Acta Scientific Dental Sciences
Volume 2 Issue 1 January 2018
Case Report

Uprighting and Protraction of Mandibular Second and Third Molars into Missing First Molar Spaces for a Patient with T-Loop and Temporary Anchorage Device: A Case Report

Susmita Choudhary[1]*, Bides Bhaumik[2], Mini Libang[3] and Aman Kumar[4]

[1]*Consultant Orthodontist, Ahmedabad, Gujarat, India*

[2]*Professor and Head, Department of Orthodontics and Dentofacial Orthopedics, Dr. R. Ahmed Dental College and Hospital, Kolkata, India*

[3]*Consultant Orthodontist, Dental Surgeon, Arunachal Pradesh, India*

[4]*Final Year MDS Student, Department of Orthodontics and Dentofacial Orthopedics, Dr. R. Ahmed Dental College and Hospital, Kolkata, India*

***Corresponding Author:** Susmita Choudhary, Consultant Orthodontist, Ahmedabad, Gujarat, India.

Received: November 27, 2017; **Published:** December 22, 2017

Abstract

In a young woman, aged 16 years, with upper anterior spacing and mesiopalatal rotation of upper central incisors, the right and left mandibular first molar extraction spaces were closed by protraction of the second and third molars without reciprocal retraction of the incisors and the premolars. The amounts of protraction for the second molars were 8 mm on the right side and 6 mm on the left side. Initial uprighting of lower second molars were done by T-loop on both sides. A titanium miniscrew was placed in the buccal alveolar bone between the first and second premolars on right side to provide direct anchorage for absolute protraction forces. On the left side uprighting and protraction was done simultaneously with the use of T-loop as uneven and less space was present on left side as compared to the right side. Careful biomechanical consideration was used to prevent tipping, rotation of posterior teeth. The treatment time was 20 months. Ideal overjet and overbite with good posterior occlusion was achieved.

Keywords: Molar Protraction; Miniscrew; Uprighting; T-Loop

Introduction

Mandibular first permanent molar is the most common tooth to be lost due to caries according to Moyers [6]. Loss of permanent tooth results in undesirable consequences such as mesial tipping and rotation of adjacent teeth, supra-eruption of opposing tooth into the extraction space [1,2]. Previously prosthetic replacement of the edentulous spaces was considered as a sole treatment option as molar protraction was seldom attempted by clinicians due to increased anchorage demands and also prosthetic replacement was difficult due to mesial tipping of adjacent teeth.

Protraction of mandibular molars is challenging because of the high density of mandibular bone. Anterior dental anchorage is often inadequate to protract even a single first molar without reciprocal retraction of the incisors or movement of the dental midline [7-15]. Furthermore, if the buccal and lingual cortical plates in the edentulous region have collapsed, safe and effective protraction may be impossible.

Orthodontic temporary anchorage devices (TADs) can provide skeletal anchorage for mandibular molar protraction, avoiding the problems often encountered with the use of dental anchorage.

Kyung., *et al.* [10] reported a 9-mm mesial movement of mandibular second molars, and Nagaraj., *et al.* [14] reported an 8-mm movement using miniscrews to close bilateral missing mandibular first molar spaces. Kravitz and Jolley [15] discussed problems, such as buccal proclination, during mandibular molar protraction with miniscrews.

Diagnosis and Etiology

A Young woman, aged 16 years, reported to our Department with the chief complaint of irregularly placed upper front teeth. She also wanted to close the space due to missing lower first molar on both sides. The right and left mandibular first molars had been extracted 2 years back, because of severe caries.

The patient had a straight profile with mesoprosopic facial type. No remarkable facial asymmetry was seen.

Figure 1: Pretreatment Facial and Intraoral Photographs.

Intraorally she had mesiopalatally rotated upper right and left central incisors and midline diastema of 2 mm in the upper arch with overjet of 3 mm and overbite of 2 mm. Both the mandibular first molars were missing.

