

Restorative - Orthodontics: Is This An Option?

ANIL SHARMA

ABSTRACT

Edentulous spaces in the dental arches have conventionally been managed with either implants or other fixed or removable prostheses. This article describes another possibility of orthodontically closing these extraction spaces, especially in young individuals, thereby restoring an ideal occlusion and arch integrity without the need of a prosthesis. This article presents

case reports where the edentulous spaces were closed orthodontically, leaving no room for a prosthesis, thereby providing a physiologically balanced occlusion and avoiding the lifelong maintenance of a prosthesis.

Key Words: Molar protraction, Edentulous space closure

INTRODUCTION

A missing tooth in a dental office, is always a potential case for a bridge or an implant. The treatment is predictable and the treatment time is shorter. But, there is a possibility in orthodontics that can be explored in some cases, especially in young individuals where the edentulous spaces are closed to give a physiologically balanced occlusion, thus avoiding the lifelong maintenance of a prosthesis. Many orthodontic patients have posterior spacing due to missing mandibular teeth. Excluding the third molars, the mandibular second premolar is the most common congenitally absent tooth [1]. The mandibular first molar is the most frequently lost tooth in adults [2].

Molar protraction can be an alternative to restoration with posterior dental implants or fixed partial dentures. Three case reports are presented in this article, in which the posterior edentulous spaces were closed by molar protraction (mesial movement of the molar into the edentulous space).

Case Report 1:

An 18 yr. old young girl reported to the clinic with a missing lower left 1st molar, which had been extracted due to an extensive carious lesion, asking for the replacement of the same. On clinical examination, she presented with an anterior openbite, excessive overjet, as well as crowding in the lower anterior region. The lower left 2nd molar had tipped mesially into the extraction space. The attention of the patient and her parents was drawn towards the existing condition and a holistic approach was discussed, to orthodontically treat the condition to achieve a better occlusion as well as the space closure of the missing left 1st molar space by the mesial movement of the 2nd molar and the retraction of the anteriors.



[Table/Fig 1]: Fig 1a-1f Pre-treatment Photographs of patient showing a missing lower left first molar, class-II Div-1 malocclusion, anterior openbite and an increased overjet.

The treatment plan included - extraction of - upper left and - right 1st premolars, - lower right 1st premolar and the use of the space of - missing left lower 1st molar in the lower left quadrant. The case was treated orthodontically. A straight wire appliance with an MBT prescription and an .022 slot was used to treat the case. The extractions of the three premolars were carried out as planned, the upper and the lower arches were bonded with the straight wire appliance and the treatment was initiated.



[Table/Fig 2]: Fig 1g – Fig 1k between treatment photographs showing completion of initial leveling and alignment. The maxillary canines have been retracted completely and the anterior retraction is in progress

The crowding was relieved in the lower segment. The initial leveling and alignment was carried out with the help of flexible nickel-titanium wires. The lower left second molar which had tipped mesially into the extraction space of the missing 1st molar, was uprighted before moving it mesially to close the edentulous space. The upper anterior teeth were retracted sufficiently and were extruded to eliminate their proclination and to establish an ideal overjet and an overbite relationship.

The canines were brought in a class-1 relationship and the residual spaces were closed by the mesial movement of the molars. The post-treatment photographs show the complete closure of the open-bite thus establishing a normal overjet-overbite relationship. The edentulous space of the missing lower left 1st molar was taken up by the lower left 2nd molar and this facilitated the eruption of the lower left 3rd molar into the arch.

The final result shows a comfortable occlusion, an ideal overjet-

overbite and a good posterior intercuspation. At the end of the treatment, the patient's facial profile had improved. The patient was happy to have straighter teeth, a pleasant smile and above all, the edentulous space had been closed completely, without the need for any prosthesis.

With this treatment, not only was the patient's appearance improved, but also, the posterior occlusion which had been mutilated on the left side due to the loss of the lower 1st molar, was restored completely without the need for any prosthesis.



[Table/Fig 3]: Fig: 1l-1p Post-treatment photographs showing the restoration of an ideal occlusion by substituting the edentulous space of the missing lower left 1st molar with the second molar

Case Report 2:

A female patient who was aged 19 yrs, reported to the clinic for the restoration of the edentulous space in relation to the mandibular right and left 1st molars with a dental bridge. On examination, the patient was found to have crowding in both the arches. Since the lower first molars had been missing for many years, the upper first molars had supra-erupted into the edentulous space, thus disturbing the bite. The adverse effects of this malocclusion were discussed with the patient and her parents.



[Table/Fig 4]: Fig: 2a-2e Pretreatment photographs showing a mutilated dentition with crowded upper & lower anterior teeth as well as a bimaxillary protrusion

Since there was - crowding of teeth in both the arches and as the upper teeth were also proclined, it was decided to extract the upper first premolars to relieve the crowding and to retract the anterior teeth. In the lower arch, the space which was available due to the missing first molars was used to relieve the crowding. A straight wire appliance (MBT prescription - .022 slot) was bonded to both the arches. Retraction of upper and the lower anterior teeth was carried out to relieve the crowding and to reduce the overjet /overbite.

