

Case Report

Forced eruption of adjoining maxillary premolars using a removable orthodontic appliance: a case report

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Abstract: Forced eruption can be performed in teeth with caries, fracture, resorption or perforation in the cervical third of the root or isolated teeth with one- or two-walled vertical periodontal defects. The purpose of this case report is to introduce an innovative orthodontic appliance which enables forced eruption. This appliance is easy to fabricate, cost-effective and very effective in forced eruption of non-restorable teeth. (J. Oral Sci. 49, 75-78, 2007)

Keywords: forced eruption; removable appliance; tooth decay.

Introduction

Perforations, fractures, root resorption, and caries occurring in the cervical region of teeth present many challenges to the clinician (1). These conditions are mostly managed with extraction, surgical crown lengthening, surgical intra-alveolar transplantation or orthodontic extrusion (2-4).

Orthodontic root extrusion or forced eruption, first reported by Heithersay (5) and Ingber (3), is a well-documented clinical procedure which alters the relationship between a non-restorable tooth and its attachment apparatus, elevating sound tooth material from within the alveolar socket (1).

The objectives of forced eruption include preservation of the biologic width, exposure of sound tooth structure for the placement of restorative margins, and maintenance

of esthetics. It facilitates the establishment of the biologic width because 1 to 2 mm of sound tooth structure is necessary coronal to the epithelial attachment to allow placement of the restoration margin (1). Forced eruption has some advantages over surgical crown lengthening, which causes a negative change in the length of the clinical crowns of both the tooth and the neighboring teeth, produces poor esthetics, widens embrasures and is less conservative considering the sacrifice of supporting bone of adjacent teeth (1,6,7).

There are several treatment protocols for forced eruption using both fixed and removable appliances and in various situations, the dentist must adjust the appliance to suit the specific clinical situation (1,8). The present paper describes a simple procedure using a removable orthodontic appliance which requires a minimum of materials and orthodontic skills.

Case Report

A 23-year-old female patient with extensive caries on the maxillary left first and second premolars was evaluated for treatment at Mashad Dental Faculty, Mashad, Iran. These teeth had been endodontically treated one month earlier. The patient's medical history was non-contributory.

Clinical examination revealed extensively damaged crowns with remaining thin buccal and palatal enamel walls. The mesial and distal walls of both teeth and the palatal surface of the second premolar were located 2 to 3 mm below the gingival margin. The first molar had a mesioclusal amalgam restoration. (Fig. 1) There was no tenderness on percussion or palpation. The periodontal condition of the teeth was normal with no pockets. The teeth had mobility within the normal limits (Grade I), without any observable swelling.

Radiographic examination confirmed that the roots had

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been endodontically treated with no pathosis. (Fig. 2)

After analyzing factors such as the height of smile line, age of the patient, root anatomy, and financial resources, it was decided that the teeth be treated by means of extrusion to permit fabrication of fixed partial dentures that would result in improved esthetics and adequate biologic width. In this special case, conventional forced eruption treatment with fixed appliances was not possible because the left maxillary second molar was partially erupted; so this tooth could not be applied as anchorage. Furthermore, the first molar would not provide enough anchorage in the posterior segment. Hence, it was decided to extrude these teeth using a removable orthodontic appliance which acts as an anchorage itself.

Alginate impressions of both arches were taken to prepare working casts for fabrication of an acrylic removable orthodontic appliance. The appliance had three Adams clasps on the maxillary right first premolar, maxillary right first molar and maxillary left first molar. In addition, two adjoining horizontal loops, which were



Fig. 1 Initial photograph.



Fig. 2 Initial radiograph.

located on the left maxillary first and second premolars, were added. (Fig. 3)

After oral hygiene instructions and dental prophylaxis, the carious lesions on the premolars were excavated. Approximately 5 mm of gutta-percha in the second premolar canal and buccal canal of the first premolar was removed by a heat-carrier instrument (Maillefer, Ballaigues, Switzerland). For each canal, one hook was fabricated using a 1-mm diameter SS round wire (Dentaurum, Insprigen, Germany) which had some artificial notches on its body to increase the retention after cementation. Hooks were cemented in the canals with zinc oxide-phosphate cement (Harvard, Dahlwitz-Hoppengarten, Germany). They were placed in the deepest area of the chamber to equalize the distance between the hooks and the loops to the distance the teeth should be extruded. (Fig. 4)

On the next appointment, the appliance was activated by tying two separate elastics between the hooks and the appliance loops which were above the teeth. (Fig. 5) A force of 70 g in an occlusal direction, which was repeated twice weekly, was exerted to extrude the teeth. The patient was encouraged to maintain good oral hygiene (by brushing



Fig. 3 Removable orthodontic appliance.



Fig. 4 Cemented hooks in canals.

the teeth two times per day, rinsing with mouthwash, and complete cleaning and disinfection of the appliance at the times of exchanging the elastics), to wear the appliance all the time except during appliance cleaning and disinfection, and to abstain from eating hard, sticky foods. The gradual extrusion of the teeth was evident in each appointment and after 4 weeks, the extrusion was complete which was obvious in the radiograph. (Fig. 6)

On completion of the forced eruption, the teeth were stabilized for a period of 8 weeks. At the end of this period, limited recontouring of the gingiva and alveolar bone was performed to produce a contour at the level of the adjacent teeth and proper biologic width. (Fig. 7) Cast post and core and metal/porcelain crowns were then fabricated for these premolars. Post-operative esthetics and periodontal health were good after placement of the final restoration. (Fig. 8) The patient had an uneventful post-operative course and twelve months post-operatively, the teeth remained asymptomatic.



Fig. 5 Activated appliance.



Fig. 6 Final radiograph.



Fig. 7 After soft tissue surgery.



Fig. 8 Clinical view after prosthetic treatment.

Discussion

Advantages of using a removable appliance as an alternative to a fixed appliance include more favorable esthetic appearance and less chairside time. In addition, Graber contends that because of a patient's muscular activity, a more physiologic type of tooth movement occurs with a removable orthodontic appliance (9).

Whatever appliance is used, the patient must be seen every 1 to 2 weeks to reduce the occlusal surface of the tooth being extruded, control inflammation, and monitor progress. The time required for forced eruption varies with the age of the patient, the distance the tooth has to be moved, and the viability of the PDL. In general, extrusion can be as rapid as 1 mm per week without damage to the PDL, so 3 to 6 weeks is sufficient for almost any patient (6).

The extrusion rate used in this case was similar to that recommended by other authors (2,3,10,11). After 30 days of extrusion, 3.5 mm of the roots were exposed at an average speed of 1 mm per week. According to some studies, a force of 30-60 g is required to extrude the tooth

(2,10,12,13) while other authors reported that forces of 70-150 g were necessary (14). In this case, 70 g of force was exerted.

After active tooth movement, the tooth should be stabilized to allow for proper reorganization of the PDL fibers and bone remodeling, and to prevent relapse. In general, 3 to 6 weeks of stabilization should be sufficient after extrusion (6) but some studies indicated that a stabilization period of 7-14 weeks is required (3-5,10,13,15,16). In majority of cases, a 2-month stabilization period will suffice (17).

The simplified forced eruption technique described has several advantages over other methods because orthodontic bands and brackets or wire bends are not required, resulting in a more comfortable oral appliance. However, wearing orthodontic appliances can be an unpleasant experience for the patients.

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