Management of Grade III Furcation Involvement in Molars by Regenerative Periodontal Therapy: A Report of Three Cases

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ABSTRACT

Aim: This series of three cases aims to evaluate the clinical outcome of management of grade III furcation involvement in both maxillary and mandibular molars with bone graft and collagen membrane followed up for 18 months.

Background: The prevalence of periodontal disease is increasing worldwide. Successful periodontal therapy aims to regenerate the lost periodontal structures. Management of teeth with furcation involvement often poses a challenge to clinicians. There exists dilemma of whether to extract the tooth or to adapt regenerative periodontal procedures owing to the lack of predictable outcome.

Case description: Three patients, 48-year-old male, 54-year-old male, and 38-year-old female, diagnosed with grade III furcation in 16, 26, and 47, respectively, were treated with osseous graft and guided tissue regeneration (GTR) membrane (Periocol) following curettage and root planing. Postoperative instructions were given to all the patients to use chlorhexidine mouthwash (10 mL of 0.2%) 2 times a day for 6 weeks and to clean the surgical area with 0.2% chlorhexidine-soaked cotton and to avoid brushing the surgical area for 1 week. Follow-up was done for 18 months. A satisfactory functional clinical outcome was observed in all the three patients.

Conclusion: Although several factors such as patient-related and surgical site-related could play an influential role in the final outcome of GTR procedure, the present case series reports a satisfactory clinical outcome in periodontally hopeless teeth.

Clinical significance: Treatment of periodontally compromised teeth should not only be confined to extraction but also regenerative periodontal therapy in properly selected cases could prove to be beneficial to the patients.

Keywords: Bone graft, Collagen membrane, Furcation, Guided tissue regeneration.

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BACKGROUND

Over the past several years, several treatment strategies have been implemented to improve the prognosis of molars with furcation involvement. Several classification systems have been put forth for furcation involvement.1 Furcation areas of molars owing to its anatomy and defect morphology pose a clinical challenge for access.2 Resective osseous surgery performed to treat furcation defects could jeopardize the prognosis for the tooth.3 Successful periodontal therapy aims to regenerate the lost periodontal structures. Several regenerative osseous procedures have been documented for the management of furcation, including the bone grafts or substitutes, guided tissue regeneration (GTR), root biomodification, and use of growth factors.4 Guided tissue regeneration (GTR) with bone graft and resorbable membrane has been used as the treatment of choice for grade III furcation involvement.1 Ideally, successful regeneration of periodontal furcation defects is the clinically complete elimination of horizontal and vertical defect components by bone fill. However, the clinical outcome of GTR with osseous graft to treat grade III furcation involvement has shown to have variable results. This article reports clinical outcome of three cases of grade III furcation involvement treated with osseous graft and GTR and followed up for 18 months. Clinical outcome of the treatment was assessed by examination of the furcation area to determine the probing pocket depth and radiographic examination to assess bone fill.

CASE DESCRIPTIONS

Case I

A 48-year-old male patient reported to a private dental clinic in Chennai on June 15, 2018, with a chief complaint of dull pain in the upper right back tooth for the past 3 months. A through history was elicited to rule out any relevant medical history and previous dental history. No significant habits or medical conditions were present. On clinical and radiographical examination, a provisional diagnosis of chronic generalized periodontitis with grade III furcation involvement in relation to 16 was made (clinical parameters mentioned in Table 1). Electric pulp test and thermal parameters.

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tests revealed 16 was vital. Phase-I nonsurgical periodontal therapy was performed, and the patient was reviewed 1 month later.

**Surgical Procedure**
Written and signed consent for periodontal surgery was obtained prior to the procedure. Preoperative probing depth was recorded in relation to tooth 16 (Fig. 1A) following which local anesthesia (2% lignocaine with 1:200,000 adrenaline) was administered. Full-thickness mucoperiosteal flap was elevated buccally from distal aspect of 12 to mesial aspect of 17 and palatally from distal aspect of 14 to mesial aspect of 17 using crevicular incisions. Complete debridement of root surface was performed using Gracey curettes. Saline irrigation was done. Osseous destruction was observed along the buccal cortical plate of 16 exposing the furcation (Fig. 1B) and also completely involving the mesial furcation (Fig. 1C). PerioGlas®, an osteoconductive and osteostimulative particulate bone graft, was mixed with sterile saline in a dappen dish and carried to the furcation defect (Fig. 1D). The defect was filled with the graft in such a way that it would not impede with neovascularizations. Then, subsequently a bioresorbable GTR membrane (Periocol) was soaked in normal saline solution to improve its adhesion property and was placed over the graft (Fig. 1E). It was then adapted over the defect extending 2–3 mm apical to the crest of the existing bone stabilized with 3–0 braided black silk simple interrupted sutures (Fig. 1F).

