International Journal of Early Childhood Special Education (INT-JECSE)
DOI:10.9756/INTJECSE/V14I7.23 ISSN: 1308-5581 Vol 14, Issue 07 2022

# Orthodontic Forced Eruption of Permanent Central Incisor with Subgingival Margins: A Case Report

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**Abstract**
The management of teeth with deep caries, fracture, or perforation in the cervical third of the root is a vital part of dental practice.Severely loss of tooth structure often requires full coverage restoration. When the defect is subgingival there are two treatment options including crown lengthening surgery and orthodontic forced eruption. Due to preserving periodontal structure,the tooth would have better prognosis by orthodontic forced eruption and lower risk of failure. This method provides better esthetic results specially in anterior teeth. The aim of this case report was to presenta simple and effective orthodontic forced eruption method that successfully preserve and treat the teeth with subgingival margins.

## 1. Introduction

Traditionally the teeth which lost their clinical crown were considered hopeless and extracted. The concept of conservative dentistry leaded to innovation of treatment methods to restore these severely damaged teeth with favorable prognosis. This has challenged the deeprooted treatment approaches and values of dentistry, including preserving natural teeth and the root system as long as clinically possible (1). Extraction of the destructed tooth and fabrication of an implant supported restoration seems to be a promising solution but is in fact clearing the issue. Studies have shown that in 90% of cases, the maxillary anterior facial bone wall thickness is <1mm, and in 50%, it is <0.5mm(2). As a result, thin facial bone walls mainly composed of bundle bone are susceptible to resorption after tooth extraction. Therefore, caution should be exercised when implants are placed in thin gingival biotypes, in which the post-extraction bone is prone to resorb at a high rate(3).

In fractured or severely decayed teeth, especially in teeth with previous endodontic treatment, many dentists recommend that a severely damaged/broken endodontically treated tooth should be replaced by an implant (4). In many cases, dentistry falls short of restoring the normal periodontal architecture, despite novel technologies and biomaterials, soft and hard tissue grafting techniques, and advances in implantology. These shortcomings give rise to sub-optimal esthetic outcomes, including loss of interdental papillae or marginal gingival heights not aligned esthetically with adjacent teeth(5). Orthodontic tooth extrusion has been advocated instead of sacrificing the natural root system(3, 6). If this technique is applied correctly, it gives rise to the preservation of the natural root system and the associated periodontal structure and architecture, and the patient can enjoy years of additional service. It can also preserve adjacent supporting tooth structures and the choice for reconstruction with implants(5, 7). Surgical extrusion is an alternative to extraction for teeth with crown-root fractures, cervical root fractures, and subgingival caries. It is based on the concept of relocating the affected area of a tooth to a supragingival position, leaving sound tooth structure exposed to improve tooth restorability, and providing space for the reestablishment of the biological width.

Orthodontic root extrusion was first introduced by Heithersay and Ingber(8) to preserve the biologic width, expose sound tooth structure for optimal placement of restorative margins, and achieve esthetics (9). Orthodontic extrusion is not possible in these situations: unfavorable axial tooth position, compromised periodontal health, short roots that lead to inadequate crown-to-root ratio, and wide internal root form (10). Orthodontic tooth eruption is the preferred treatment modality to avoid the negative consequences of surgical crown lengthening, especially in esthetic areas. It is an interdisciplinary treatment requiring the expertise of endodontists, periodontists, orthodontists, and restorative dentists (11). Some of the advantages of orthodontic forced eruption are improved bone level, low cost, and less time; however, poor esthetic outcomes during treatment and the need for more patient cooperation are the disadvantages of this technique (12). This paper presents a case with orthodontic extrusion of the upper central incisorand management of such teeth with subgingival margins.

## 2. Case Report

A 14-year-old female patient was referred from the Endodontics Department, Dental School, Tehran University of Medical Sciences for the restoration of the upper left central incisor. The root canal was filled with MTA which was covered with resin modified glass ionomer. The patient's medical history was noncontributory.

After removal of temporary restoration clinical examination revealed severe loss of clinical crown with subgingival margins (Figure 1). There was no tenderness on percussion or palpation. After analyzing factors such as the height of the smile line, patient's age, root anatomy, and financial resources, with the patient's consent, the teeth were decided to be treated through extrusion to allow the fabrication of crowns for these teeth to achieve improved esthetics and adequate biological width.

A fixed appliance was used in this case. After providing oral hygiene instructions (OHI) and implementing prophylactic measures, the carious lesions were eliminated. A hook was fabricated with a piece of SS round wire (Dentarum, Inspringen, Germany), measuring 1mm in diameter, with several artificial notches on its body for improved retention following cementation. The hook was cemented in the root canal with zinc phosphate cement (Harvard,Dahlwitz-Hoppegarten, Germany). Also, an archwire was shaped conforming to the upper arch and fixed on the buccal surface of the teeth, extending from the right lateral incisor to left lateral incisor. An elastic thread was passed between the hook and the archwire. The distance between the hooks and wire was determined, and the elastics were connected to the hooks on the provisional crown, curling around the supporting wire (Figure 2).The elastic thread was replaced with a shorter one every seven days until predetermined extrusion was achieved.

