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# Mandibular Molar Rehabilitation Using Orthodontic Extrusion Associated with Odontoplasty

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## Abstract

The aim of this clinical report is to describe the successful treatment of a mandibular first molar presenting an extensive fracture at the buccal aspect in a young patient. The extension of the fracture was a negative prognostic factor for tooth maintenance. An alternative clinical treatment was proposed since the patient was young and presented with good oral hygiene and periodontal health. The treatment was based on orthodontic forced eruption associated with odontoplasty. A 3-year follow-up after the surgical procedure demonstrated the maintenance of periodontal health and good plaque control. It can be concluded that orthodontic forced eruption associated with odontoplasty promoted favorable conditions for prosthetic rehabilitation and is a feasible procedure in the treatment of tooth fracture extended below the cementoenamel junction.

Tooth fractures are among the leading causes of endodontic-restorative failure.[1-3] Such fractures are frequently associated with the following situations: excessive dental removal during endodontic therapy, large or nonconservative restorations, excessive contact on the posterior region, or excessive muscle influences. Parafunctional habits such as bruxism and malocclusion also contribute to a localized tooth fracture.[4]

The quality of the restorative procedure has a direct impact on the prognosis of endodontically treated teeth[5,6] once the tooth resistance decreases after endodontic treatment. The force imposed on the functional cusp results in a tension mostly concentrated on the base of the cusp.[7,8] The endodontically treated teeth restorations have to take into account the decreased resistance and cuspal protection.

Successful restorative dentistry also requires the preservation of a healthy periodontal attachment apparatus.[9] The concept of biologic width is critical to the periodontal interface to be restored. According to various authors, the average biologic width is 2.04 mm, ranging from 1.19 to 2.88 mm.[10-13]

The reestablishment of biological width can be achieved using surgical techniques to increase the clinical crown associated with bone resection or using orthodontic extrusion, or through a combination of both techniques.[14-16] Usually, a surgical technique is more appropriate for posterior teeth, while orthodontic maneuvers are frequently employed in anterior teeth.[17]

Prognosis and treatment of a tooth fracture vary according to its extent. If the fracture extends into the pulp region and/or below the gingival attachment, the possibility of tooth maintenance is negatively affected.[4] Thus, the aim of this clinical report is to describe the successful use of orthodontic forced eruption and crown-lengthening surgery associated with odontoplasty in the treatment of a mandibular first molar presenting an extensive subgingival fracture at the buccal aspect in a young patient.

## Clinical report

A 27-year-old male patient was referred to the clinic of our institution, reporting a dental fracture of the mandibular left first molar. Dental history revealed that he had an endodontic treatment and a composite resin restoration involving more than two-thirds of the intercuspal distance, performed 2 years before the first clinical appointment. The intraoral examination showed a subgingival fracture at the buccal aspect that involved the enamel-dentin junction and the fragment was still attached to the gingival margin (Figs 1 and 2 ). After fragment removal, a beveled fracture with deep biological width was diagnosed.

**Figure 1** Buccal view of the traumatized tooth with a fracture.

**Figure 2** Occlusal view of the fractured tooth. Note that the fragment was still in position and extended subgingivally.

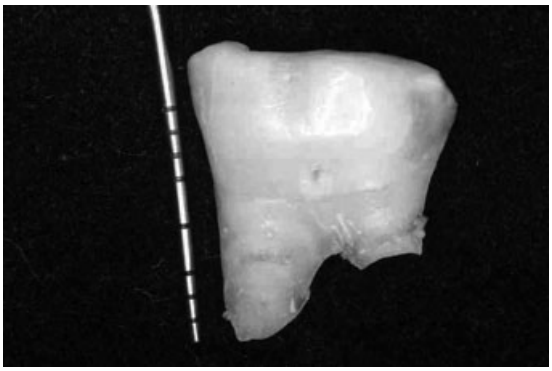

**Figure 3** Corono-radicular fragment extending 2 mm below the cementoenamel junction.

The fragment analysis showed that the fracture base was 3 (distal root) to 6 mm (mesial root) below the cementoenamel junction, involving the furcation region at the buccal aspect (Fig 3). Radiographs were also taken to confirm the extension of the problem and to facilitate the therapeutic approach (Fig 4). The patient was classified as class 1 according to the Prosthodontic Diagnostic Index.

