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CLINICAL REPORT

Surgical extrusion with biologically oriented preparation: An alternative to extraction

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ABSTRACT

Surgical extrusion should be considered as an alternative treatment in patients with structurally compromised teeth that retain coronal integrity and have favorable root anatomy. The procedure described is straightforward and can be performed quickly. A situation in which it was used to treat a maxillary premolar with substantial structural loss but well-preserved periodontal attachment is presented. The biologically oriented preparation technique is a conservative method of tooth restoration. (J Prosthet Dent 2019;121:553-6)

Structurally compromised teeth with subgingival cervical margins resulting from caries progression, fracture, resorption, or iatrogenic factors are often encountered in clinical practice. Preservation of such teeth is particularly important when the patient's esthetics have been compromised and in young patients who have not completed growth.[1,2] These situations are complex because the placement of restorative materials requires invasion of the biological structures, which could cause periodontal problems such as gingival inflammation, clinical attachment loss, and bone resorption.[3]

Therapeutic options for augmenting the supragingival dental structure, which facilitates retention of the restoration and promotes periodontal health, include surgical crown lengthening, orthodontic extrusion, and surgical extrusion. Treatment selection depends on esthetic requirements, crown-to-root ratio, root proximity and morphology, location of the furcation, individual tooth position, and position of the tooth in the dental arch.[4]

Surgical crown lengthening involves the removal of bone and gingival tissue for greater exposure of the dental structures, which may lead to periodontal attachment loss in treated (crown-root ration could be compromised) and adjacent teeth and may compromise esthetics and function.[5,6] Orthodontic extrusion is a conservative method with a lengthy treatment time and greater cost for the patient and can lead to esthetic problems related to the difficulty of cementing appliances.[7] Surgical extrusion involves detaching the periodontium from the tooth root and bone to enable coronal repositioning of the root. The technique is relatively straightforward, can be performed quickly and at low cost, and requires little cooperation from the patient.[3] However, this technique could also create problems such as fracture of the root, root resorption, tooth mobility, ankylosis, and possible reduction of the alveolar bone.[3,5]

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A 37-year-old woman with no relevant medical history was referred to the Masters of Endodontics clinic (University of Santiago de Compostela) for treatment of the maxillary right second premolar. On clinical examination, a small dental remnant with a subgingival margin located close to the bone crest was observed (Fig. 1A-C). Radiologically, evidence of previous endodontic

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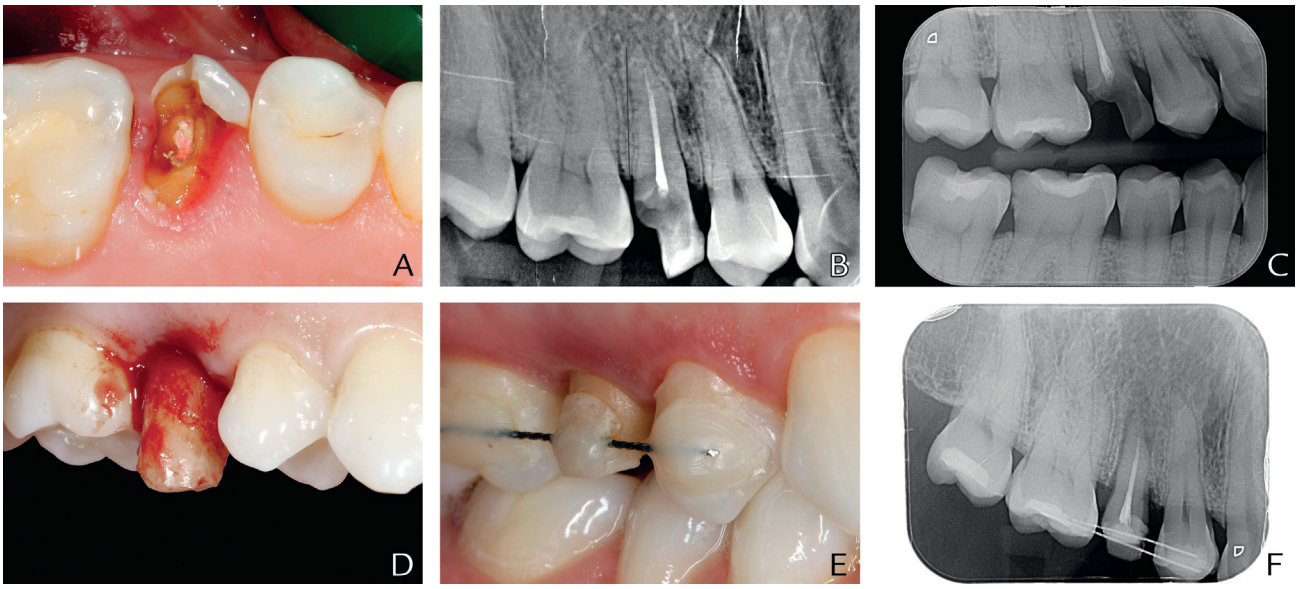

