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CASE REPORT

Guided Tissue Regeneration Principle with Inserts of PerioGlas in Endodontic Surgery: Two Case Reports

Jyoti Lokade, Sattyam Wankhade, Monaj Chandak, Anuja Lanjewar

ABSTRACT

Most periapical radiolucent lesions associated with infections of the root canal system heal uneventfully after endodontic treatment. However, some cases may require periradicular surgery in order to remove pathologic tissue from the periapical region and simultaneously eliminate any source of infection that could not be removed by orthograde root canal treatment. With an adequate technique, surgery can address these issues, although it may be insufficient in some situations. This report describes the healing process after surgery in two cases with a 12 months follow-up. In these cases, apicoectomy was followed by retrograde sealing with Super EBA (Harry J. Bosworth Company, Illinois, USA). The bone defect was filled with PerioGlas (NovaBone, Austin, TX, USA) and covered with a resorbable Guidor membrane (Sunstar, Foster Ave, Chicago, USA). No intraoperative or postoperative complications were observed. After 24 months of follow-up, the patient showed no clinical signs or symptoms associated with the lesion and radiographic examination showed progressive resolution of radiolucency.

Keywords: Guided tissue regeneration, PerioGlas, Periapical lesion.

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INTRODUCTION

Endodontic surgery may be a consideration in the management of periradicular pathosis when nonsurgical treatment of the 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 dramatically.[2] In these cases a success rate of only 27% has been cited. In cases of bone loss both buccally and lingually or palatally, the success rate is reduced even further. Skoglund and Persson[3] identified an initial success rate of 37% in periradicular surgery cases exhibiting total buccal bone loss, with 33% of the cases studied listed as uncertain and 30% as unsuccessful. Over a 4-year evaluation, the success rate rose to only 38.5%. The use of a bioresorbable membrane may prevent the proliferation of the epithelium into the wound site, resulting in an increase in favorable prognosis. However, there is a paucity of information that supports this use of a bioresorbable membrane in this environment.

Regeneration of periapical bone defects constitutes a significant problem in periradicular surgery, since the proliferation of gingival connective tissue or the migration of the oral epithelium into such defects can occur and prevent the formation of normal trabecular bone.[4] Several studies in humans and animals have evaluated the concept of guided tissue regeneration (GTR). This has led to the development of synthetic bone substitutes, bone grafts and membranes or barriers that allow the cellular regrowth of periodontal defects caused by pathosis or surgical trauma. The principle of GTR used in periodontics has been applied in periradicular surgery with success by some clinicians who have reported an excellent recovery in cases that originally had a poor prognosis. This has helped to improve the predictability of periapical surgical procedures. With these new techniques, the migration of cells of the gingival connective tissue or oral epithelium is prevented, allowing the cells of the periodontal ligament and trabecular bone to regenerate the lost tissue.[5-7]

The indications suggested for GTR in endodontic surgery are: through-and-through lesions that involve the integrity of both the buccal (labial) and palatal (lingual) alveolar cortical plates; chronic periapical lesions and 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. The purpose of this article is to present two case reports with periapical osseous defects treated by a combination of PerioGlas (alloplast) and GTR.[7]

CASE REPORTS

Case 1

A 25-year-old patient reported to the Department of Conservative Dentistry and Endodontics, Wardha with a chief complaint of discolored and fractured upper anterior teeth. The patient suffered a roadside automobile accident 4 years ago, which had resulted in fracture and subluxation of her maxillary central incisors. History revealed incomplete root canal treatment after 1 week of injury.

Patient discontinued her treatment at that time and now visited the dental hospital at SDPC after almost 4 years for esthetic reason. On clinical examination there was Ellis class III fracture on tooth #21, Ellis class II fracture on tooth # 11. Patient reported that she experienced dull aching pain in her maxillary anterior region. Teeth numbers 11 and 21

were tender to percussion. Probing depth was normal and on palpation the overlying gingiva was tender. Intraoral radiograph revealed incomplete root canal treatment of 11 and 21, periapical radiolucency seen with 11 and 21. Both teeth were discolored without sinus tracts or intraoral swellings were noted. Based on clinical findings and radiographic examination the case was diagnosed as chronic periapical abscess. State what was found on the intraoral radiograph here and then state diagnosis (Figs 1 and 2).