A traditional clinical crown lengthening would result in an extensive furcation lesion. To allow the rehabilitation of the fractured tooth, an alternative procedure associating forced

**Figure 4** Initial radiographic appearance of the mandibular molar.

**Figure 5** Orthodontic forced eruption with the use of orthodontic elastics.

eruption and crown-lengthening surgery with odontoplasty was employed. At the initial dental appointment, an interim prosthesis was placed to minimize the functional and esthetic damage and to facilitate plaque control. The initial procedure for tooth rehabilitation was the orthodontic forced eruption with the aid of orthodontic elastics. An impression was taken and a plaster model obtained. A 0.7-mm orthodontic wire was modeled to passively adapt to the buccal aspect of teeth #34 and 35, to the center of the distal aspect of #35 and to the center of the mesial aspect of #37 (at the contact point height), and also to the buccal aspect of #37. After that, an orthodontic button was installed at the lingual aspect of #37. It was not possible to place an orthodontic button at the buccal aspect of #37 due to the fracture; thus, a wire with a round tip was used instead of the orthodontic button. To place the wire with round tip, a 2-mm deep perforation was performed, using a diamond round bur, at the remaining composite resin, and the wire was cemented into the perforation with light-cured composite. In the sequence, the modeled wire was bonded to the buccal surface of #s 34, 35, and 37. An orthodontic elastic rubber chain was attached to the button and to the round tip, roping the part of the wire positioned over tooth #36, used as anchorage to apply the elastic traction (Fig 5). Every 3 weeks, the occlusal surface of #36 was worn with diamond burs to allow the continuous extrusion of the tooth. After 3 months, an orthodontic wire was used to sustain the tooth at the extruded position for 7 months.

**Figure 6** Internal bevel incision performed from the distal aspect of tooth #36 to the mesial of tooth #35.

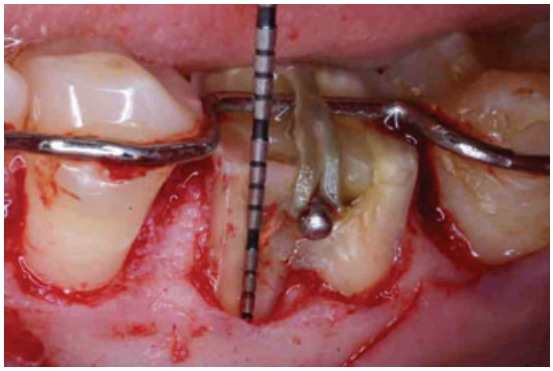

**Figure 7** Clinical view of the fractured root surface.

**Figure 8** Clinical view of the root surface after odontoplasty. Note the smoothness obtained by mini Ochsenbein chisel.

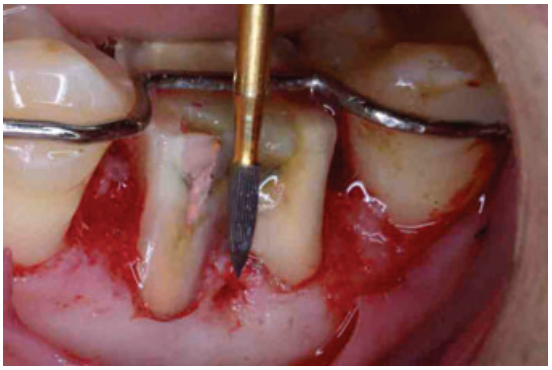

**Figure 9** Clinical view of the root surface after odontoplasty. Note the smoothness obtained by using a 30-bladed bur and periodontal curettes.

**Figure 10** Surgical site at 45 days postoperatively. Soft tissue presented normal color, without bleeding on probing. The gingival sulcus measured around 3mm.