The dental casts showed that the lengths of the mandibular edentulous spaces were 8 mm on right side and on the left side second premolar drifted back towards second molar creating spaces of 3 mm between first and second premolar as well as that between second premolar and second molar. The mandibular second molars were mesially tilted so initial uprighting of these molars were required before protraction. Prosthetic replacement was difficult in this particular case due to mesial tipping of mandibular second molars and uneven space on lower left side.

The maxillary dental midline was coincident with the facial midline, and also coincident with the mandibular dental midline. Upper right canine was in cross bite and left canine exhibited class I relation.

Figure 2: Pretreatment Study Models.

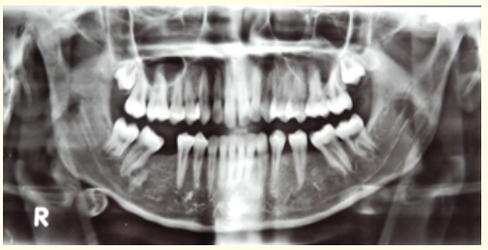

Figure 3: Pretreatment OPG.

Figure 4: Pretreatment Cephalogram.

A panoramic radiograph showed long edentulous spaces and mesial tilt of the second molars on both sides in the mandible.

Lateral Cephalometric analysis showed Skeletal class I relation (ANB angle, 2^0; Wit's Appraisal, -1.5 mm). Vertically the patient showed an average growth pattern. Soft-tissue analysis showed a slight protrusion of the lower lip (lower lip to E-line, 3 mm).

The functional assessment showed no remarkable discrepancy between centric occlusion and centric relation, and no apparent signs and symptoms of temporomandibular joint dysfunction. There were no other medical or dental problems.

Treatment Objectives

We planned to maintain the anteroposterior position of the maxillary incisors, since there was no significant facial profile problem. The main treatment objectives consisted of initial uprighting and protraction of the mandibular second and third molars to close the missing first molar spaces and to correct the rotations of maxillary central incisors and to close the midline diastema maintaining the overjet and overbite.

Treatment Alternatives

Spaces caused by missing mandibular first molars can be corrected by prosthetic bridges, dental implants, autotransplantation of third molars, or mesial orthodontic movement of second and third molars. Prosthetic bridges offer the advantage of short treatment time but must be accompanied by significant tooth preparation.

Dental implants permit conservation of tooth structure but require surgery. Autotransplantation also requires surgery, and successful transplantation cannot be guaranteed.

Our patient finally chose orthodontic replacement, because she wanted to correct additional tooth position problems, including anterior spacing, rotations of maxillary central incisors and cross bite of right canine.

Treatment Progress

The patient was bonded with 0.022" MBT appliance using metal brackets and initial alignment was done using 0.016" NiTi wires in both arches followed by 0.018" NiTi. The mandibular second molars were tilted mesially so after initial alignment the molar uprighting was done first on the right side using T-loop made of 0.017" x 0.025" TMA wire with base arch wire 0.019" x 0.025" stainless steel wire. T-loop was selected as segmental uprighting arch wires with T-loops are easy to fabricate and use; T-looped uprighting springs can be engaged immediately and used efficiently in instances in which helical spring or box-loop uprighting appliances are contraindicated; T-looped uprighting springs offer excellent controlled movements of teeth in three planes of space; acceptance by the patient is favorable; and treatment time, depending on the amount of tooth movement required, is rapid and varies between 8 to 16 weeks as discussed by Burstone [5].

Following uprighting, 0.016" × 0.022" NiTi wire was ligated, followed by 0.017" × 0.025"SS and finally 0.019" × 0.025"SS wires were ligated in both arches. Upper anterior space consolidation was done on 0.019" x 0.025" stainless steel wire using elastomeric

chain. On the mandibular left side space consolidation was done mesial to second premolar and then there was 6 mm space left between second premolar and second molar. Molar uprighting as well as protraction was done using T-loop made of 0.017" x 0.025" TMA wire on the left side as there was comparatively less space on the left side than on the right side. On the mandibular right side molar uprighting was completed in around 2 months using T-loop.

