

Bone block graft to treat an apicomarginal defect simultaneously with apical surgery of the maxillary incisors: A case report with three-year follow-up

Abstract

Objective

The objective of this article is to describe the successful management of an apicomarginal defect of a maxillary lateral incisor with a bone block graft performed simultaneously with apical surgery of both lateral and central incisors.

Case presentation

A 15-year-old male patient with a recurrent sinus tract involving the maxillary right incisors was referred for possible treatment with apical surgery. Root canal treatment and apical surgery had been undertaken unsuccessfully one year before. Radiographic examination revealed a radiolucent area surrounding the tooth apexes. A bone block was harvested from the apical area of the central incisor with ultrasound tips to gain access to the root end and apical surgery of both incisors was performed. The bone block graft was used to cover an apicomarginal bony defect of the maxillary lateral incisor. At the three-year follow-up, the teeth had no clinical signs or symptoms, and the periapical radiograph demonstrated complete healing around the apexes.

Conclusion

The use of a bone block graft to treat an apicomarginal defect in conjunction with apical surgery achieved complete healing of the periradicular tissue in this case.

Keywords

Apicomarginal defect, apical surgery, bone regeneration.

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Introduction

An apicomarginal defect is defined as a localized bony defect that is characterized by the absence of alveolar bone over the entire root length.¹ This type of defect significantly reduces the prognosis of periapical surgery. Hirsch et al.² and Skoglund and Persson³ observed healing rates of 27% and 37%, respectively, in teeth that had undergone periapical surgery and with apicomarginal defects, substantially lower than teeth in which the vestibular cortical was intact. Current surgical techniques, supported by the use of ultrasound, amplification and magnification devices, have improved the prognosis of periapical surgery,⁴ also in teeth with this type of bony defect. Kim et al. observed a healing success of 77.5% in teeth with apicomarginal defects using a microsurgical technique, but still significantly lower than the 95.2% rate of teeth with lesions confined to the apical area.⁵

The reason for the poorer prognosis in teeth with apicomarginal defects has been suggested to be the formation of a long junctional epithelium over the denuded root surface, preventing bone regeneration.⁶ Experimental^{7,8} and clinical studies⁹ have shown significantly higher success rates with the use of tissue regeneration techniques (guided tissue regeneration, GTR) in apicomarginal defects.

The purpose of this article is to describe the successful management of an apicomarginal defect of a maxillary lateral incisor with a bone block graft performed simultaneously with apical surgery of both lateral and central incisors.

Case report

A 15-year-old male patient was referred to our clinic because of a recurrent sinus tract involving the maxillary right incisors (**Fig. 1**). Regarding the patient's medical history, no health problem was reported, nor was a history of allergies or the use of any medication. The patient had suffered a traumatism one year before that caused fracturing of the central incisors and the right lateral incisor. The central incisors were restored with composite and root canal fillings were performed in both central and lateral right incisors; in addition, root resection of the lateral incisor had been performed without retrograde filling. The periapical radiograph showed a radiolucent area surrounding the tooth apex (**Fig. 2**). Probing depth was normal around the central incisor and the

lateral incisor had a 7 mm depth at the vestibular aspect.

The surgical treatment combined two procedures: endodontic surgery of both maxillary right incisors and a bone autograft to regenerate the buccal bone plate of the lateral incisor. The surgery was carried out under local anesthesia with 4% articaine and 1:100,000 epinephrine (Inibsa, Lliçà de Vall, Spain). After elevation of a full-thickness mucoperiosteal flap, the pathological tissue around the apex of the lateral incisor was debrided. Afterward, a bone block was harvested from the apical area of the central incisor with ultrasound tips to gain access to the root end (**Fig. 3**); the block was kept submerged in saline solution. The root of the central incisor was then resected approximately 3 mm from the apex; the lateral incisor root had been resected in a previous periapical surgery (**Fig. 4**). Hemostasis of the bony crypt was achieved with aluminum chloride (Expasyl, Produits Dentaires Pierre Rolland, Merignac, France).¹⁰ The root ends were inspected using a rigid endoscope (Möller-Wedel, Munich, Germany; **Figs. 5 & 6**). The root-end cavities were prepared with sonic-driven microtips (Piezon Master 400, EMS Electro Medical Systems, Nyon, Switzerland; **Fig. 7**) and were retrofilled with mineral trioxide aggregate (MTA; DENTSPLY Tulsa Dental Specialties, Tulsa, Okla., U.S.; **Fig. 8**). The quality of the retrograde fillings was inspected with the endoscope (**Fig. 9**). The bone block graft was fixed with an osteosynthesis screw to regenerate the buccal wall of the lateral incisor (**Fig. 10**). The bony defect at the donor area and the apical area of tooth #12 were covered with textured bovine collagen (Lyostypt, B. Braun Melsungen, Tuttlingen, Germany). After cleaning the wound area, primary wound closure was accomplished with multiple interrupted sutures.