During this period, professional cleaning procedures were performed every 2 months, and the patient received continuous oral hygiene instructions to allow the surgical procedure.

The surgical area was free from visible plaque at the moment of the surgery; however, an excess of gingival tissue could be noted. The rationale for the surgery was to expose the base of the fracture, to recontour the irregularities promoted by the fracture, and to increase the clinical crown.

Probing depth measurements were used as a reference for marginal tissue removal. After local anesthesia (2% lidocaine with 1:100000 epinephrine), an internal bevel incision was accomplished around the teeth required for dental margin exposure (Figs 6 and 7). An intrasulcular incision was then performed, a mucoperiosteal flap was reflected, and the gingival tissues were removed to allow the visualization of the bone and the dental margins. A slight osteotomy using a mini Ochsenbein chisel enabled the visualization of fracture limits planed by a 30-blade bur 9714FF and 9904FF (KG Sorensen, São Paulo, Brazil) and periodontal curettes (Hu-Friedy Co., Chicago, IL) creating a supraosseus area of 3 mm or more (Figs 8 and 9). The soft tissues were adapted with interrupted simple sutures and chlorhexidine digluconate (0.12%) mouthwash was prescribed twice a day for 2 weeks. Analgesics were prescribed to control postoperative discomfort. The sutures were removed 7 days after surgery.

The procedures for prosthetic rehabilitation began 30 days after periodontal surgery (Fig 10), with postspace preparation, reproduction of the internal details with DuraLay acrylic resin (Reliance Dental Mfg. Co., Worth, IL), and casting of a silver-palladium pin-core. The pin-core was cemented, an impression was taken with polyether (Impregum Soft, 3M ESPE, St. Paul, MN), and a plaster model was obtained. After that, a metal-ceramic prosthetic element (#36), in accordance with the

**Figure 11** Restored tooth four months after prosthetic crown placement.

**Figure 12** Periodontal examination showing the surgical site clinically healthy six months after surgery.

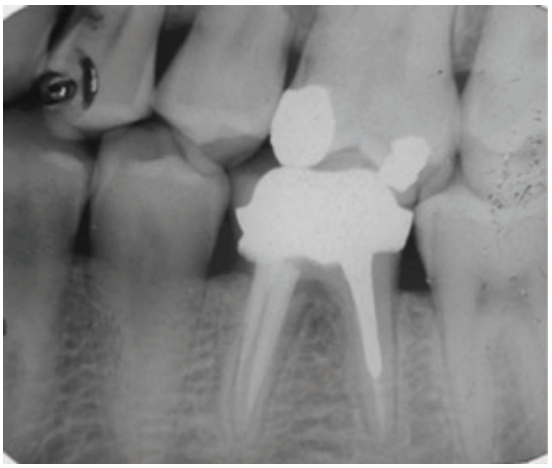

**Figure 13** Radiographic Follow-up after 12 months of the periodontal surgery.

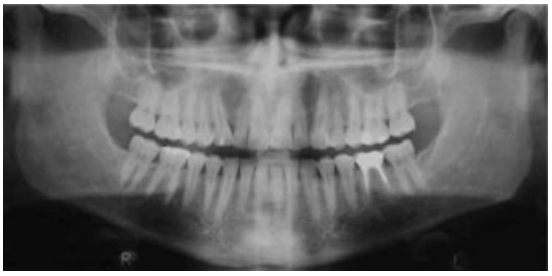

**Figure 14** Panoramic radiographic after 36 months of the periodontal surgery.

new cervical contour, was produced and cemented. The 3-year follow-up demonstrated the success of the employed therapeutic approach. The prosthetic rehabilitation presented clinical and radiographic success and the root remnant was able to support a fixed prosthesis (Figs 11-14). The periodontal parameters at the region revealed good oral hygiene and periodontal health.