Figure 1. Initial situation and surgical procedure. A, Initial clinical situation. B, Preoperative periapical radiograph. C, Preoperative bitewing radiograph evaluating alveolar bone relation. D, Extruded premolar. E, Semirigid splinting. F, Radiographic situation after extrusion to new position.

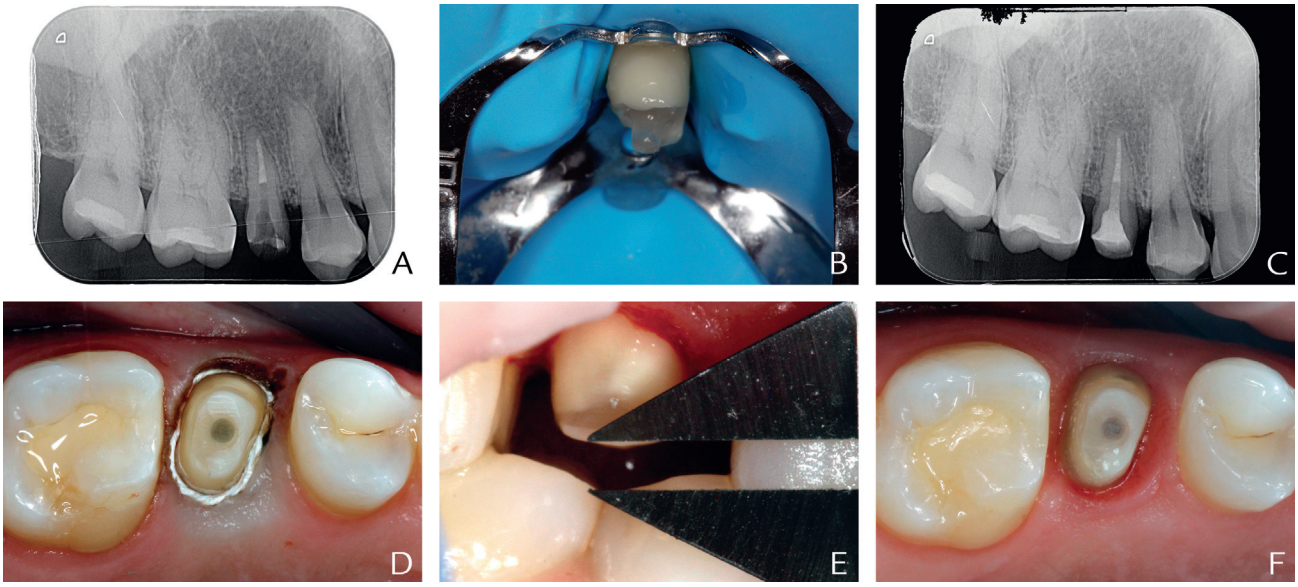

Figure 2. Restoration procedure. A, Periapical radiograph after retreatment sealing with MTA. B, Glass-fiber post placement under rubber dam isolation. C, Periapical radiograph after restoration. D, Vertical BOPT. E, Prosthodontic space verified. F, Clinical situation after 2 months, showing good periodontal status. BOPT, biologically oriented preparation technique; MTA, mineral trioxide aggregate.

treatment but not of periapical radiolucency was detected (Fig. 1B). Proper restoration of this premolar would require a crown, for which an adequate ferrule would be needed.[8]

Radiographs showed that surgical crown lengthening would be an overly aggressive approach as it would require wide (3 mm) bone resection to obtain a 3-mm biological width and provide a 1.5-mm space for the ferrule. As the patient declined orthodontic extrusion and the premolar had a conical root, the patient elected surgical extrusion.