Clinical Procedure

Clinical procedure involved access opening to the root canal space gained through the lingual surface of 11 and 21. Working length was determined and debridement was done. A thick mixture of calcium hydroxide powder (Vishal Chemicals, India) and local anesthesia (Lignocaine, 1:80,000, Warren, Indogo, Mumbai, India) in the ratio of 2:1 was placed inside the canal by using hand plugger. Access cavity was sealed with Cavit. What was the temporary restoration placed in the access. Any analgesics recommended?

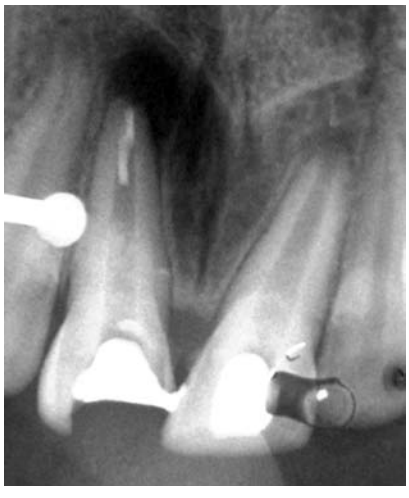

Fig. 1: Preoperative radiograph intraoral periapical with 11 and 21

Fig. 2: Postobturation intraoral periapical with 11 and 21

Two weeks later, the patient reported with same symptoms. Calcium hydroxide was removed from the root canal space and was irrigated with 2.5% sodium hypochlorite. Again calcium hydroxide dressing was placed in the root canal with hand pluggers and patient was kept under observation and was recalled after 1 month for follow-up.

Since, the patient remained symptomatic throughout this treatment process. Removal of calcium hydroxide was done with K-files, 10% citric acid and the canal was irrigated with 5 ml of 2.5% sodium hypochlorite and 10 ml of saline and periapical surgery was planned after obturation.

Definitive treatment plan was formulated which included: obturation, periapical curettage, root end filling, placement of bone graft material PerioGlas (NovaBone, Jacksonville, FL) in the bony defect followed by a full surface restoration. Materials used were gutta-percha and Resinoseal, IRM, PerioGlas, GTR membrane, Z-350 (3M ESPE) for postobturation restoration (Figs 1 to 8). Postoperatively follow-up was done at 6 and 12 months (Fig. 3) respectively.

The patient remained asymptomatic after periapical surgery and at 6 months and at 1 year follow-up. The postoperative radiographs show a decrease in the size of the periapical radiolucency suggestive of new bone deposition.

Case 2

A 25-year-old male patient reported to the Department of Conservative Dentistry and Endodontic, with a chief complaint of discoloration of lower anterior teeth. The patient met with an accident 4 years earlier, which had resulted in fracture of 31 and 41. History revealed nonsurgical root canal treatment of 31 and 41 after 1 year of injury. There was no swelling or sinus tract was associated and probing depth was normal with 31 and 41. Overlying mucosa was tender to palpation. Report of oral exam should include presence or absence of swelling, sinus tract, palpation, probing. On percussion, tenderness and mobility was noted on 31 and 41. Intraoral periapical radiograph reveals a radiolucent lesion associated with teeth numbers 31 and 41 and an radiopaque material consisted with extruded silver point on tooth #41. Radiographs were also suggestive of lateral perforation on 31 and 41 (Figs 1 to 6).