A miniscrew of dimensions 1.5 × 8 mm was inserted with respect to 44 and 45 and a protraction force was applied using a NiTi closed-coil spring from the miniscrew to 47. Then space was created between second and third molars on right side as well as on the left side. So after the protraction of mandibular second molars, elastics in Class II pattern was advised to use on both sides from lower 3rd molars to upper intermaxillary hook for protraction of 3rd molars as well as overjet correction. The third molars extrusion were prevented as closed coil spring was attached from third molar to miniscrew on right side and T-loop was continued on the left side. Finishing and detailing was continued for another 3 months. The total treatment time was 20 months. A 0.0175-in twisted-wire fixed retainer was attached onto the lingual surfaces of the anterior teeth in both arches immediately after debonding.

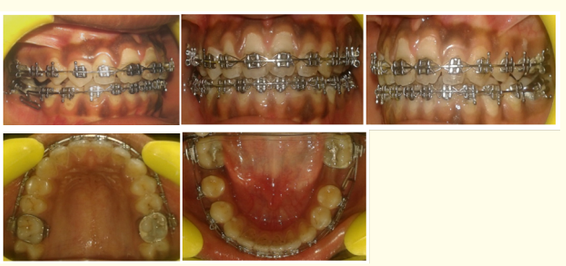

Figure 5: Initial Uprighting of 47 using T-loop after initial alignment and leveling.

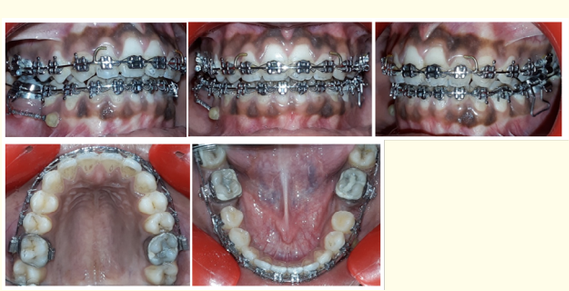

Figure 6: Initial Uprighting of 47 using T-loop after initial alignment and leveling.

Treatment Results

The maxillary and mandibular arches were well aligned and coordinated without midline deviations. Normal overbite and overjet were achieved. The final models showed normal Class I molar and canine relationships and good intercuspation. The edentulous spaces in the mandibular arch were completely closed by protraction of the second and third molars. The mesially tipped mandibular second molars were uprighted. The posttreatment panoramic radiograph showed good root parallelism. There was no remarkable root resorption. All teeth showed good alveolar bone height. Post treatment cephalogram and superimposed tracing shows the mesial movement of the second and third molars. There was no significant change in the facial profile with no increase in facial height. The changes in the upper lip and chin were minimal during treatment. Wire fixed retainers were attached to the lingual aspect of each tooth from the right to the left canines in both arches.

Figure 7: Post treatment Facial and Intraoral Photographs.

Figure 8: Post treatment OPG.

Figure 9: Post treatment Cephalogram.

Discussion

The mandibular first molar is the most frequently lost tooth in adults [6]. Molar protraction can be an alternative to restoration with posterior dental implants or fixed partial dentures. Recently, there have been more reports about orthodontic protraction of the second and third molars into missing first molar spaces [10,14,15]. Compared with other cases previously reported, our patient is different in several ways. First, the edentulous span

was uneven on lower left side. Second, the edentulous spaces were closed entirely by protraction of the second and third molars as very minimal space was required to establish normal overjet and overbite. A miniscrew was placed in between the roots of first and second premolars on lower right side to provide direct anchorage for efficient molar protraction. During the movement of a tooth over a long distance, tipping is a big concern. To prevent mesial tipping, a heat-treated 0.016" x 0.022" stainless steel wire was inserted and changed at every visit. Long buccal hook attached to the lower right second molar bracket was also used to protract the teeth through the center of resistance. Stepovich [3] also demonstrated that posterior mandibular edentulous spaces could be closed without tipping. In our patient, this problem was minimized by placing an antirotation bend in the posterior portion of the arch wire. Despite our efforts, a slight mesial rotation occurred on the right second molar during protraction . Therefore, we removed the bands and bonded the brackets toward the mesial sides of the teeth. At debonding, there were no rotations or crossbites of the second and third molars. Molar protraction often requires a phase of uprighting due to the tipping of molar into the extraction site. A T-loop was used in the present case to allow distal crown moment and mesial root moment of the molar on the right side. On the left side T-loop was used to upright as well as protract second molar [16-19].

