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Case Report RRJoD

Protraction of Mandibular Third Molar with Mini-Implants: A Case Report on a Preventive Strategy

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Abstract

This report outlines the orthodontic management of a 22-year-old female presenting with bimaxillary protrusion and a mandibular second molar (teeth #37 &47) with failed root canal treatment and deep caries, respectively. To address the edentulous space left by the non-restorable second molar, Temporary Anchorage Devices (TADs) were precisely positioned in the buccal alveolar bone between the roots of the second premolar and first molar. These TADs ensured firm anchorage for the forward movement of the third molar into the area previously occupied by the second molar. Approximately 9 mm of protraction was successfully achieved, with careful management of tooth movement to avoid excessive lingual tipping of the incisors. The treatment resulted in a stable posterior occlusion, effectively closing the space and preserving the functional and esthetic integrity of the dentition.

Keywords: Third Molar Protraction, Temporary Anchorage Device (TADs)

INTRODUCTION

When a mandibular molar, whether the first or second, is lost, orthodontic replacement with the second or third molars, respectively, can serve as an excellent treatment option, if success can be assured. This approach offers a viable solution for restoring functional occlusion and maintaining the integrity of the dental arch, contingent upon favorable conditions and proper treatment planning. Stepovich [1] presented the possibilities of these methods without severe complications, such as root resorption and tipping of adjacent teeth. Roberts et al. [2, 3] used endosseous implants placed in the retromolar area to close missing first molar spaces by mesial movement of the mandibular molars. In recent years, orthodontic miniscrews, which are more convenient, simple, and cheaper than endosseous implants, have been used widely. Kyung et al. [4] reported a 9-mm mesial movement of mandibular second molars, and Nagaraj et al. [5] reported an 8-mm movement using miniscrews to close bilateral missing mandibular first molar spaces. Kravitz and Jolley [6] discussed problems, such as buccal proclination, during mandibular molar protraction with miniscrews. In the case presented, titanium screws were strategically placed in the buccal alveolar bone to facilitate the protraction of the mandibular third molars into the extraction sites of the second molars. The same TADs were utilized to retract the anterior teeth in both the upper and lower arches, effectively addressing the proclination of the anterior teeth.

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CASE PRESENTATION

A 22-year-old female patient presented with the chief complaint of forwardly placed upper and lower front teeth with slight spacing in the upper front teeth. Extra orally, the patient presented with a convex profile, characterized by an acute nasolabial angle and a pronounced deep mentolabial sulcus. Intraorally, class 1 molar relation bilaterally with proclined upper and lower anteriors. Deep carries wrt 47 and root canal treated 37. Erupting mandibular third molars bilaterally.

DIAGNOSIS

Patient was diagnosed as Angles class I bimaxillary protrusion on skeletal class II bases with average growth pattern (Figure 1).