Under local anesthesia, the root was dislocated by using a fine periotome (Luxator L2S; Directa) along the longitudinal axis without removing the tooth from the alveolar bone (Fig. 1D). Trauma to the bone and periodontal ligament (PDL) was avoided to prevent marginal bone and root resorption.[9-11] After luxation, the tooth was extruded to the desired position as determined by measuring the distance from the margin to the bone by using a periodontal probe. The wound was closed by using simple sutures, and a semirigid splint with a flexible orthodontic wire (Braided steel wire; Proclinic) was fixed

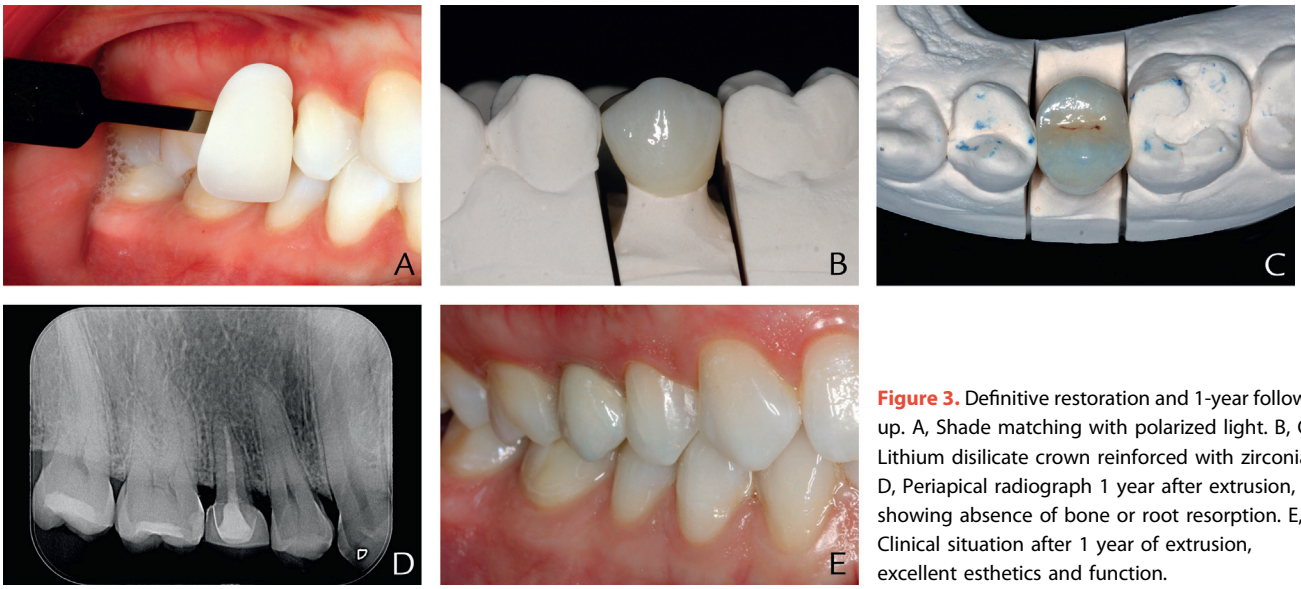

Figure 3. Definitive restoration and 1-year follow-up. A, Shade matching with polarized light. B, C, Lithium disilicate crown reinforced with zirconia. D, Periapical radiograph 1 year after extrusion, showing absence of bone or root resorption. E, Clinical situation after 1 year of extrusion, excellent esthetics and function.

with composite to anchor the tooth to the adjacent teeth for 4 weeks (Fig. 1E, F).[2,12,13]

To promote gingival health, the patient was instructed to rinse the mouth with 0.12% chlorhexidine for 15 days. No antibiotic was prescribed, as antibiotic use is recommended only in situations with tissue laceration.[14] The sutures were removed after 7 days, and the patient was referred for follow-up every 2 weeks during the first 2 postoperative months.