**Clinical Outcome**
Following 18 months, there was a decrease in probing pocket depth from 9 mm preoperatively to 3 mm postoperatively (Table 1) and furcation involvement (Fig. 2A). Radiographic evidence showed significant bone regeneration in comparison to preoperative radiograph (Figs 2B and C).

**Case II**
A 54-year-old male reported to a private dental clinic in Chennai on June 3, 2018, with chief complaint of receding gums in the upper left back teeth. No significant habits or medical conditions were present. A routine complete clinical and radiographic dental examination was performed. Tooth 26 had a probing depth of 8 mm in the mesiopalatal aspect. Grade I mobility was also present in 26 (clinical parameters mentioned in Table 1). Subgingival calculus was present. A provisional diagnosis of chronic localized periodontitis was made. Tooth vitality test revealed 26 was vital. Phase I periodontal therapy of scaling and root planning was performed, and the patient was reviewed 1 month later.

**Surgical Procedure**
Written and signed consent for periodontal surgery was obtained prior to the procedure. Preoperative probing depth was recorded (Fig. 3A), and local anesthesia (2% lignocaine with 1:200,000 adrenaline) was administered in relation to 26. Using crevicular incisions on the buccal (Fig. 3B) and palatal aspect (Fig. 3C), a full thickness mucoperiosteal flap was elevated buccally from distal aspect of 22 to mesial aspect of 27 and palatally from distal aspect of 22 to mesial aspect of 27. Granulation tissue was removed completely and root surface planned using Gracey curettes. Saline irrigation was done, and the osseous architecture was observed. Grade III furcation involvement was observed in 26 involving the mesial furcation. PerioGlas®, an osteoconductive and osteostimulative particulate bone graft, was mixed with sterile saline in a dappen dish and carried to the furcation defect (Fig. 3D). The defect was not packed with graft tightly, as it might

**Table 1:** Comparison of probing pocket depth before and after treatment

| Case no. (tooth no.) | Furcation probing depth (mm) | Before treatment | After treatment |
|---------------------|-----------------------------|-----------------|----------------|
| I (16)              |                             | 9               | 3              |
| II (26)             |                             | 9               | 3              |
| III (47)            |                             | 9               | 3              |

Figs 1A to F: Case I (A) Preoperative probing depth in relation to 16 buccal furcation; (B) Full thickness mucoperiosteal flap elevated on the buccal aspect; (C) Full thickness mucoperiosteal flap elevated on the palatal aspect; (D) Bone grafting done in the furcation defect; (E) Resorbable collagen GTR membrane placed over the graft; (F) Flaps approximated with 3–0 braided black silk sutures
impede with neovascularization. Subsequently, a bioresorbable GTR membrane (Periocol) (Fig. 3E) was placed over the graft and stabilized with 3–0 braided black silk simple interrupted sutures (Fig. 3F). Care was taken to secure the flap without tension. With regard to postoperative instruction and suture removal, similar procedure as mentioned in case I was followed.

Clinical Outcome
Following 18 months there was a decrease in probing pocket depth from 9 mm preoperatively to 3 mm postoperatively (Table 1) and furcation involvement (Fig. 4A). Radiographic evidence showed significant bone regeneration in comparison to preoperative radiograph (Figs 4B and C).

Case III
A 38-year-old female reported to a private dental clinic in Chennai on July 25, 2018, with chief complaint of dull pain in gums in relation to lower right back tooth. No significant habits or medical conditions were present. Tooth 47 had a full coverage restoration and a clinically probable furcation involvement. Tooth mobility was not present. Radiographic examination revealed radio opaque filling material in the mesial and distal root of 47 suggestive of root canal treatment and radiolucency in the furcation region of 47 (clinical parameters mentioned in Table 1). Endo-perio lesion was ruled out, as the radiographic examination did not reveal any periapical radiolucency. A provisional diagnosis of chronic localized
periodontitis in relation to tooth 47 was made. Phase-I periodontal therapy of scaling and root planning was performed, and the patient was reviewed one month later.