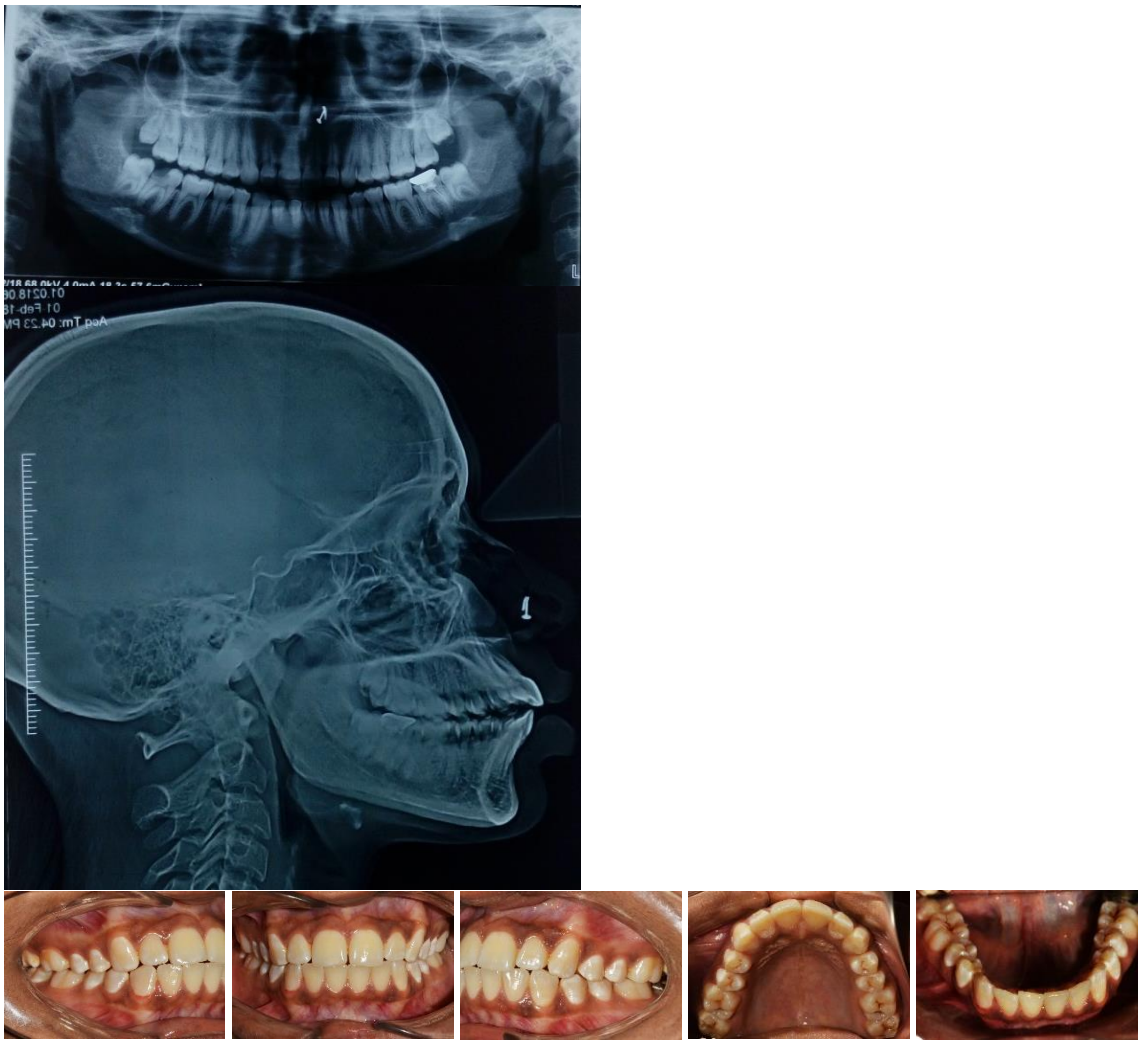

Figure 1. Pre-treatment intraoral images displaying bimaxillary protrusion, along with the lateral cephalogram and orthopantomogram (OPG).

Treatment Planning

To address the bimaxillary protrusion, the decision was made to extract all four premolars. However, significant concern arose regarding the prognosis of the root canal-treated tooth #37, which exhibited a positive test for tenderness on percussion (TOP), and the presence of deep caries in tooth #47. Given the poor prognosis of both teeth, it was determined that extraction of #37 and #47 was necessary. Following the extractions, the third molars were protracted into the resulting extraction sites. To facilitate both anterior retraction and third molar proportion, mini-implants (TADs) were employed as a means of effective anchorage.

Treatment Progress

Following the extraction of teeth #37 and #47, a bondable button was placed on tooth #38, and an elastomeric chain was applied from tooth #33 to #38 to facilitate the eruption of the third molar. On the contralateral side, tooth #48 was bonded, and a sectional TMA wire (0.017 x 0.025) was inserted from the auxiliary tube of tooth #46 to #48, providing the necessary mechanical support for alignment and movement (Figure 2(a, b)).