Periodic evaluations were carried out every two weeks, and movements were measured for two months. After achieving favorable extrusion, the supporting wire and composite resin were removed. No active force was applied during a 60-day stabilization period. The extruded tooth was splinted to the adjacent teeth using composite resin to maintain the tooth position achieved by extrusion. After a two-month maintenance period, the wire was removed, and the interim crown and hooks were trimmed with diamond burs. Composite build up was done to restore the tooth (Figure 3).

**3. Discussion**

Extensive caries or crown fractures might create a difficult situation for restoration placement. The significant problem is the lack of adequate coronal ferrule and a compromised biological width. Tooth extrusive movements entail the application of tractional forces throughout the periodontium to induce the marginal apposition of crestal bone (13). A histological evaluation by Simon et al. indicated that extrusion of endodontically treated teeth did not pose any apparent problems. They reported that the alveolar process moves in the occlusal direction as the tooth is extruded, followed by bone deposition at the alveolar crest and the interradicular area (14). The cases reported here consisted of teeth with subgingival carious lesions that were successfully treated using a multidisciplinary approach. Among the treatment options for such cases, such as extraction followed by implant rehabilitation, orthodontic extrusion was deemed the best choice. Implant rehabilitation in such cases often involves surgical procedures to improve the hard and soft tissue profiles of implant recipient sites. Systematic evaluation of interproximal and buccal bone and the amount and type of soft tissue available at the implant site might determine long-term esthetic outcomes. The pink and white esthetic scores (PES and WES) are tools that objectively evaluate implant restorations in the esthetic zone and describe the patient's appraisal of their treatment outcomes (15). A gingival thickness of ≥2mm was deemed a thick tissue biotype, and a gingival thickness of <1.5mm was deemed a thin tissue biotype. The prevalence of thin gingival biotype is 43% in the maxillary incisor area(16, 17). The PES/WES scores of patients with a thick gingival biotype are significantly higher than those with a thin gingival biotype. A thin gingival biotype might fail to reach the clinically acceptable PES level (18). Peri-implant soft tissue stability depends on the gingival biotype as a significant parameter for the esthetic outcome of the implant restoration in the esthetic zone (19). The gingival tissue's potential to cover any underlying material is of utmost importance for achieving aesthetic outcomes, especially in implant, regenerative, and restorative procedures, where subgingival metallic restorations are used (20). During the restoration of maxillary central incisors, it is important to preserve or reconstruct the interdental papillae. Orthodontic extrusion enhances the quality and quantity of the papilla (21). The simplified forced eruption technique described has several advantages over other methods; because orthodontic band and bracket are not required, with bonded brackets, there is a necessity to align the anteriors, and time will be lost as a result. Furthermore, reciprocal forces of intrusion might act on the adjacent teeth. In this method, using dentinal pin on the buccal surface of the tooth instead of using a hook inside the root canal has led to overcome the problem of short distance between the hook and the wire to place the elastics; in addition, we will not have occlusal interferences in the palatal surface of the tooth. Therefore, this method can be easily done with the equipment available in any office. One point that should be considered is that one of the most common ways to prevent caries during orthodontic treatment is to use topical fluoride products such as fluoride varnish and mouthwash. These substances lead to the formation of fluorhydroxyapatite in enamel prisms, which are more resistant to acid attacks and can interfere with the bonding procedures of the composite to the enamel. Therefore, it is recommended that

there be more than 15 days delay between the application of topical fluoride products and the bonding procedure to the enamel to achieve the optimal bond strength (22). 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. During the eruptive phase, the application of gel with postbiotics can be useful to prevent gingivitis following plaque accumulation, which can lead to attachment loss and tissue destruction due to the presence of periopathogenic bacteria (22). The patient's age, the distance the tooth is to be moved, and the PDL viability determine the time required for forced eruption (22). After two months of extrusion, 3–4mm of the roots were exposed at an average speed of 0.5mm/week, while other authors reported an average extrusion rate of 1mm/week(23). In this case, a 30-g force was exerted. Composite build upwas used for final restoration. Pre- and postoperative comparisons revealed excellent esthetic results.

**4. Conclusion**

Orthodontic extrusion or forced eruption is a conservative treatment modality to restore fractured or extensively damaged teeth at a subgingival level to preserve the natural tooth and maintain periodontal architecture.