The patient was prescribed amoxicillin (500 mg/8 h) preoperatively (two days before surgery) for suppurative abscess and five days after intervention owing to the bone block graft procedure, ibuprofen (400 mg/8 h for four days), a 0.12% chlorhexidine rinse (t.i.d. for seven days) and paracetamol (500 mg on demand) in the event of intense pain. The sutures were removed after one week.

At the follow-up visit after three years, the teeth were asymptomatic, no gingival recession had occurred and normal periodontal probing depths were recorded around both teeth (**Fig. 11**). The periapical radiograph showed complete bone regeneration around the apices (**Fig. 12**).

Fig. 1
Sinus tract involving the maxillary right incisors.



Fig. 2
The periapical radiograph shows a radiolucency around the apices of the central and lateral incisors.



Figs. 1 & 2

Fig. 3
Using ultrasound, a bone block was harvested from the apical area of the central incisor.

Fig. 4
Intraoperative image after root-end resection.

Fig. 5
Endoscopic image of the lateral incisor apex, resected during a previous periapical surgery.



Figs. 3 & 4

Fig. 6
Endoscopic image of the central incisor apex after root-end resection, showing the gutta-percha.

Fig. 7
Root-end cavities prepared in both teeth.



Figs. 5 & 6

Fig. 8
Image after root-end cavity filling. The apicomarginal defect of the lateral incisor is evident over the entire buccal bone plate.



Figs. 7 & 8

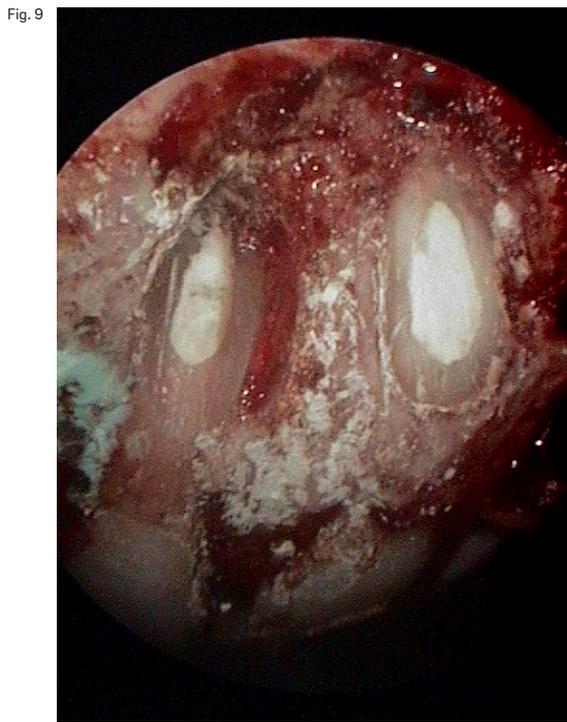


Fig. 9

Fig. 9
Endoscopic image after cavity filling with MTA.

observed that GTR improved the success rate of periapical surgery, particularly in large and through-and-through lesions, although the differences were not statistically significant.¹⁵ However, none of the studies included evaluated the prognosis of teeth with apicomarginal defects. Tissue regeneration in teeth with apicomarginal defects is not as predictable and there is no verified treatment option.¹⁶ Only four clinical trials, none of them with control groups, were found in which the prognosis of periapical surgery in teeth with apicomarginal lesions was studied. Dietrich et al. grafted the defects with inorganic bovine bone material and a collagen membrane.¹⁷ After one year, the clinical and radiographic assessment demonstrated a success rate of 82.6% and the median probing pocket depth decreased from 9 mm to 3 mm. Three years later, Marín-Botero et al. found similar results in two study groups.⁹ In one group, a polyglactin 910 membrane was placed over the apicomarginal defect ($n = 15$), and in the other group, a sliding periosteal graft was used to cover the defect ($n = 15$). Identical success rates of 87% were observed in both groups.