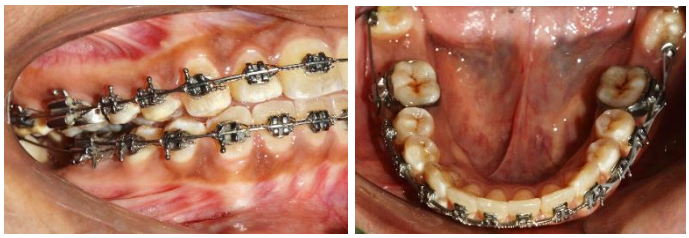

Figure 2. A – Buttons and tubes are bonded on teeth 38 and 48, respectively. B – Sectional TMA wire is placed from tooth 46 to tooth 48.

Once sufficient eruption of the third molars was achieved, molar tubes were bonded, and alignment was performed for both arches. Subsequently, mini-implants (diameter 0.8 mm, length 8 mm for the maxilla and 10 mm for the mandible) were placed between the second premolar and first molar in all quadrants. Hooks were also at distal to the laterals in all four quadrants. Elastic chains were then utilized to apply force for the protraction of the third molars (38 and #48) and for the retraction of the upper and lower anterior teeth, with anchorage provided by the mini-implants (Figure 3).

Figure 3. Intraoral photographs showing the placement of TADs (Temporary Anchorage Devices) as described above.

The third molars (#38 and #48) were protracted using a 0.019" x 0.025" stainless steel wire to preserve the arch form, while simultaneous retraction of the upper and lower anterior teeth was performed. Both molar protraction and anterior retraction were successfully completed within 8 months, resulting in a bilateral Angle's Class I molar relationship and well-aligned arches (Figure 4). A significant improvement in the patient's facial profile has been achieved following the retraction of the anterior teeth and the protraction of the lower molars (38 and 48). Both molars were successfully up righted with no tipping observed, ensuring proper alignment and positioning within the dental arches. These adjustments have resulted in an optimal occlusion.

As demonstrated in the lateral cephalogram and orthopantomogram (Figure 5), the desired changes in the skeletal and dental relationships are clear. The retraction of the anterior teeth has enhanced the overall profile, while the protraction and uprighting of the molars have contributed to a more stable occlusion. The absence of tipping in the molars further supports the controlled nature of the treatment, ensuring long-term stability and function. These changes reflect the successful outcome of the treatment plan, resulting in both functional and aesthetic improvements for the patient. The imaging results validate the precision and effectiveness of the orthodontic intervention.

Figure 4. Intraoral photographs depicting the closure of spaces following retraction and the protraction of the third molars.

DISCUSSION

Previously, Graber [7] stated that clinicians can seldom close molar spaces with limited orthodontic therapy. The large root surfaces of molars can complicate their movement, often resulting in undesirable

tooth movements, such as lingual tipping of the incisors. However, with the advent of skeletal anchorage, it is now possible to address anchorage challenges that were previously difficult to resolve, providing enhanced control and stability in orthodontic treatment. Titanium screws have gained wider acceptability; they have several advantages over dental implants, such as simpler placement, lower costs, minimal surgical trauma, and immediate loading [8–10]. Additionally, due to their compact size, clinicians can strategically place Temporary Anchorage Devices (TADs) in various anatomic locations, allowing for the precise application of force in the desired direction. In this case, TADs were positioned on the buccal alveolar bone, between the roots of the second premolars and first molars, ensuring easier accessibility and facilitating better oral hygiene maintenance. Although the titanium screws remained stable throughout the protraction phase, mild chronic inflammation around the screw sites may cause some discomfort. To mitigate these issues, it is essential to accurately position the screws and ensure diligent oral hygiene, including regular brushing and the use of chlorhexidine treatment, to prevent complications. According to Kessler [11], we should not attempt the physical movement of mandibular molars because their roots are wider than the adjacent edentulous ridge and can cause loss of osseous support. However, a couple of reports in orthodontic literature have refuted that statement [12, 13]. Hom and Turley [12] reported that mandibular space closure was not only possible, but it could even provide great benefits to some patients. They proposed space closure as potential therapy when the mandibular first molars are missing. Root resorption was minimal for both molars; even though they translated more than 8 mm. Stepovitch [13] studied the changes in edentulous ridge before and after space closure of mandibular first molar spaces. He concluded that clinicians could close spaces of 10 mm or more in adults, but maintaining the closed spaces is difficult. For the same reason, it is advisable to use fixed buccal retainers from molar to premolar in the mandibular arch to prevent the spaces from reopening during the retention phase.

