Fraidi A, Afify AR. Unusual treatment of bimaxillary dentoalveolar protrusion via miniscrews and molar extraction. J Orthodont Sci 2012;1:51-7.

Source of Support: Nil, Conflict of Interest: None declared.