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Case Report

GUIDED TISSUE REGENERATION IN LARGE PERIAPICAL DEFECT USING BARRIER MEMBRANE TECHNIQUE – A CASE REPORT

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ABSTRACT

Endodontic surgery aims at the resolution of a periapical inflammatory process by surgical access followed by enucleation of the lesion and root-end filling to curb any potentially noxious agent within the physical confines of the affected root. Guided tissue regeneration could be associated with endodontic surgery aiming to enhance periradicular tissue regeneration. A barrier membrane when placed over a surgical site allows the selective proliferation of osteoprogenitor cells, and thus, good healing with bone formation, instead of fibrous tissue is obtained. This case report describes the healing process after endodontic surgery with a 6-months follow-up. The apicoectomy was followed by retrograde filling with MTA. The bone defect was filled with PerioGlas (NovaBone, Austin, TX, USA) and covered with a resorbable Guidor membrane (Sunstar, Foster Ave, Chicago, USA). The patient showed no clinical signs and symptoms on 6-month follow up and radiographic evaluation showed progressive healing of the defect at 6 months.

INTRODUCTION

Endodontic surgery may be a consideration in the management of periapical pathosis when non-surgical treatment of root canal is ineffective or impractical. The success of periradicular surgery generally ranges from 50% to 70%.[1] However, when buccal or lingual bone is lost, or a naturally occurring dehiscence is identified upon entry to the surgical site, a successful outcome is reduced to almost 27%.[2] In such cases, the use of a bioresorbable membrane may prevent the proliferation of the epithelium into the wound site, resulting in an increase in favorable prognosis.[3] Such concept has been termed as Guided tissue regeneration (GTR) and has been widely used for bone and periodontal tissue regeneration. In endodontic surgery, GTR has been applied using different bone substitute materials and/or different barrier membranes.[4] The use of a membrane for regeneration of tooth-supporting structure was first reported in 1982 by Nyman *et al*.[5] The principles of GTR are based on the concept that if epithelial cells, that migrate approximately ten times faster than other periodontal cell types are excluded from the wound space long enough for other cell types (as osteoblasts) with regenerative potential to become established, epithelial down growth is prevented and regeneration can be achieved. This can be obtained by using various barrier membranes with or without bone grafts. The objectives of the application of a "space making technique" in endodontic surgery resemble those in periodontology and implantology: *(i)* facilitate tissue regeneration by creating an optimum environment (stable and protected wound); and *(ii)* exclude non-desired fast proliferating cells from interfering with tissue regeneration.[4] The indications suggested for GTR in endodontic surgery are: through and through lesions that involve the integrity of both the buccal and palatal alveolar cortical plates, chronic periapical lesions with combined endodontic-periodontic involvement, such as communication of periodontal pockets with periapical lesions, compromised bifurcation or trifurcation crests and root perforation with alveolar crest bone loss.[3]

The present case report describes the treatment of periapical osseous defect (buccal bone dehiscence) by a combination of a bone graft with GTR membrane.

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Case Report

A 23-year-old healthy patient with non-contributory medical history presented with the chief complaint of discoloured and fractured mandibular central incisors. The patient gave the history of trauma from fall 3 years ago. On clinical examination, teeth 31 and 41 were discoloured with a fenestration exposing the root apex of tooth 41. On vitality testing, 31 and 41 were found to be non-vital. Both the teeth exhibited Grade I mobility. On radiographic examination, a large, diffuse radiolucency measuring about 5x3 cm in size involving the apices of 31 and 41 was seen (Fig.1). A treatment plan was formulated that consisted of root canal treatment of teeth 31 and 41, apicoectomy and thorough curettage of the lesion, followed by Guided tissue regeneration using PerioGlas (NovaBone, Jacksonville, FL) bone graft and Guidor (Sunstar, Foster Ave, Chicago, USA) as the barrier membrane.

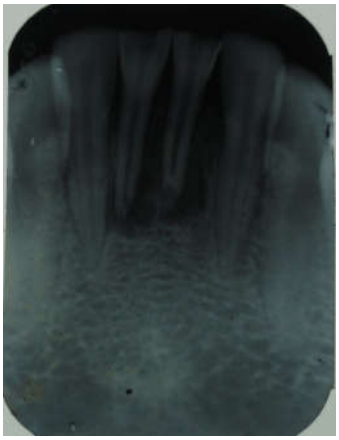

Fig. 1 Preoperative Radiograph showing large periapical radiolucency w.r.t 31, 41

Root canal treatment of teeth 31 and 41 was started. Working length was determined using electronic apex locator and confirmed with an intraoral periapical radiograph. Cleaning and shaping were done with step-back technique up to 30-K file under copious irrigation with 17% EDTA, 3% sodium hypochlorite followed by a final rinse of 0.2% CHX. The canals were obturated with 2% gutta-percha cones and zinc-oxide based sealer using lateral compaction technique. Following obturation, the teeth were temporized using temporary filling material (Orafil-G™, Prevest DenPro®)

Surgical Procedure

The procedure was performed under local anaesthesia using lignocaine 2% with adrenaline 1:80,000. A full thickness trapezoidal flap was raised extending from 32 to 42.(Fig.2).

Fig. 2 Full Thickness trapezoidal flap raised exposing root apex of teeth 31, 41

The lesion was debrided of all the granulomatous tissues and root-end resection of teeth 31 and 41 was done with cylindrical surgical carbide finishing bur at high speed.(Fig.3). The cavity preparation was done using inverted cone bur and MTA (ProRoot MTA, Dentsply Maillefer, Ballaigues, Switzerland) was used as the root-end filling material.

