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Abstract

Surgical extrusion should be considered as an alternative treatment in cases in which the teeth are structurally compromised but still retain coronal integrity and have favorable root anatomy. This technique is simple and can be performed quickly. Here, we report on a case in which it was used to treat a maxillary premolar with substantial structural loss but well-preserved periodontal attachment. The biologically oriented preparation technique is a conservative method for tooth rehabilitation.

Keywords	Biologically oriented preparation technique, surgical extrusion
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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 cases in which the teeth are structurally compromised but still retain coronal integrity and have favorable root anatomy. This technique is simple and can be performed quickly. Here, we report on a case in which it was used to treat a maxillary premolar with substantial structural loss but well-preserved periodontal attachment. The biologically oriented preparation technique is a conservative method for tooth rehabilitation.

KEYWORDS

Biologically oriented preparation technique, surgical extrusion.

INTRODUCTION

Structurally compromised teeth with subgingival cervical margins resulting from caries progression, fracture, resorption, or iatrogenic factors are often encountered in clinical practice. The preservation of such teeth is particularly important when the patient's aesthetics have been compromised and in young patients who have not completed growth.[1,2] These cases 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 augmentation of 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 the aesthetic requirements, crown-to-root ratio, root proximity and morphology, furcation localization, 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 and adjacent teeth and may compromise aesthetics and function.[5,6]

Orthodontic extrusion is a conservative method with a lengthy treatment time and greater cost for the patient, and it can lead to aesthetic problems related to the difficulty of cementing fixed appliances.[7]

Surgical extrusion involves detachment of the periodontium from the tooth root and bone to enable coronal repositioning of the root. The technique is relatively simple, can be performed quickly and at low cost, and requires little cooperation from the patient.[3]

CLINICAL REPORT

A 37-year-old woman with no relevant medical history presented at our dental clinic for treatment of the maxillary right second premolar. On clinical examination, we observed a small dental remnant with a subgingival margin located close to the bone crest (Fig. 1A–C). Radiologically, evidence of previous root canal treatment, but no periapical periodontitis, was observed (Fig. 1B). We determined that proper restoration of this premolar would require a crown, for which we would need an adequate ferrule.[8]

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

Under local anesthesia, we dislocated the root using a fine periotome along the longitudinal axis without removing the tooth from the alveolus (Fig. 1D), while avoiding trauma to the bone and periodontal ligament (PDL) to prevent marginal bone and root resorption.[9–11] After luxation, the tooth was extruded to the desired position, determined by measuring the distance from the margin to the bone with a periodontal probe. The wound was closed with simple sutures, and a semirigid splint with a flexible orthodontic wire was fixed with composite to anchor the tooth to the adjacent teeth for 4 weeks (Fig. 1E, F).[2,12,13]

As a hygienic measure, the patient was instructed to rinse with 0.12% chlorhexidine for 15 days. No antibiotic was prescribed, as antibiotic use is recommended only in cases of 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 using ultrasonic tips (Start-X 3; Dentsply Sirona, Salzburg, Austria), retreatment rotatory files (ProTaper D2 and D3; Maillefer, Ballaigues, Switzerland), and manual files (K #10 and #20, Hedstrom 20; Maillefer). A calcium hydroxide dressing (ApexCal; Ivoclar Vivadent, Schaan, Liechtenstein) was applied and left in place between sessions. After 15 days, the canal was sealed with mineral trioxide aggregate (MTA; ProRoot; Dentsply Sirona) because the apical gauge was 50 (Fig. 2A). Three days later, after verifying that the material had cured correctly, we installed a fiberglass post (core and post system; Dentsply Sirona; Fig. 2B).[15,16] The core was reconstructed with composite (CeramX Universal; Dentsply Sirona; Fig. 2C), and the tooth was prepared for a full crown restoration using the biologically oriented preparation technique (BOPT; Fig. 2D, E). This technique is conservative and permits natural crown emergence.[17] The patient wore a provisional acrylic crown for 2 months until the tissue had healed completely (Fig. 2F). Then,

impressions were taken, and the color of the final crown was determined (Fig. 3A). After 15 days, a zirconia-reinforced lithium disilicate crown was placed and cemented using an adhesive technique (Celtra Duo; Dentsply Sirona; Fig. 3B, C).[18,19,20] One year later, the patient's periodontal, aesthetic, and functional status was checked (Fig. 3D, E).