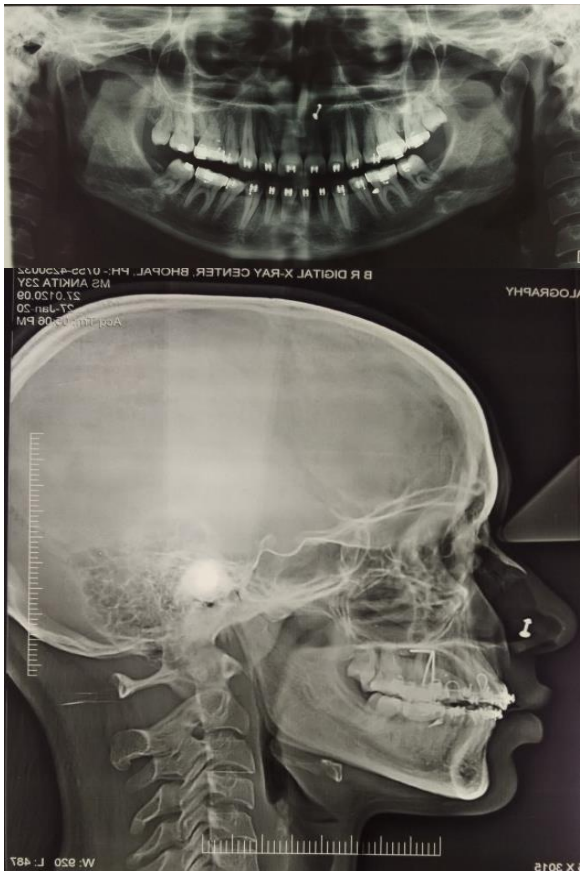

Figure 5. Demonstrates the lateral cephalogram and orthopantomogram following the retraction of the anterior teeth and protraction of third molars into the position of the second molars in the mandibular arch.

CONCLUSIONS

An insightful overview of the challenges in managing edentulous spaces, particularly in terms of preserving bone and choosing the appropriate restorative solution. Fixed prostheses are generally the go-to option due to their longevity and functional benefits, they do come with significant downsides, including cost, the potential for damage to adjacent teeth, and the risk of mechanical failures over time. Use of titanium screw anchorage to protract mandibular 3rd molars into extraction sites, offers an innovative approach to address these limitations. This method leverages the concept of orthodontic space closure, using anchorage systems to move teeth into edentulous areas, which can be highly beneficial in cases with moderate bone loss.

By using titanium screw anchorage, clinician can achieve controlled tooth movement, thus facilitating closure of the edentulous space without the need for a fixed prosthesis or implant placement. This strategy also reduces the risk of compromising adjacent healthy teeth, and the overall treatment could be more cost-effective than traditional implant-based approaches.

Clinical Pearl

From a clinical perspective, this approach may be especially valuable in patients who are either not ideal candidates for implants due to insufficient bone volume or those who are seeking less invasive alternatives to full rehabilitation with fixed prostheses. However, it is essential to carefully evaluate the case to ensure that the anchorage system provides sufficient stability and that the tooth movement is predictable and effective.

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