The remaining space was closed by protracting the molars forward into the extraction space. Care was taken not to over-retract the lower anterior teeth to maintain a normal overjet-overbite relation-

ship of the anterior teeth. Heavy CI-II elastics were used to protract the lower molars and to maintain the overjet-overbite relation of the anterior teeth. The closure of the lower molar spaces was achieved as promised, without any prosthesis, as well as the patient's facial appearance was improved with the extraction of the upper 1st premolars and the subsequent retraction of the anterior teeth into these extraction spaces. A good occlusion, a pleasant smile and a well balanced facial musculature was achieved at the end of the treatment.

At the end of the treatment, the patient was happy to have straight teeth which were easy to clean and that looked good too. The patient's desire for an artificial replacement of the missing tooth, was thus substituted with a natural healthy dentition, without the need for any artificial tooth.



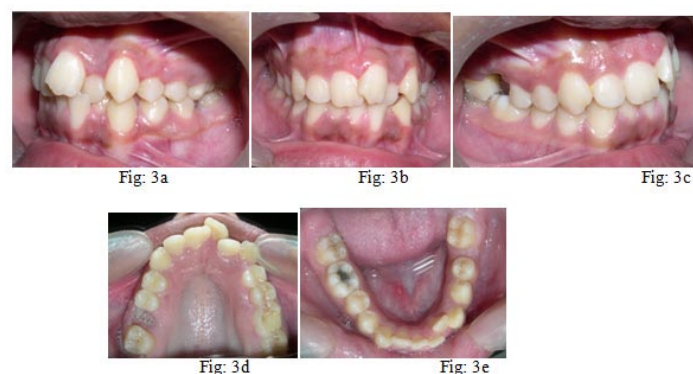
[Table/Fig 5]: Fig 2f-2j Post-treatment photographs showing the restoration of an ideal occlusion by substituting the edentulous spaces of the missing lower first molars with the lower second molars

Case Report 3:

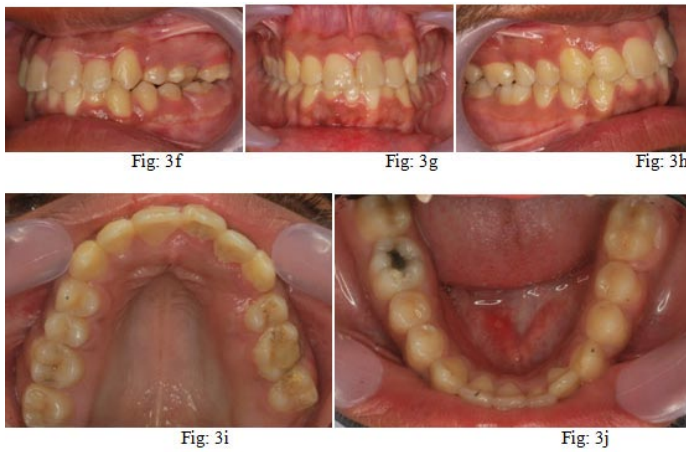
A patient who was aged 16yrs consulted the clinic for the extraction of the root stump of the maxillary right 1st molar and the restoration of the edentulous spaces of the upper right first molar and the lower left first molar.

The patient did - present crowding of teeth in both the arches and so the possibility of an orthodontic correction of the teeth was discussed with the patient. The maxillary 1st bicuspid in the left quadrant was also extracted to relieve the crowding and to restore the midline. In the mandible, no extraction was carried out and the teeth were uncrowded by using the edentulous space of the lower left first molar.

The residual space in the lower arch was eliminated by protracting the lower left second molar into the extraction space. A temporary anchorage device was used to protract the molars forward into the extraction space. At the end of the treatment, the patient was satisfied to achieve an aesthetic smile, a better functional occlusion, hygienically maintainable teeth and no prosthesis.



[Table/Fig 6]: Fig 3a-3e Pretreatment photographs showing malaligned teeth and edentulous spaces in relation to upper right & lower left first molars



[Table/Fig 7]: Fig 3f-3j Post-treatment photographs showing the restoration of an ideal occlusion by substituting the edentulous spaces of missing upper right & lower left first molars with the second molars

CONCLUSION

The protraction of the 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 the reciprocal retraction of the incisors or the movement of the dental midline. Furthermore, if the buccal and lingual cortical plates in the edentulous region have collapsed, a safe and effective protraction may be impossible. Avoiding anchorage loss is considerably more challenging in the mandible than in the maxilla, in part because of the structural differences between the two jaws. The posterior maxilla is composed of uniformly thin cortices which are interconnected by a network of spacious trabeculae [3], while the posterior mandible consists of a thicker cortical bone with dense, radially oriented trabeculae [4].