DISCUSSION

Surgical extrusion is a clear alternative for treatment of teeth with advanced structural loss and cervical margins near 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 as well as associated risks and potential complications. Extrusion carries a high risk of tooth fracture,[2] but this technique is generally 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 for periodontal healing because they induce new bone formation.[9,21]

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 cases with 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]

In the final stage of treatment, provisional restoration should be performed when the tooth shows type 1 mobility. Two months thereafter, if new bone deposition is observed and mobility is absent, final restoration should be performed.[5,14]

The initial assessment should consider pulpal status, previous endodontic treatment, and the 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]

When more than half of the dental tissue has been lost, the tooth should be restored with a post and full 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 MTA, which is often necessary.[17,22] In addition, the emergence of CAD-CAM systems and new ceramic materials has enabled the use of thinner restorations without compromising aesthetics. The use of such materials with adhesive cementation provides homogeneous force distribution on the tooth–restoration complex, increasing its final resistance.[18,19,20]

SUMMARY

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

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FIGURE LEGENDS

Fig 1A. Initial clinical situation.

Fig. 1B. Preoperative periapical radiograph.

Fig. 1C. Preoperative bitewing radiograph obtained for the evaluation of alveolar bone relationships.

Fig. 1D. Extruded premolar.

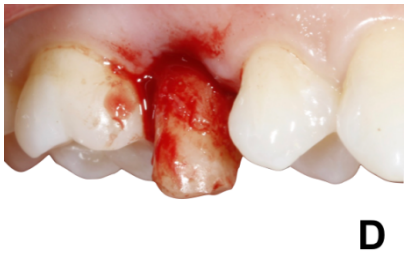


Fig. 1E. Semi-rigid splinting.

Fig 1F. Radiographic situation after extrusion.

Fig. 2A. Periapical radiograph obtained after retreatment and sealing with MTA.

Fig. 2B. Fiberglass post placement under absolute insulation.

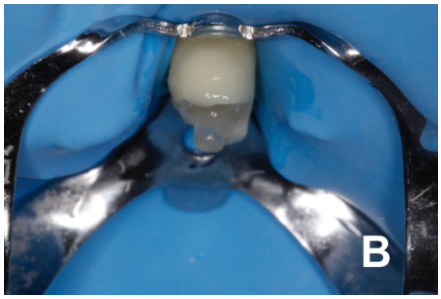


Fig. 2C. Periapical radiograph obtained after restoration.

Fig. 2D. Vertical preparation using BOPT.

Fig. 2E. Evaluation of the prosthodontic space.

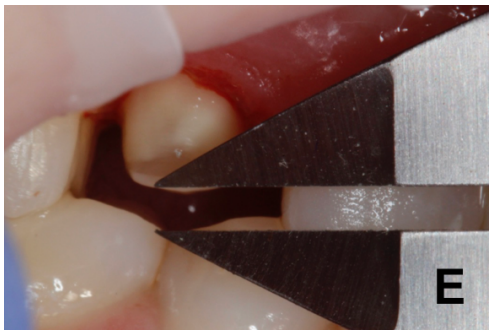


Fig. 2F. Clinical situation after 2 months with good periodontal status.

Fig. 3A. Shade matching with polarized light.

Figs. 3B and C. Lithium disilicate crown reinforced with zirconium.