*Figure 1. clinical view after caries removal*

*Figure 2. Buccal view of fixed appliance used for orthodontic extrusion central incisor.*

*Figure 3. Composite build up under rubber dam isolation.*

*Figure 4. Final clinical view.*

1. Rifkin R, McLaren E. Treatment selection for anterior endodontically involved teeth. PRACTICAL PROCEDURES AND AESTHETIC DENTISTRY. 2004;16(8):553-66.
2. Vera C, De Kok IJ, Reinhold D, Limpiphipatanakorn P, Yap AK, Tyndall D, et al. Evaluation of buccal alveolar bone dimension of maxillary anterior and premolar teeth: a cone beam computed tomography investigation. International Journal of Oral & Maxillofacial Implants. 2012;27(6).
3. Chappuis V, Araújo MG, Buser D. Clinical relevance of dimensional bone and soft tissue alterations post-extraction in esthetic sites. Periodontology 2000. 2017;73(1):73-83.
4. Murchison D, Schwartz R. The use of removable appliances for forced eruption of teeth. Quintessence International (Berlin, Germany: 1985). 1986;17(8):497-501.
5. Ziskind D, Sharon E, Hirschfeld Z, Becker A. Analysis of lateral tooth movement during forced orthodontic eruption. The Journal of Prosthetic Dentistry. 2000;84(4):462-6.
6. Mandel RC, Binzer WC, Withers JA. Forced eruption in restoring severely fractured teeth using removable orthodontic appliances. The Journal of Prosthetic Dentistry. 1982;47(3):269-74.
7. Simon JH, Kelly WH, Gordon DG, Ericksen GW. Extrusion of endodontically treated teeth. The Journal of the American Dental Association. 1978;97(1):17-23.
8. Ingber JS. Forced eruption: part II. A method of treating nonrestorable teeth--Periodontal and restorative considerations. Journal of Periodontology. 1976;47(4):203-16.
9. Parikh T, Parikh A, Dave B, Sutaria S. INTERDISCIPLINARY APPROACH IN RESTORING FRACTURED LATERAL INCISOR. Journal of Advanced Medical and Dental Sciences Research. 2017;5(2):149.
10. Fidel SR, Fidel-Junior RAS, Sassone LM, Murad CF, Fidel RAS. Clinical management of a complicated crown-root fracture: a case report. Brazilian Dental Journal. 2011;22:258-62.
11. Singh AR, Verma R. Crown lengthening vs forced eruption. Orthodontic Journal of Nepal. 2011;1(1):52-5.
12. Sirisha K, Shankar YR, Yalavarthy NS, Suneetha K. Management of crown root fractures: A novel technique with multidisciplinary approach. Journal of Dr NTR University of Health Sciences. 2013;2(1):72.
13. Patil SS, Panicker AS, Hindlekar A, Srinidhi S, Dhumal A, Vhora K. Forced orthodontic extrusion for anterior traumatized teeth by a simplistic approach. Journal of Dental and Allied Sciences. 2014;3(2):111.
14. Simon JH, Lythgoe JB, Torabinejad M. Clinical and histologic evaluation of extruded endodontically treated teeth in dogs. Oral Surgery, Oral Medicine, Oral Pathology. 1980;50(4):361-71.
15. Jones AR, Martin W. Comparing pink and white esthetic scores to layperson perception in the single-tooth implant patient. International Journal of Oral & Maxillofacial Implants. 2014;29(6).
16. Zawawi KH, Al-Zahrani MS. Gingival biotype in relation to incisors' inclination and position. Saudi medical journal. 2014;35(11):1378.
17. Claffey N, Shanley D. Relationship of gingival thickness and bleeding to loss of probing attachment in shallow sites following nonsurgical periodontal therapy. Journal of clinical periodontology. 1986;13(7):654-7.
18. Altay MA, Sindel A, Tezerişener HA, Yıldırımyan N, Özarslan MM. Esthetic evaluation of implant-supported single crowns: a comparison of objective and patient-reported outcomes. International journal of implant dentistry. 2019;5(1):1-8.
19. Proffit WR, Fields Jr HW, Sarver DM. Contemporary orthodontics: Elsevier Health Sciences; 2006.

20. Manjunath RS, Rana A, Sarkar A. Gingival biotype assessment in a healthy periodontium: transgingival probing method. Journal of Clinical and Diagnostic Research: JCDR. 2015;9(5):ZC66.
21. Ribeiro GLU, Maciel JVB, da Silva Pereira J, Tanaka OM. Forced eruption for all four maxillary incisors prior to implant rehabilitation. European Journal of General Dentistry. 2012;1(02):99-103.
22. Cossellu G, Lanteri V, Butera A, Laffi N, Merlini A, Farronato G. Timing considerations on the shear bond strength of orthodontic brackets after topical fluoride varnish applications. Journal of orthodontic science. 2017;6(1):11.
23. Kondapuram Seshu MR, Gash CL. Multidisciplinary management of a fractured premolar: A case report with followup. Case Reports in Dentistry. 2012;2012.