Clinical Procedure

Clinical procedure involved access opening through the lingual surface of 11 and 21. Working length was determined by intraoral periapical radiograph. Cleaning and shaping was done with balanced force technique upto 30 K-file under copious irrigation with 10 ml of 17%

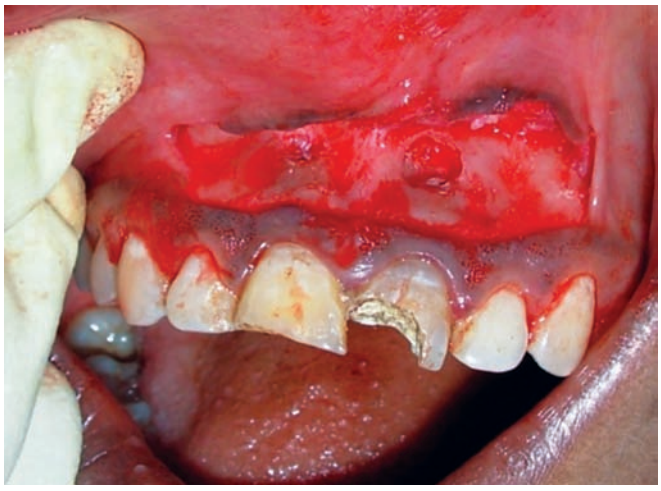

Fig. 3: Flap reflection with bony defect in apical region of 11 and 21

Fig. 4: Placement of PerioGlas and Guidor membrane in bony defect of 21

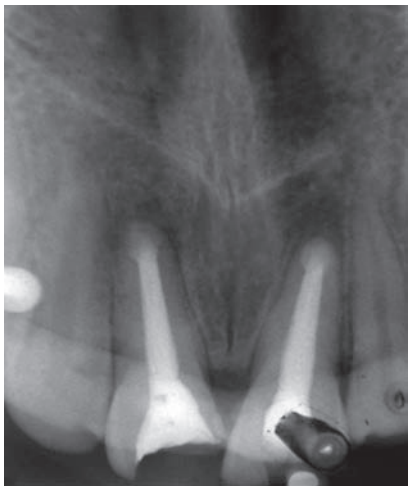

Fig. 5: Postsurgical intraoral periapical with 11 and 21

EDTA, 10 ml of 2.5% sodium hypochlorite followed by 10 ml of normal saline. Silver point retrieval was tried with Masserann kit but it was failure as because of corrosion it was snugly fitted beyond apical foramina. A thick mixture of calcium hydroxide powder (Vishal Chemicals, India) and 2% lidocaine hydrochloride with 1:200,000 epinephrine (AstraZeneca Pharma, India) was placed inside the canal using hand plugger. Patient was recalled after 2 weeks. Patient remained symptomatic throughout this period. So, a surgical treatment plan was formulated to treat this condition which included mucoperiosteal flap reflection, osteotomy, periradicular curettage-enucleation, root-end resection with cylindrical surgical carbide finishing bur at high speed, cavity preparation was done with an inverted cone bur. Root-end filling and lateral perforation repair was done with mineral trioxide aggregate (Figs 7 to 13). The sutures were removed after 7 days after the surgical procedure and then clinical and radiographic follow-up was done every 3 months up to 6 months. Postoperative clinical examination revealed no signs of inflammation, tooth was asymptomatic and radiograph revealed reduction in periapical radiolucency.

Fig. 6: One year follow-up

DISCUSSION

Biomaterials such as membrane barriers and/or bone grafts are often used to enhance periapical new bone formation. A combination of apical surgery and these biomaterials is one of the latest treatment options for avoiding tooth extraction. In case of periapical lesions, GTR is attempted to improve the self-regenerative healing process by excluding undesired proliferation of the gingival connective tissue or migration of the oral epithelial cells into osseous defects. In many cases, GTR is necessary for achieving periodontal tissue healing.[8]

Use of GTR in apical surgery can increase the success rate of this procedure.[9] The technique helps to create ideal conditions for the restoration of original structures and normal functioning of the tissues that were lost because of infectious and inflammatory processes.[10] The basic principle of GTR is cellular selectivity. The technique aims at enhancing the quality and quantity of new bone and accelerating bone

