# Surgical re-entry evaluation of regenerative efficacy of bioactive Gengigel® and platelet-rich fibrin in the treatment of grade II furcation: A novel approach

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## Abstract

The furcation area creates situations in which routine periodontal procedures are somewhat limited, and surgical procedures are generally required. The introduction of bioactive agents, such as platelet concentrates, enamel matrix derivatives, bone morphogenic proteins, and matrix macromolecules such as hyaluronic acid has expanded the scope for better outcomes in furcation treatment. Hyaluronic acid is a naturally occurring nonsulfated high molecular weight glycosaminoglycan that forms a critical component of the extracellular matrix and contributes significantly to tissue hydrodynamics, cell migration, and proliferation. Platelet-rich fibrin (PRF) is an immune and platelet concentrate containing all the constituents of a blood sample, which are favorable for healing and immunity. The purpose of the present case report was to assess through surgical re-entry, the regenerative capacity of Gengigel® in conjunction with PRF in a patient with grade II furcation defect. It was observed that the combined approach resulted in significant furcation defect fill on re-evaluation at 6 months.

**Keywords:** Furcation, Gengigel®, hyaluronic acid, platelet-rich fibrin

## Introduction

Multi-rooted teeth offer unique and challenging problems for the periodontist. The furcation area creates situations in which routine periodontal procedures, such as scaling and root planing are somewhat limited, and surgical procedures are generally required. Treatment approaches that have been used to resolve grade II furcation defects surgically include autografts, demineralized freeze-dried bone allografts, bovine-derived xenografts, barrier membranes, and combinations of membranes and bone grafts. Even though these regenerative materials are still used today, the introduction of bioactive agents, such as platelet concentrates, enamel matrix derivatives, bone morphogenic proteins, and matrix macromolecules such as hyaluronic acid has expanded the scope for better outcomes in furcation treatment.

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Hyaluronic acid (hyaluronan) is a linear, widely distributed glycosaminoglycan of the extracellular matrix of mammalian connective tissues, primarily synthesized by mesenchymal cells and forms the backbone for the organization of proteoglycans, establishing links with collagen, fibrin, and different matrix molecules.[1] Gengigel® (Ricerfarma, Milano, Italy) contains high molecular weight fractions of Hyaluronic acid in gel formulation with 0.8% concentration suitable for bone regeneration in periodontal bony defects [Figure 1a]. Gengigel as a product for oral use has been evaluated by skin irritation test, sensitizing potentiality, and percutaneous absorption test and has been proved to be a safe nonirritant product.[2]

Platelet-rich fibrin (PRF) is an immune and platelet concentrate, containing all the constituents of a blood sample which are favorable for healing and immunity. It consists of a fibrin matrix polymerized in a tetra-molecular structure, with the incorporation of platelets, leukocytes, cytokines, circulating stem cells, and growth factors.[3] Hence, the purpose of the present case report was to assess the regenerative capacity of Gengigel® in conjunction with bioactive PRF in a patient with grade II furcation defect.



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## Case Report

A 40-year-old male patient reported to the outpatient Department of Periodontics with a chief complaint of bleeding gums while brushing and sensitivity to cold while eating and drinking in the lower back tooth region. Clinical examination revealed Miller's Class I gingival recession and grade II furcation involvement in the mandibular left first molar region and [Figure 1b]. On radiovisiographic examination of the region, radiolucency was noted in the furcation area [Figure 1c]. Treatment was accomplished through Phase I and Phase II therapy. During Phase I therapy, full-mouth scaling and root planing was done, and general oral hygiene instructions were given. Phase II therapy included open flap debridement, followed by regeneration of the furcation defect. Following administration of local anesthesia, buccal and lingual crevicular incisions were made, and the mucoperiosteal flap was reflected to access the underlying bone morphology in the furcation area [Figure 2a]. After meticulous debridement with Gracey curettes [Figure 2b], the furcation area was assessed using Q2N Naber's probe [Figure 2c]. It was found that the assessed defect was around 3 mm horizontally and 2 mm vertically [Figure 2c].

Then, around 5 ml of whole venous blood was collected from the antecubital vein of the patient in a sterile vacutainer tube without anticoagulant for the preparation of autologous PRF. The vacutainer tube was placed in the centrifugal machine set at 3000 revolutions per minute (rpm) for 10 min. The resultant product consisted of platelet poor plasma at the top, PRF clot in the middle and red blood cells at the bottom. Meanwhile, the debrided defect was slightly overfilled with Gengigel® (Ricerfarma, Milano, Italy) [Figure 2d]. Autologous PRF of the required size was filled into the furcation defect after separation from the other two layers [Figure 3a and b] and the remainder part was used as a GTR membrane by squeezing out the fluids to cover the furcation [Figure 3c]. The reflected flap was repositioned over the PRF membrane and secured with interrupted direct loop 3-0 nonresorbable silk sutures. The patient was put on systemic analgesics and antibiotics (500 mg of paracetamol every 6 h and 500 mg of amoxicillin every 8 h for 5 days), along with chlorhexidine digluconate rinses (0.12%) twice daily for 2 weeks. Instructions to continue regular oral hygiene except in the operated area were given. The sutures were removed 1 week after the surgery [Figure 4] and gentle tooth brushing with a soft toothbrush using Charter's method was initiated. Oral hygiene instructions were reinforced.