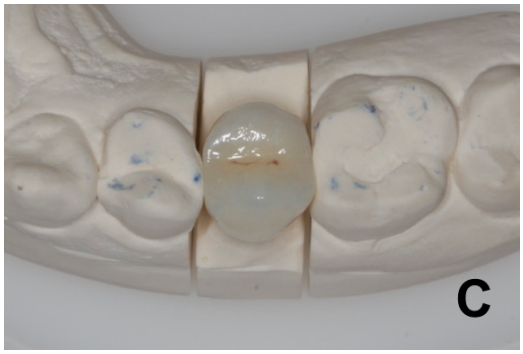
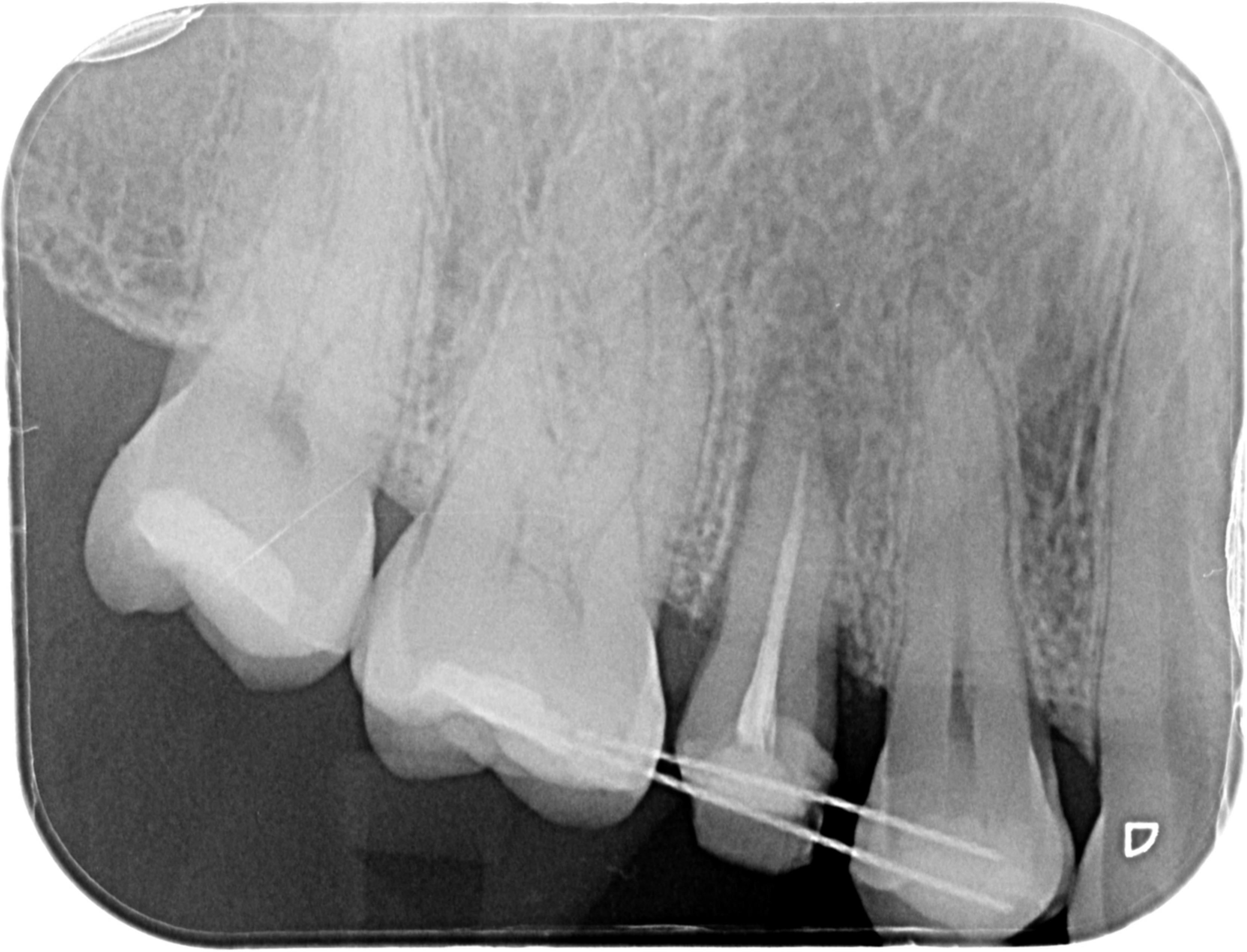


Fig. 3D. Periapical radiograph obtained 1 year after extrusion showing the absence of bone and root resorption.