In the molar region, the maxilla has an average buccal cortical thickness of 1.5mm, as compared to the 2mm thickness in the mandible [4],[5].

The rate of molar protraction is inversely related to the radiographical density or the cortical thickness of the resisting alveolar bone [6].

Because of the increased thickness of the mandibular cortical bone, the rate of mandibular molar translation with skeletal anchorage is nearly half that of the maxillary molar translation, which is approximately .34-.60mm per month [7].

Many adult orthodontic patients with posterior edentulous spacing have been missing teeth for years and therefore exhibit alveolar ridge resorption. The rate of resorption is greatest during the first several months to two years after extraction, but it decreases thereafter [8].

The amount of post-extraction resorption is significantly greater on the buccal than on the lingual side in both the arches [9].

During the first year after tooth extraction, the amount of resorption in the mandible is twice of that in the maxilla—a ratio that increases to 4:1 after seven years [10].

The potential risks of molar protraction through an atrophic ridge include the loss of attachment (particularly in the presence of plaque), dehiscence, mobility, ankylosis, root resorption, devitalization, and tooth morbidity. Although a successful molar protraction through the atrophic ridges has been reported [11-12], no clinical study to date, has evaluated the correlation between an atrophic ridge and periodontal response during bodily tooth movement. Hence, the decision on whether to proceed with orthodontic tooth movement through an atrophic ridge must be made on a case-to-case basis.

REFERENCES:

- [1] Thilander, B. and Myrberg, N.: The prevalence of malocclusion in Swedish schoolchildren, *Scand. J. Dent. Res.* 1973, 81:12-21.
- [2] Meskin, L.H. and Brown, L.J.: Prevalence and patterns of tooth loss in U.S. employed adult and senior populations, *J. Dent. Educ.* 1988, 52:686-691.
- [3] Adell, R.; Lekholm, U.; Rockler, B.; and Brånemark, P.I.: A 15-year study of osseointegrated implants in the treatment of the edentulous jaw, *Int. J. Oral Surg.* 1981, 10:387-416.
- [4] Deguchi, T.; Nasu, M.; Murakami, K.; Yabuuchi, T.; Kamioka, H.; and Takano-Yamamoto, T.: Quantitative evaluation of cortical bone thickness with computed tomographic scanning for orthodontic implants, *Am. J. Orthod.* 2006, e7-12: 129:721.
- [5] Katranji, A.; Misch, K.; and Wang, H.L.: Cortical bone thickness in dentate and edentulous human cadavers, *J. Periodontol.* 2007, 78:874-878.
- [6] Roberts, W.E.: Bone physiology, metabolism, and biomechanics in orthodontic practice, in *Orthodontics: Current Principles and Techniques*, 2nd ed., ed. T.M. Graber and R.L. Vanarsdall, Mosby, St. Louis, 1994, 193-234.
- [7] Roberts, W.E.; Arbuckle, G.R.; and Analoui, M.: Rate of mesial translation of mandibular molars using implant-anchored mechanics, *Angle Orthod.* 1996, 66:331-338.
- [8] Woelfel, J.B.; Winter, C.M.; and Igarashi, T.: Five-year cephalometric study of mandibular ridge resorption with different posterior occlusal forms, Part I: Denture construction and initial comparison, *J. Prosthet. Dent.* 1976, 36:602-623.
- [9] Irinakis, T.: Rationale for socket preservation after extraction of a single-rooted tooth when planning for future implant placement, *J. Can. Dent. Assoc.* 2006, 72:917-922.
- [10] Kovacic, I.; Celebic, A.; Knezovic Zlataric, D.; Stipetic, J.; and Papic, M.: Influence of body mass index and the time of edentulousness on the residual alveolar ridge resorption in complete denture wearers, *Coll. Antropol.* 27(Suppl. 2): 2003, 69-74.
- [11] Roberts, W.E.; Nelson, C.L.; and Goodacre, C.J.: Ridge implant anchorage to close a mandibular first molar extraction site, *J. Clin. Orthod.* 1994, 28:693-704.
- [12] Roberts, W.E.; Marshall, K.J.; and Mozsary, P.G.: Rigid endosseous implant utilized as anchorage to protract molars and close an atrophic extraction site, *Angle Orthod.* 1990, 60:135-152.

AUTHORS:

1. Dr. ANIL SHARMA

NAME OF DEPARTMENT(S) / INSTITUTION(S) TO WHICH THE WORK IS ATTRIBUTED:

Dept of orthodontics

NAME, ADDRESS, TELEPHONE, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Anil Sharma, Alignorthodontics, B-280 G/F, Sector-57, Gurgaon, Haryana-122002.

E-mail: alignorthodontics@rediffmail.com

Phone: 09910088977, 0124-4294280

DECLARATION ON COMPETING INTERESTS: No competing Interests

Date of Submission: Jan 03, 2011
Peer Review Completion: Jan 18, 2011
Date of Acceptance: Jan 27, 2011
Date of Publication: Apr 11, 2011