Orthodontic extrusion for a preprosthetic approach: A bracketless mini-implant-based mechanics

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Aim: To propose a new mini-implant–based mechanics for the orthodontic extrusion of fractured posterior teeth. Methods: An innovative biomechanical bracketless system was used to gain vertical movement of fractured maxillary molars with three-dimensional control to meet preprosthetic objectives. Two slotted-head mini-implants were inserted between the roots of the canine and premolars. A sectional TMA wire was passively adapted to the mini-implant positions and connected to the first molar by a crossing crown hole. The extrusion movement was achieved in two phases. In the first phase, a vertical spring loop was formed in the sectional wire for initial pure vertical movement. Next, a horizontal spring loop was modeled to improve the proper spatial position of the molar. Conclusion: The extrusion movement and stabilization were achieved without patient compliance. The maxillary molar was extruded about 3 mm, allowing exposure of the most apical border of the fracture, giving the prosthodontist the proper clinical conditions for ideal restoration of the tooth. ORTHODONTICS (CHIC) 2012;13:210–215.

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Following the evolution of orthodontics and general dental philosophy, the orthodontic treatment of adults should be managed with the cooperation of different dental specialists, including orthodontists, oral surgeons, periodontists, endodontists, and prosthodontists, to ensure proper comprehensive treatment that fits patients’ ideal objectives.¹ The possibility of discussing the treatment options with all the members of an orthodontic/dental team before the presentation of the treatment plan to the patient is fundamental in avoiding compromise solutions and optimizing outcomes.² One of the most common movements required by the prosthodontist for restorative reasons is the extrusion of fractured teeth.³⁻⁸ The vertical movement and associated circumferential fibrotomy allows the tooth to be moved while maintaining a normal gingival sulcus depth, exposing the defective area and improving the biological shape of the tooth, the crown/root ratio, and...
the restorative stability.\textsuperscript{9,10} Ingber\textsuperscript{11} described the forced eruption technique to treat periodontal defects and restore the biological width of a tooth in cases in which the loss of dental structure was apical to the gingival margin as a consequence of caries, fracture, improper prosthetic preparation, etc. In previous reports, traditional orthodontic management of the forced eruption technique was accomplished with a double arch.\textsuperscript{7} To reinforce anchorage and avoid detrimental effects on the arches, even with inclusion of several teeth in the fixed appliances, the use of elastics, which requires patient compliance, may be necessary. To reduce stress on adjacent teeth, several temporary anchorage devices (TADs) have been proposed, with delayed or immediate loading.\textsuperscript{12–18} The aim of this article is to describe a new bracketless essential mini-implant–based mechanics for the orthodontic extrusion of fractured posterior teeth without patient compliance.

**METHODS**

A 35-year-old man presented with a Class I malocclusion and a severe oblique fracture of the maxillary left first molar that had been previously endodontically treated. The prosthodontist requested that the tooth be extruded to expose the most apical border of the lesion, reduce the invasiveness of the preprosthetic surgical procedure, and improve the crown/root ratio. The patient's chief desire was to avoid even sectional fixed appliances during treatment (Figs 1 and 2).

After the removal of the fractured part of the tooth and 3 weeks of healing, orthodontic treatment began with the surgical insertion of two slotted mini-implants (HDC Spider Screw K1—length, 8 mm; diameter, 1.5 mm) between the roots of the maxillary left canine and premolars. A sectional wire (beta-titanium alloy [TMA], 0.016 × 0.022 inch) was modeled with a vertical spring loop to gain extrusion movement of the molar. It was passively inserted and blocked with flow composite into the slot of the screws.\textsuperscript{19} To avoid the use of any brackets, the terminal area of the sectional wire in the occlusal plane was connected to the molar by means of a small hole in vestibular wall, crossing from buccal to palatal side, to control the vertical and torque movement during extrusion. The molar was equilibrated during orthodontic treatment, with selective grinding and circular fibrotomy every 10 days (Figs 3 to 7).
Fig 1  Pretreatment records showing the fractured maxillary first molar.

Fig 2  (a) Removal of the fractured area of maxillary first molar. (b) Area after 2 of weeks healing.

Fig 3  Insertion of the mini-implants and 0.016 × 0.022-inch TMA sectional wire connected with a vertical spring loop.
Discus the effects of orthodontic extrusion on fractured teeth and the advantages of a multidisciplinary approach over traditional surgical preprosthetic methods.

**Fig 4** Initial molar extrusion after 9 weeks of treatment. At this point, the amount of extrusion was 2 mm. To improve the torque control of the molar and increase the palatal exposure of the tooth, a new sectional wire was modeled with a horizontal spring loop activated both for third-order and crown movement toward the center of the alveolar crest.

**Fig 5** Torque improvement with a new sectional wire with horizontal spring loop.

**DISCUSSION**

The multidisciplinary treatment of fractured teeth (orthodontic extrusion before restoration) represents a valid alternative treatment option to the traditional surgical preprosthetic approach.
The advantages for the prosthodontist are:

- Possibility to expose the apical border of the fracture
- Reduced periodontal surgical procedures after extrusion
- A balanced crown/root ratio
- Clinical crown exposure maintained for best esthetic result
Very often, the extrusion of teeth in need of restoration can be achieved by the use of fixed sectional appliances involving adjacent elements (two mesial and two distal teeth) to manage vertical anchorage and the adverse effects on a specified area of the dental arch. The introduction of skeletal anchorage influenced this kind of approach, allowing the possibility of performing vertical and buccolingual movements and avoiding bonding on other teeth. As described in a previous study, the use of two slotted-head mini-implants and a TMA sectional wire achieves the desired orthodontic movement while preventing reactional forces on the other teeth to extrude one tooth, avoids the need for patient cooperation, and gains proper control of the tooth in all spatial dimensions (vertical, transverse, and horizontal). Moreover, the proposed alternative mechanics can be easily managed by modeling and activating the sectional TMA wire, reducing the encumbrance of the appliance, and reaching the preprosthetic orthodontic goals.

CONCLUSION

The described mechanics for the orthodontic extrusion of fractured posterior teeth in need of prosthetic restoration proved to be an effective, simple-to-manage, anchorage-free alternative treatment option. The proposed approach can be used to achieve a predictable outcome in cases in which there is a question regarding patient cooperation or the patient does not want fixed appliances.

REFERENCES