Fig. 3E. Clinical situation 1 year after extrusion showing excellent aesthetic and functional status.


11.3 mm

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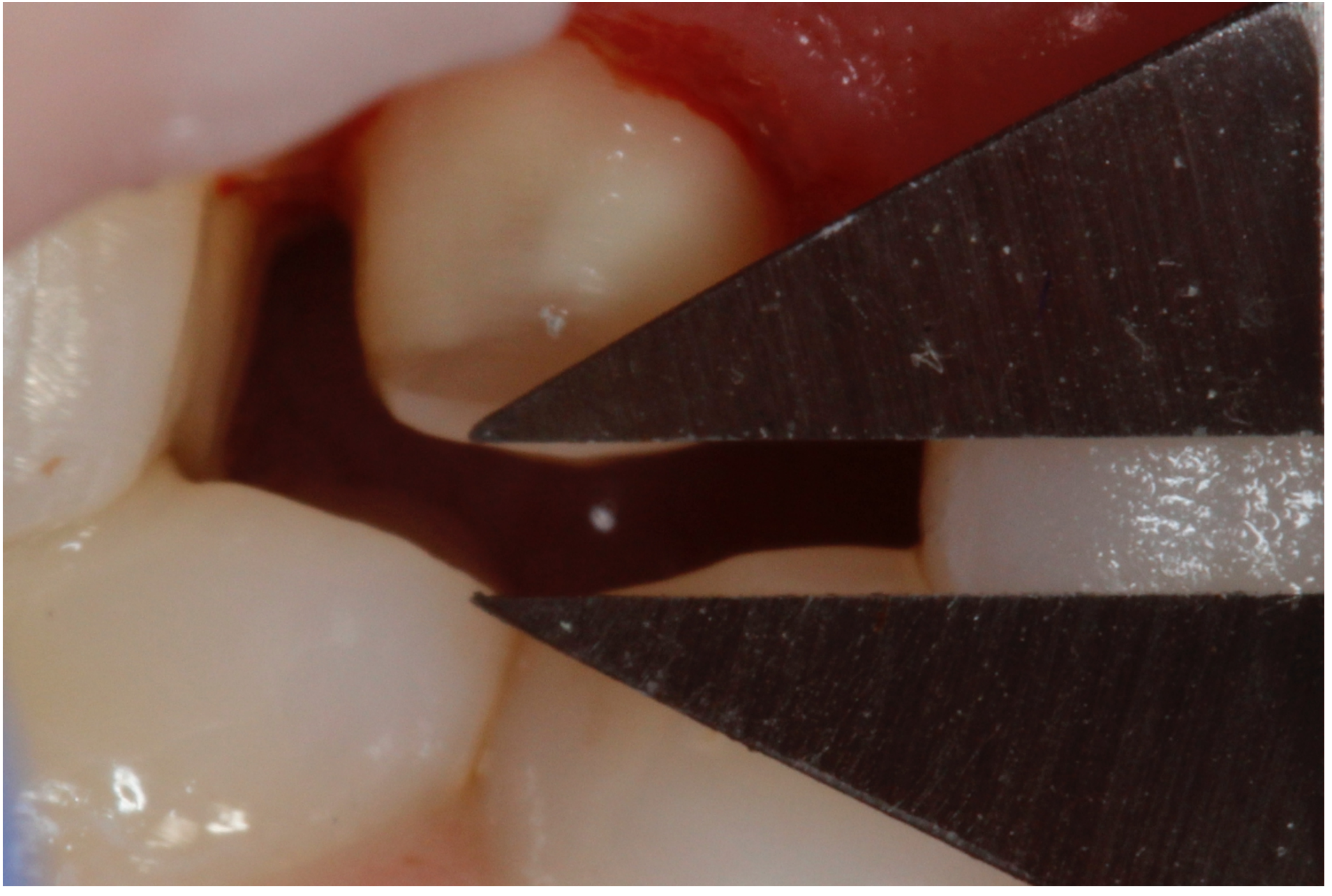