## Discussion

This clinical report showed a conservative approach for the treatment of an extensive coronoradicular fracture of a mandibular first molar in a young patient. The association of forced eruption, clinical crown lengthening, and odontoplasty avoided tooth extraction and promoted an adequate tooth remnant for crown placement without a negative impact on supporting tissues. The maintenance of a dental root instead of tooth extraction and implant placement could be questioned, especially currently, in which some clinicians overestimate the use of titanium implants as a therapeutic approach. Despite the long-term results of Ti implants, a tooth-supported crown is preferable when compared to an implant-supported prosthesis, mainly in young patients with long life expectancy. In addition, the association of forced eruption and odontoplasty exerts a minor influence on bone height/thickness, not hindering a future implant placement, in case of tooth loss. The great benefit of odontoplasty technique is a reduced necessity for osteotomy, and the advantage of forced eruption prior to periodontal surgery is that the subsequent bone removal is confined to the extruded tooth,[16] which frequently has an excess of tissue promoted by forced eruption (as in this case). The divergence of molar roots could be a contraindication for forced eruption.[17] However, this case did not present divergent roots allowing forced eruption. Such properties of the employed technique and the characteristics of the clinical case make this a feasible option for the treatment of an extensive fracture with furcation involvement and biological width invasion.

The technique of forced eruption in the treatment of a deeply fractured molar was first described by Wehr et al.[16] The authors reported a case of a molar successfully treated by forced eruption and concluded that the procedure is a practicable alternative to avoid tooth extraction. Forced eruption is a widely used technique in the treatment of biological width invasion of anterior teeth, but its use in posterior teeth has been poorly reported. Forced eruption allows an additional exposure of the remaining root favoring surgical and restorative procedures.

The periodontal parameters of the operated region presented a similar behavior when compared to other sites of the mouth. This finding suggests that the modification of the anatomy (promoted by odontoplasty and forced eruption) in the operated

sites did not affect the periodontal health. In fact, according to Ross and Gargiulo[18] normal healing occurs when odontoplasty is accomplished in proximal areas (a technique known as RAI). Histological studies in dogs evaluating the RAI technique showed a similar healing pattern when odontoplasty areas were compared to areas of periodontal surgery without odontoplasty.[19,20]

Vertical root fractures are common in root-filled posterior teeth because of weakening of functional cusps.[21] Additionally, such fractures significantly increase the risk of extraction.[3] A number of contributing factors have been implicated in root fracture, including extensive intracoronal restorations associated with a history of extensive and/or consecutive dental treatments, involving repeated occlusal adjustments and replacement of restorations.[4]

Commonly, the tooth has been structurally compromised by removal of tooth substance during endodontic treatment and restorative procedures. Moreover, endodontically treated teeth can be easily fractured because of pulp chamber roof removal,[8] mainly when the marginal ridge is thin or totally removed.[22] During mastication, occlusal contacts occur on almost every chewing cycle. In the presence of extensive intracoronal restorations associated with a weakened tooth remnant, such cyclic forces may result in the establishment and propagation of cracks. Restorations placed without proper consideration for cuspal protection also render the tooth vulnerable.[3]

In cases of coronoradicular fracture, the radicular wear promoted by odontoplasty is added to the structure loss caused by the fracture.[23] Thus, the resistance of the dental remnant, the occlusion of the patient, and parafunctional habits (i.e., bruxism) should be carefully evaluated. This treatment planning enabled clinical success with prosthetic procedures and a relatively simple surgical technique. Moreover, both anatomical alteration and thickness reduction promoted by odontoplasty seemed not to be critical for periodontal health and restorative success; however, further studies are necessary to evaluate the outcomes of odontoplasty in a larger sample and over the long term. Therefore, the favorable results of the presented case can be attributed to the adequate choice of orthodontic forced eruption combined with odontoplasty technique, to the favorable occlusion of the patient, and to the rehabilitation with a crown combined with a metallic pin.

## Conclusion

It can be concluded that, in this case, the forced eruption and odontoplasty procedure promoted good conditions for prosthetic rehabilitation and maintenance of periodontal health.

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