Fig. 7: Preoperative intraoral periapical radiograph of 31 and 41

Fig. 10: Placement of PerioGlas in bony defect

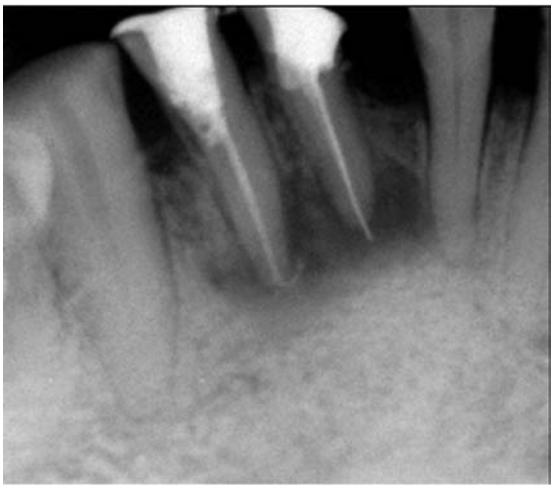

Fig. 8: Postobturation intraoral periapical with 31 and 41

Fig. 11: Postsurgical intraoral periapical with 11 and 21

Fig. 9: Flap refection with bony defect in relation to 31 and 41

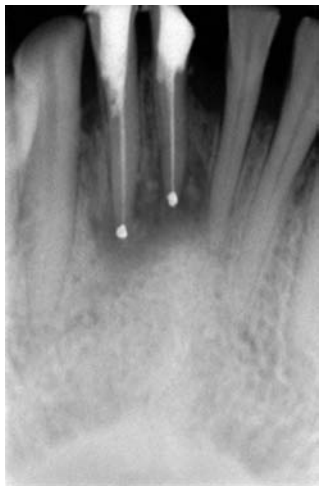

Fig. 12: Six months follow-up of 31 and 41

growth around the bone cavity.[11] The barrier is put on the bone defect and may frequently 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. Furthermore,

Fig. 13: Immediate postoperative view

the space created by the membrane enables undifferentiated mesenchymal cells to migrate to this area and differentiate, thus promoting osteogenesis without the interference of other types of competitor cells.[12,13]

PerioGlas is a bioactive glass composed of primarily silica, calcium, sodium and phosphorus. It is an amorphous crystalline and completely absorbable material. Its principle mode of action is by osteostimulation which stimulate and accelerates new bone formation in an osseous defect. In addition the osteoconductive effect leads to new bone formation at the defect margin which penetrates to center of the graft. Adjunctive benefits include antimicrobial, anti-inflammatory and hemostatic effect. These are a result of alkaline nature of cations released by the graft which ensures rapid healing. PerioGlas has shown greater new cementum and alveolar bone formation than other materials.[14-17]

In this case, the lesions showed positive response to the combination of surgical treatment and biomaterials. The use of membrane barriers and other agents, such as bone graft materials or tissue growth factors, has been reported as a viable treatment option.[18-22] No intraoperative or postoperative complications were observed. At the 12 months follow-up, the patient showed no clinical signs or symptoms associated with the lesion and radiography showed progressive resolution of the radiolucency. Compared to the traditional methods of endodontic surgery, GTR techniques have significantly improved the outcomes for periapical lesions.[22] A review of literature suggests that there is a lot of optimism about regenerative procedures.

The results obtained in the histological evaluations were similar to the studies reported by Dahlin et al (1988) and Nyman (1991) in experimental studies in animals. The use of GTR techniques has been proposed as an adjunct to endodontic surgery to favor bone healing.[23] Pecora et al (1995) evaluated the healing of periapical lesions of more than 10 mm, and showed clinical and radiographic evidence of complete bone regeneration, when the membrane technique was used as a barrier.[24] In contrast to this, another study reported that placement of a guided tissue membrane over the bony opening created during an endodontic periapical surgical procedure has no beneficial effect on the rate of healing and the added expense to the patient would not be warranted in these cases.[25]

However, despite the success achieved with these procedures, as seen in this case report, they should be applied with caution. Biological studies in experimental models should be conducted to evaluate the need for GTR use with apical surgery.

CONCLUSION

Application of GTR and use of bone graft concepts to periapical surgery is primarily based on extensive studies of periodontal regenerative therapy. Compared to the traditional methods of endodontic surgery, GTR techniques have significantly improved the outcomes for periapical lesions. Further studies should be conducted to determine which clinical situations would benefit from GTR and which techniques are most effective. 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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