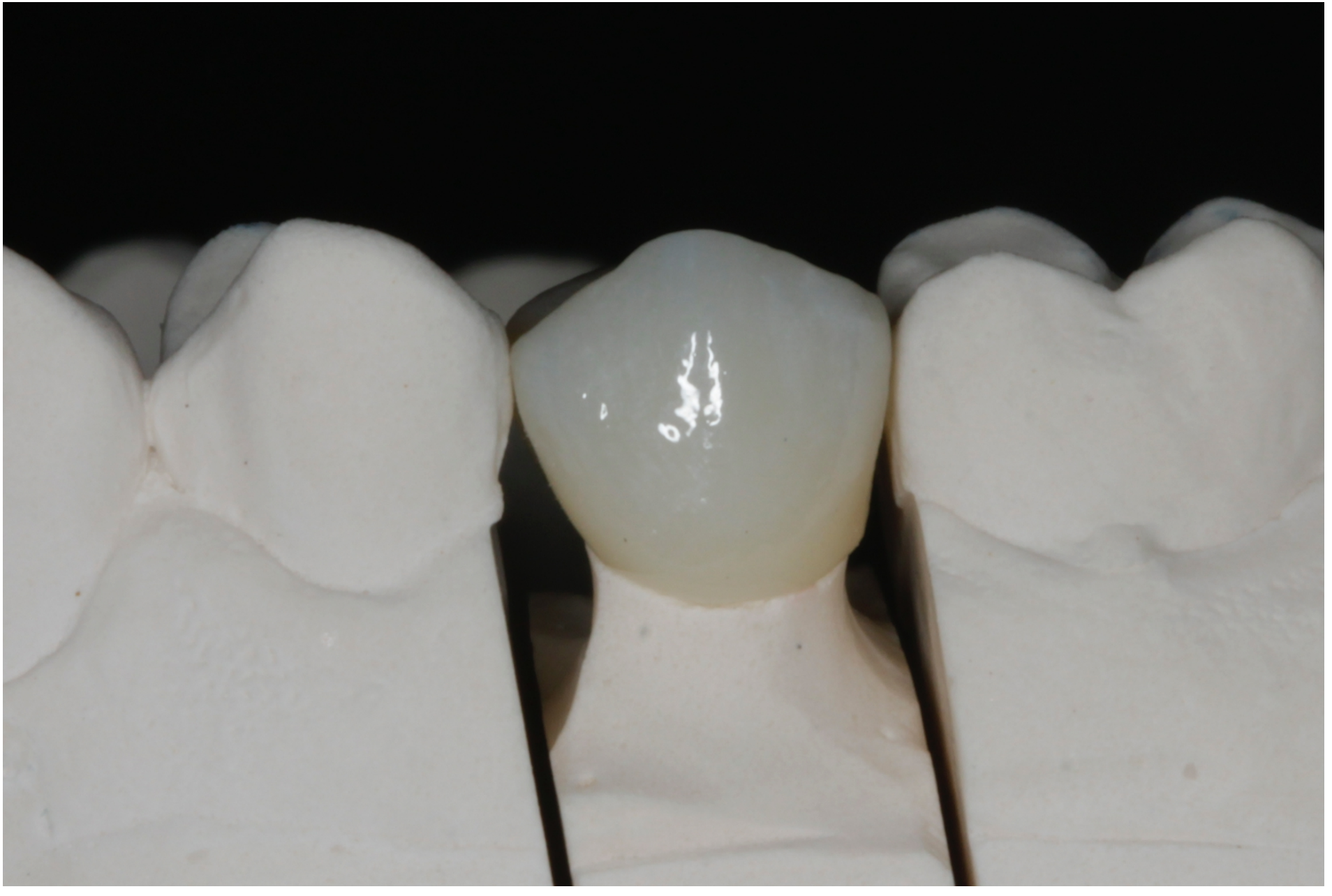

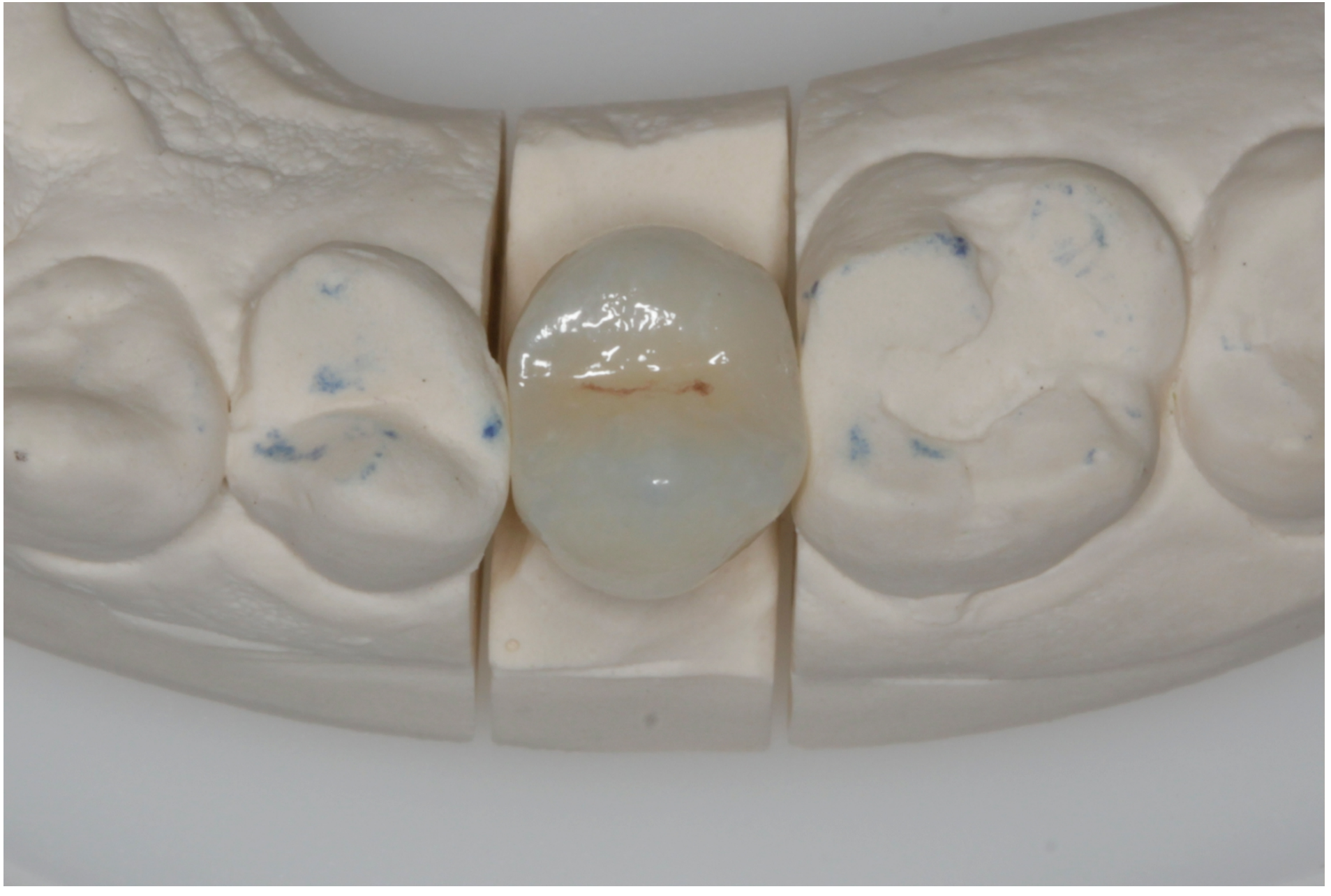


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