Surgical Procedure
Written and signed consent for periodontal surgery was obtained prior to the procedure. Preoperative probing depth was recorded (Fig. 5A), and local anesthesia (2% lignocaine with 1:200000 adrenaline) was administered in relation to 47. Using horizontal crevicular incisions on the buccal (Fig. 5B) and lingual aspect (Fig. 5C), a full-thickness mucoperiosteal flap was elevated buccally from distal aspect of 45 to mesial aspect of 48 and lingually from distal aspect of 45 to mesial aspect of 48. Granulation tissue was eliminated using Gracey curettes. Saline irrigation was done, and the osseous architecture was observed. Grade III furcation involvement was observed in 47. Puros® (demineralized bone matrix putty) was taken in a sterile dappen dish and carried to the furcation defect (Fig. 5D). Subsequently, a bioresorbable GTR membrane (Periocol) (Fig. 5E) was placed over the graft and stabilized with 3–0 braided black silk sutures (Fig. 5F). Care was taken to secure the flap without tension. With regard to postoperative instruction and suture removal, a similar procedure as mentioned in case I was followed.

Clinical Outcome
Following 18 months, there was a decrease in probing pocket depth from 9 mm preoperatively to 3 mm postoperatively (Table 1) and furcation involvement (Fig. 6A). Radiographic evidence showed significant bone fill in comparison with preoperative radiograph (Figs 6B and C).

All the three patients adhered to the recall periodontal maintenance visits every 3 months and underwent radiographic
examination and nonsurgical periodontal therapy. All the three patients were instructed to use 0.2% chlorhexidine mouth wash twice daily for 6 weeks following suture removal.

**Discussion**

Furcation involvement in periodontal disease presents a diagnostic and clinical challenge to the dental surgeon addressing the issue. Furcation involvement has been graded by systems like Glickman’s grading,5 Goldman’s grading,6 Tarnow, and Fletcher grading.7 According to these, the grade III furcation denotes complete loss of interradicular bone resulting in a tunnel that is not open but covered by soft tissue atleast on one side. Hence, performing regenerative osseous surgery to regenerate and gain new attachment in such a type of a defect is challenging, as there is no interradicular bone or a wall type defect to retain the bone graft material in place till regeneration is accomplished. Hence, the need of a GTR membrane arises which can hold the clot and serve as a scaffold for selective cell repopulation.8 The combination of bone graft with bioresorbable membrane has been shown as a predictable treatment option for management of grade III furcation involvement in the maxillary or mandibular molars.9 The bone graft and collagen membrane used were biocompatible, and no case of membrane exposure was observed in all three cases. The collagen membrane used has inherent haemostatic10 and chemotactic11 property that enhances clot formation and early wound stabilization. This would eventually help in better flap adaptation owing to less frequent cases of membrane exposure during the healing phase. Fibroblast migration over the surgical site is enhanced by the chemotactic property of collagen which ensures complete flap closure. PASS principle as suggested by Wang et al.12 is critical for predictable bone regeneration: primary wound closure, angiogenesis, space (defect space) maintenance, and stability of the wound. Ge et al.13 suggested that debridement of subgingival pocket area with Er,Cr:YSGG laser is a safe and effective clinically while debridement of the furcation area. Complete removal of granulation tissue with area specific Gracey curettes was done to ensure minimum postoperative complications like graft or membrane infection and subsequent rejection. All three patients were compliant with the postoperative instructions and did not miss any recall appointments. Furthermore, all patients were satisfied with the treatment rendered to them which improved the periodontal prognosis of the teeth, rather than extraction and replacement of it. During recall visits, patients underwent a complete periodontal and radiographic examination. Oral hygiene instructions and brushing techniques were also reinforced during these visits.

**Conclusion**

Several patient-related factors and surgical sites-related factors could play an influential role in the final outcome of GTR procedure. Nevertheless, management of periodontally hopeless tooth should not only be confined to extraction, but regenerative periodontal therapy in properly selected cases could prove to be beneficial to the patients.

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