After 2 months, endodontic retreatment was performed by using ultrasonic tips (Start-X 3; Dentsply Sirona), retreatment rotary files (ProTaper D2 and D3; Dentsply Sirona), and manual files (K #10 and #20, Hedstrom 20; Dentsply Sirona). A calcium hydroxide dressing (ApexCal; Ivoclar Vivadent AG) was applied and left in place between sessions. After 15 days, the canal was sealed by using mineral trioxide aggregate (ProRoot; Dentsply Sirona) because the apical gauge was 50 (Fig. 2A). Three days later, after verifying that the material had polymerized correctly, a glass-fiber post was placed (x-post/core x flow/xp bond and self-cure activator; Dentsply Sirona) (Fig. 2B).[15,16] The core was reconstructed by using composite resin (Ceram.x Universal; Dentsply Sirona) (Fig. 2C), and the tooth was prepared for a complete crown restoration by the biologically oriented preparation technique (BOPT) (Fig. 2D, E). This technique is conservative and permits adequate crown emergence (creating an overcontoured profile).[17] The patient wore an interim acrylic resin crown for 2 months until the tissue had healed completely (Fig. 2F). Then, impressions were made, and the color of the definitive crown was determined (Fig. 3A). After 15 days, a zirconia-reinforced lithium disilicate crown was placed and cemented by an adhesive technique (Celtra Duo; Dentsply Sirona) (Fig. 3B, C).[18-20] One year later, the patient's periodontal, esthetic, and functional status was evaluated (Fig. 3D, E).

DISCUSSION

Surgical extrusion is an alternative treatment for teeth with extensive structural loss and cervical margins near to the bone crest. The patient's condition should be evaluated, and periodontal, endodontic, and restorative factors should be explored before a therapeutic decision is made.[5] The patient must be informed of all treatment options, associated risks, and potential complications. Extrusion carries a risk of tooth fracture.[2] The apex of the root frequently fractures, or cracks may be initiated by the extraction instruments.[2] This technique is proposed when crown lengthening would have a high biological cost due to the need for extensive osseous resection.[4] Orthodontic extrusion is a safer option, but it is slower, and patients often refuse it because they do not wish to wear fixed appliances.[7]

The technique currently used for extrusion is based on root luxation without exposure to the external environment. This approach prevents the dehydration of PDL cells, radicular resorption, ankylosis, and marginal bone loss.[4,10] A fine elevator is used for luxation by PDL separation while avoiding trauma to the marginal bone, which minimizes bone loss and root resorption.[4,12] Resorption occurs less frequently in teeth extruded by following the root axis than in those extruded with rotational movements. Such movements can tear the PDL and compress the root against the socket, damaging cementoblasts, which are fundamental to periodontal healing because they induce new bone formation.[9,21] Additional challenges are related to the soft tissue

contours because of the narrower root diameter after the surgical extrusion. Frequently, an overcontoured crown is needed to avoid black triangles, and periodontal intervention is needed to ensure appropriate soft tissue contours.[6]

Other important factors to consider when seeking to avoid complications are the type and duration of splinting. Normal mobility has been observed after 3 or 4 weeks due to rapid PDL healing,[11] and longer splinting times increase the risk of ankylosis.[2] Semirigid splinting allows functional stimulation, which seems to be advantageous for healing and prevents ankylosis and resorption.[2,4,11,13] It also avoids root dislocation, especially in situations where there is notable discrepancy between the root and socket. Finally, it helps to prevent patients, who do not always follow postoperative instructions, from compromising initial stabilization.[2]

The initial assessment should consider the pulpal status, previous endodontic treatment, and presence of periapical pathology. Endodontic treatment can be started before extrusion when the area can be isolated, although less bacterial colonization has been observed when such treatment is performed after surgery.[3,10] In the final stage of the treatment, an interim restoration should be provided when the tooth shows type 1 mobility. Two months thereafter, if new bone deposition is observed and mobility is absent, a definitive restoration should be provided.[5,14]

When more than half of the dental tissue has been lost, the tooth should be restored with a post and complete crown; the ferrule will optimize biomechanical behavior and stabilize the restoration.[8,15,16] BOPT preserves the cervical dentin to the maximum degree possible while treating the periodontal tissues. It allows repositioning of the margin and augmentation of gingival thickness, which help to camouflage the cervical area affected by the use of mineral trioxide aggregate, which is often necessary.[17,22] In addition, the emergence of computer-aided design and computer-aided manufacturing (CAD-CAM) systems and new ceramic materials has enabled the use of thinner restorations without compromising esthetics (although oral hygiene should be adequate because of the overcontoured emergence profile of the crown). The use of such materials with adhesive cementation provides homogeneous force distribution on the tooth-restoration complex, increasing its resistance form.[18-20]

SUMMARY

Surgical extrusion using BOPT can be an alternative treatment in teeth with advanced structural loss requiring ferrule placement and in those involving core color changes.

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