Fig. 3 Root end resection w.r.t teeth 31, 41

Following complete debridement of the area and retrograde filling; PerioGlas (NovaBone, Jacksonville, FL) was used to fill the defect.(Fig.4).

Fig. 4 Placement of PerioGlas bone graft into the bony defect

A sterile aluminium foil was then cut accordingly to cover the defect which served as a template for determining the size of the Guidor membrane.(Fig.5).

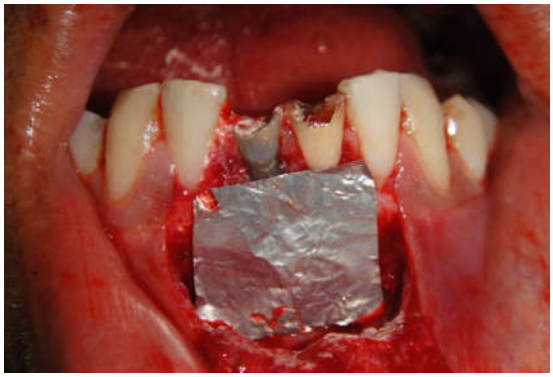

Fig. 5 Placement of sterile aluminium foil as a template

The Guidor membrane (Sunstar, Foster Ave, Chicago, USA) was then trimmed to cover the defect with its borders on the margins of the sound bone.(Fig.6). The flap was secured back and sutured using 4-0 silk sutures followed by the placement of Coe-pack (GC America ALSIP, ILLINOIS, U.S.A).(Fig.7). Routine post-surgical home care instructions along with a prescription of antibiotics and anti-inflammatory drugs were

given to the patient. Healing was uneventful. Sutures were removed on 7th day post-operatively and then clinical and radiographic follow-up was done at 3 months and 6 months. The patient was free of symptoms at the follow-up visits, the mobility of the teeth also reduced from Grade I too almost negligible and the radiograph revealed progressive healing of the bone at 6 months. (Fig.8).

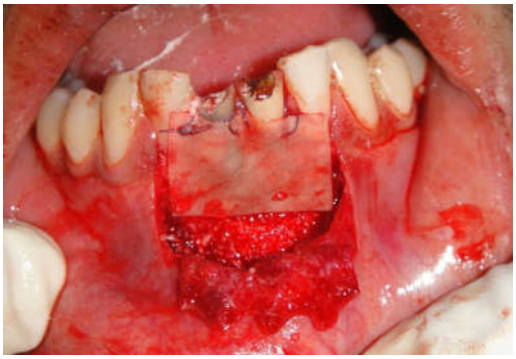

Fig. 6 Placement of Guidor barrier membrane over the bony defect

Fig. 7 Application of Coe-pack following suture placement

Fig. 8 6 months follow-up radiograph showing progressive healing of bone

DISCUSSION

Endodontic surgery has become a standard of care for tooth maintenance if conventional endodontic treatment is not feasible or associated with risks. However, in certain situations, the outcome of endodontic surgery may be compromised or uncertain due to the extent or location of the periapical or periradicular lesions.[6] The effectiveness of the periapical surgery may be diminished if the epithelial cells are allowed to repopulate into the defect.[7] This is especially true if the defect size is large as was in the present case. Thus, a combination of apical surgery and biomaterials such as membrane barriers and/or bone graft is one of the latest treatment options for avoiding tooth extraction. GTR is attempted to improve the self-regenerative healing process by excluding undesired proliferation of the gingival connective tissue or migration of oral epithelial cells into osseous defects.[3]

The basic principle of GTR is cellular selectivity. The technique aims at enhancing the quality and quantity of new bone and accelerating bone growth around the bone cavity.[8] The barrier is put on the bone defect and may be associated with osseous grafting materials. This avoids the penetration of cells from both the epithelial tissue and gingival connective tissue. The use of the barrier membrane affords the time needed for the differentiation, proliferation and migration of the cells from the ligament and from periodontal and alveolar bones to the bone cavity, favoring the healing process. Moreover, the space created by the membrane enables undifferentiated mesenchymal cells to migrate to this area and differentiate which promotes osteogenesis without the interference of other competitor cells.[9]

PerioGlas is a bioactive glass composed of primary silica, calcium, sodium, and phosphorus. It is an amorphous, crystalline and completely absorbable material. It acts by osteostimulation which stimulates and accelerates new bone formation in an osseous defect. Additional benefits include antimicrobial, anti-inflammatory and hemostatic effect. The alkaline nature of cations released by the graft is mainly responsible for the rapid healing. PerioGlas has shown to have greater ability for cementum and alveolar bone formation than other materials.[10]

In the present case, the use of membrane barriers and bone graft material in combination with endodontic surgery has been reported as a viable treatment option. No intraoperative or postoperative complications were observed. At 6-months follow-up, the patient showed no clinical signs and symptoms associated with the lesion and radiographic evaluation showed progressive resolution of the radiolucency. The outcome of the present case is similar to the study conducted by Pecora *et al* (1995) who evaluated the healing of the periapical lesions of more than 10 mm and showed clinical and radiographic evidence of complete bone regeneration when membrane barrier technique was used.[11]

In contrast to this, the study conducted by Katherine G *et al* (2002) reported that the placement of guided tissue membrane over the osseous defect has no beneficial effect on the rate of healing and instead added to the expense of the patient.[12]

Compared to the traditional methods, GTR techniques have significantly improved the outcomes for periapical lesions as in the present case. However, further biological studies need to be carried out to evaluate the need for GTR use with apical surgery.

CONCLUSION

In conclusion, the combination of apical surgery and regenerative techniques can successfully help the treatment of periapical lesions of endodontic origin and is suitable for the management of challenging cases.

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