Conclusion

Mandibular molar protraction with orthodontic TADs has become the standard of care for closing posterior edentulous spaces without retracting the anterior teeth as miniscrews provide a source of skeletal anchorage. The use of miniscrews for mandibular molar protraction can be used as a routine procedure in orthodontic practice as prosthetic replacement cannot be always used as treatment alternative.

Conflict of Interest

None.

Bibliography

1. Graber TM. "Orthodontics: Principles and Practice. 3rd Edition". Philadelphia: WB. Saunders Company (1972).

2. Kessler M. "Interrelationships between orthodontics and periodontics". *American Journal of Orthodontics and Dentofacial Orthopedics* 70 (1976): 154-172.

3. Stepovich MI. "A clinical study on closing edentulous spaces in the mandible". *Angle Orthodontist* 49.4 (1979): 227-233.

4. Tuncay OC., *et al*. "Molar uprighting with T-loop springs". *Journal of the American Dental Association* 100.6 (1980): 863-866.

5. Roberts., *et al*. "A segmental approach to mandibular molar uprighting". *American Journal of Orthodontics and Dentofacial Orthopedics* 81.3 (1982): 177-184.

6. Moyers RE. "Handbook of Orthodontics". Chicago: Year Book Medical Publishers (1988).

7. Roberts WE., *et al*. "Rigid endosseous implant utilized as anchorage to protract molars and close an atrophic extraction site". *Angle Orthodontist* 60.2 (1990): 135-152.

8. Roberts WE., *et al*. "Rigid implant anchorage to close a mandibular first molar extraction site". *Journal of Clinical Orthodontics* 28 (1994): 693-704.

9. Shellhart W C and Oesterle LJ. "Uprighting molars without extrusion". *Journal of the American Dental Association* 130.3 (1999): 381-385.

10. Kyung SH., *et al*. "Miniscrew anchorage to protract lower second molars into first molar extraction sites". *Journal of Clinical Orthodontics* 37.10 (2003): 575-579.

11. Zachrisson and Bantleon. "Optimal mechanics for mandibular molar uprighting". *World Journal of Orthodontics* 6.1 (2005): 80-87.

12. Chen C H., *et al*. "The use of microimplants in orthodontic anchorage". *Journal of Oral and Maxillofacial Surgery* 64.8 (2006): 1209-1213.

13. Kravitz ND and Kusnoto B. "Risks and complications of orthodontic miniscrews". *American Journal of Orthodontics* 131.4 (2007): 43-51.

14. Nagaraj K., *et al*. "Titanum screw anchorage for protraction of mandibular second molars into first molar extraction sites". *American Journal of Orthodontics and Dentofacial Orthopedics* 134.4 (2008): 583-591.

15. Kravitz ND and Jolley T. "Mandibular molar protraction with temporary anchorage devices". *Journal of Clinical Orthodontics* 42.6 (2008): 351-355.

16. Jung MH and Kim TW. "Biomechanical considerations in treatment with miniscrew anchorage. Part 1. The sagittal plane". *Journal of Clinical Orthodontics* 42.2 (2008): 79-83.

17. Moon CH., *et al*. "Factors associated with the success rate of orthodontic miniscrews placed in the upper and lower posterior buccal region". *Angle Orthodontist* 78.1 (2008): 101-106.

18. Baik., *et al*. "Protraction of mandibular second and third molars into missing first molar spaces for a patient with an anterior open bite and anterior spacing". *American Journal of Orthodontics and Dentofacial Orthopedics* 141.6 (2012): 783-791.

19. Nihara J., *et al*. "Finite element analysis of mandibular molar protraction mechanics using miniscrews". *European Journal of Orthodontics* 37.1 (2014): 95-100.

Volume 2 Issue1 January 2018