Fig. 10
The bone block graft was fixed with an osteosynthesis screw to regenerate the buccal wall of the lateral incisor.



Fig. 10

Fig. 11
Clinical appearance at the three-year follow-up visit.

Recently, the outcome of modern endodontic microsurgery was evaluated by Kim et al. in a prospective study.⁵ They studied healing according to the type of lesion and observed a healing success rate of 73.7% for teeth with apicomarginal defects treated with calcium sulfate placed into the periradicular bony defect and a collagen membrane covering the denuded buccal surface. Goyal et al. evaluated the use of platelet-rich plasma (PRP) for the treatment of apicomarginal



Fig. 11

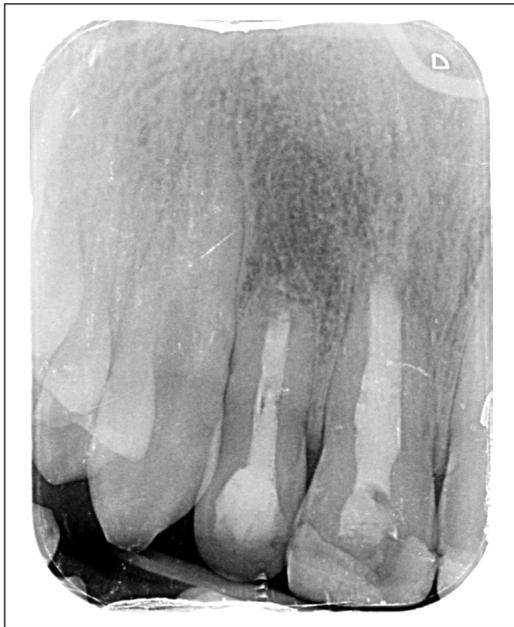


Fig. 12
Periapical radiograph three years after surgery. Complete bone regeneration around the apex was observed.

Discussion

Complete healing of periapical tissue after periapical surgery includes regeneration of the alveolar bone, periodontal ligament and cementum.¹¹ Several studies have shown that GTR applied with periapical surgery promotes healing of apical lesions and improves the prognosis of the treatment.¹²⁻¹⁴ In a recent meta-analysis, Tsisis et al.

defects.¹⁸ They conducted a study with three groups: In the first group, the defect was covered with a collagen membrane ($n = 10$); in the second group, a PRP preparation was placed over the defect ($n = 10$); and in the last group, PRP was packed into the defect and a collagen sponge was used to cover it ($n = 10$). The overall rate of healed cases was 80.76%, with differences that were not statistically significant between the groups.

Currently, the use of ultrasound, amplification and magnification devices has improved the prognosis of periapical surgery.⁴ In this case report, these advances allowed treatment of an apicomarginal defect with a bone block graft after periapical surgery of two maxillary incisors. There are no studies in the literature on the use of a block graft to treat this type of lesion simultaneously with apical surgery. Bone block grafts are used in implantology owing to osteogenic, osteoinductive and osteoconductive potential. Thus, although there are currently very few studies that provide scientific evidence sufficient to determine the ideal treatment of apicomarginal defects, we believe

that the procedure proposed in this article can be an alternative for the treatment of these defects.

One of the main problems with this type of graft is management of the soft tissue, since in order to minimize the risk of dehiscence, it is necessary to achieve a tension-less wound closure.¹⁹ The stabilization and intimate contact between the block graft and the recipient bed have been considered crucial to a successful outcome.²⁰ This can be achieved with the use of osteosynthesis screws.²¹

Conclusion

The use of a bone block graft to treat an apicomarginal defect in conjunction with apical surgery achieved complete healing of the periradicular tissue in this case.

Competing interests

The authors declare that they have no competing interests.

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