Surgical re-entry was performed after 6 months [Figure 5]. A mini-mucoperiosteal flap was raised after giving crevicular incision. The furcation area was reassessed clinically with the help of Q2N Naber's probe to assess the bone fill [Figures 3d and 6]. Healing was uneventful and at 6 months of follow-up, there was substantial defect fill in the furcation

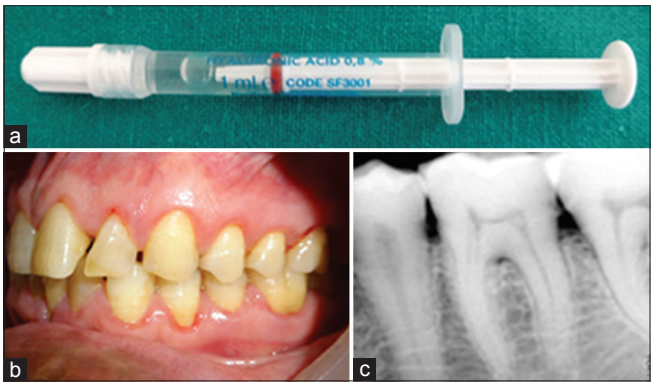


**Figure 1:** (a) Gengigel® (0.8% Hyaluronic acid, Ricerfarma, Milano, Italy). (b) Miller's Class I gingival recession in mandibular left first molar region. (c) Radiovisiographic examination showing radiolucency in the mandibular left first molar furcation area


**Figure 2:** (a) Crevicular incision. (b) Exposure of defect site after debridement. (c) Intra-operative furcation defect measurement using Q2N Naber's probe having horizontal dimension ~ 3 mm (grade II furcation). (d) Application of Gengigel® (0.8% Hyaluronic acid) in the defect site

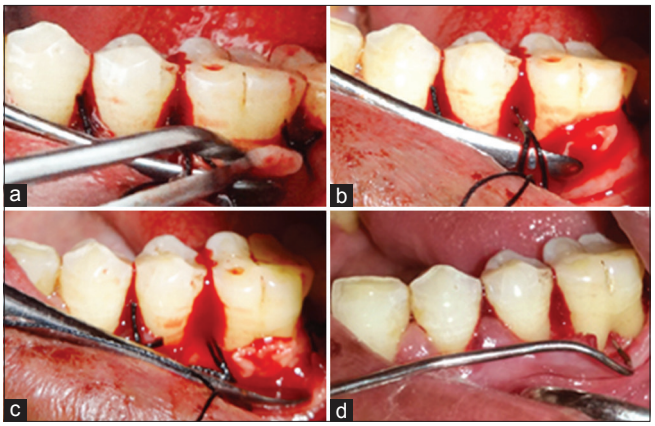


**Figure 3:** (a and b) Placement of Platelet-rich fibrin in the defect site after presuturing. (c) Placement of Platelet-rich fibrin membrane. (d) Six months postoperative furcation defect assessment through surgical re-entry using Q2N Naber's probe showing residual horizontal dimension of <1 mm

area with a residual horizontal dimension of <1 mm at 6 months, representing a significant percentage of bone formation [Figure 3d, Figures 6 and 7].

## Discussion

Hyaluronan provides a structural framework by interacting with the fibrin clot, which facilitates extracellular matrix cell infiltration into the inflamed site. It also induces the production of a series of pro-inflammatory cytokines by fibroblasts, keratinocytes, cementoblasts, and osteoblasts, which promote the inflammatory response. It is further involved in the functional activation of inflammatory cells, such as polymorphonuclear leukocytes and macrophages. During granulation phase, hyaluronan promotes cell proliferation and migration of matrix cells into granulation tissue matrix leading to its organization. In the later stage of the granulation phase, hyaluronan synthesis ceases and existing hyaluronan is depolymerized by hyaluronidases resulting in the formation of lower molecular weight hyaluronan molecules, which promote angiogenesis in the wound site.[4] It also accelerates bone regeneration by chemotaxis, proliferation, and differentiation of mesenchymal cells into osteoblasts and is osteoinductive in nature.[5]

PRF, on the other hand, has been used to fill the defect and the remainder as a GTR membrane after squeezing the fluids to cover the defect. PRF organizes as a dense fibrin scaffold for migration of stem cells and exhibits slow release of growth factors (transforming growth factor-1β, platelet-derived growth factor-AB, vascular endothelial growth factor) and glycoproteins (thrombospondin-1), which modulate the regeneration process, resulting in the formation of new cementum, periodontal ligament, and alveolar bone.[6] The ability to use PRF as a GTR membrane is an added advantage.

To the best of our knowledge, no study was found to use Gengigel® in conjunction with PRF in the treatment of furcation. The postoperative bone fill was examined through surgical re-entry in this case report, to assess the horizontal component of defect fill after 6 months, and obvious bone formation was noticed. This is in accordance with a study by Ballini *et al*., who found that autologous bone combined

**Figure 4:** One week postoperative

**Figure 5:** Six months postoperative follow-up

**Figure 6:** Surgical re-entry probing at 6 months follow-up

**Figure 7:** Six months follow-up radiograph

with an esterified low-molecular HA preparation is capable of accelerating new bone formation in the infra-bone defects.[7] Fawzy El-Sayed *et al.*, in a randomized controlled trial evaluated the effect of local application of 0.8% Hyaluronan gel in conjunction with periodontal surgery and noted statistically significant differences in clinical attachment level ($P < 0.05$) in favor of the test sites though nonsignificant results were obtained regarding probing depth.[8]

Conversely, Kanakamedala *et al*. have successfully treated a mandibular grade II furcation defect with PRF and bone graft.[9] Bajaj *et al*. have also demonstrated significantly more grade II furcation closure rates than traditional open flap instrumentation with the use of autologous PRF or PRP.[10] These studies, therefore, support the fact that the combined use of Gengigel® in conjunction with PRF seems to have an added benefit in the regeneration of Class II furcation, as described in this case report.

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### Conflicts of interest

There are no conflicts of interest.

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