Effect of Platelet-rich Fibrin on Healing of Apicomarginal Defects: A Randomized Controlled Trial

Meenu Dhiman, BDS, Suresh Kumar, MDS, Jigyasa Duhan, MDS, Pankaj Sangwan, MDS, and Sanjay Tewari, MDS

Abstract

Introduction: The purpose of this prospective, randomized controlled trial was to evaluate the healing outcomes of platelet-rich fibrin (PRF) in periapical surgeries involving apicomarginal defects and to compare these results with surgeries not using any guided tissue regeneration techniques. **Methods:** Thirty patients with suppurative chronic apical periodontitis and apicomarginal communication were randomly assigned to either the PRF or the control group. Clinical and radiographic parameters including pocket depth (PD), clinical attachment level, gingival marginal position, size of periapical lesion, and percentage reduction of the periapical radiolucency were recorded at baseline and at an interval of 3 months for a period of 12 months. **Results:** The overall success rate was 83.33%, with a success rate of 86.66% (13 of 15 teeth) for PRF group and 80% (12 of 15 teeth) for control group. Both the groups exhibited a significant reduction in PD, clinical attachment level, gingival marginal position, and size of periapical lesion at 12-month period. No significant differences were observed between the 2 groups for these parameters except PD, which showed a statistically significant reduction in the PRF group ($P < .05$). **Conclusions:** The adjunctive use of regenerative techniques may not promote healing of apicomarginal defects of endodontic origin. *(J Endod 2015;41:985–991)*

Key Words

Apicomarginal communication, guided tissue regeneration, periradicular surgery, platelet rich fibrin, success rate

From the Department of Conservative Dentistry and Endodontics, Post Graduate Institute of Dental Sciences, Rohtak, Haryana, India.

Address requests for reprints to Dr Jigyasa Duhan, Post Graduate Institute of Dental Sciences, Rohtak, Haryana 124001, India. E-mail address: prashitiduhan@rediffmail.com

0099-2399/$ - see front matter

http://dx.doi.org/10.1016/j.joen.2015.04.004

Apicomarginal defects are periradicular lesions accompanied by a periodontal breakdown with a reported incidence of 3.56% (1) to 20% (2). These defects are associated with relatively lower success rates after endodontic surgery (3, 4). Apical migration of junctional epithelium has been attributed to be an important factor in lower success of apical surgeries for these defects (5).

Recently, the use of autologous products has been preferred over the traditional practice of using guided tissue regeneration (GTR) barrier membranes for the treatment of apicomarginal defects (6). Platelet-rich plasma (PRP), a first-generation platelet concentrate, has emerged as an alternative to GTR membrane, with a comparable success rate (7, 8). Goyal et al (9) reported a significant percentage reduction of the periapical rarefaction, pocket depth (PD) reduction, and gain of attachment level by using PRP for treating apicomarginal defects. However, the need for biomodification with an anticoagulant, time taking procedure, and use of bovine thrombin/calcium chloride for activation are some of the disadvantages that limit its use (10).

Recently developed second-generation platelet concentrate, platelet-rich fibrin (PRF), is being suggested as a better alternative to PRP. PRF is a strictly autologous, slowly polymerized, high-density cicatricial fibrin network with an intimate assembly of cytokines, glycan chains, and structural glycoproteins (11). PRF acts as an immune regulation node and promotes wound healing via various growth factors such as platelet-derived growth factor-$\beta\beta$, transforming growth factor β-1, vascular endothelial growth factor, and insulin-like growth factor-1 and inflammatory cytokines such as interleukin 1β, interleukin 6, interleukin 4, and tumor necrosis factor-α (11). Compared with PRP, PRF has fewer chances of cytotoxicity, immunogenicity, and cross-reactivity. It can be instantly obtained as a fibrin membrane with a rather simplified and inexpensive procedure without the need of any biochemical manipulation (12). PRF releases a relatively constant concentration of growth factors and matrix proteins (thrombospondin-1, fibronectin, vitronectin) during a period of $\geq$7 days (13) and is linked to enhanced expression of alkaline phosphatase (highest at day 14), thereby exerting a stronger long-term stimulatory effect on osteoblasts (14) in contrast to PRP.

Application of PRF in plastic surgery (15) and oral and maxillofacial surgeries (16) has shown promising results. Moreover, PRF as a regenerative material has been found to be beneficial in the treatment of intrabony and furcation defects (17–19). However, no study has investigated the efficacy of PRF membrane in endodontic surgeries involving apicomarginal defects. Therefore, the purpose of this prospective, double-blind, randomized controlled trial was to evaluate the healing of apicomarginal defects after endodontic surgery by using PRF and also to compare the healing outcomes of PRF with surgeries not using any GTR technique in such lesions.

Materials and Methods

The study was conducted in the Department of Conservative Dentistry and Endodontics, Post Graduate Institute of Dental Sciences, Rohtak, India, and subjects were recruited between May 2011 and December 2013. The study protocol was approved by the Ethical Committee (ECR/495/Inst/HR/2013), Post Graduate Institute of Dental Sciences, Rohtak, India and accords well with the principles embodied in the Declaration of Helsinki 1975, as revised in 2000.

Subject Enrollment and Inclusion/Exclusion Criteria

Subjects were selected from the pool of patients referred for periradicular surgery with diagnosis of suppurative chronic apical periodontitis and apicomarginal communication (Fig. 1). Eligibility criteria included patients with a deep narrow pocket with probing depth >6 mm confined to buccal aspect of the root, negative response to vitality tests, radiographic evidence of radiolucency, failed previous root canal treatment and retreatment at least 1 year previously, previous surgery with unresolved bony lesion, recurrent episodes of purulent discharge, and adequate final restoration with no clinical evidence of coronal leakage. Chronic generalized periodontitis, any systemic disease contraindicating oral surgical procedures, evidence of root fracture, and resorptive processes involving more than apical third of the root were regarded as exclusion criteria. Informed consent was acquired from all participants after carefully explaining the possible risks and benefits.

Sample Size Calculation

The anticipated success rate for PRF was expected to be 80% (9), and that of control group was expected to be 27% (3). A power calculation that was based on the data suggested that a sample size with 14 patients in each group would have an 80% power of detecting differences between treatments (alpha at the 5% level and effect size of 1.06).

Preoperative Procedures and Primary Outcome Measurements

All eligible patients were given careful instructions regarding proper oral hygiene measures and were subjected to a series of professional plaque control. Occlusal adjustments were done if a traumatic occlusion was noticed. Patients were recalled for baseline examination 1 week after this initial therapy. All preoperative clinical periodontal measurements including PD, clinical attachment level (CAL), and gingival margin position (GMP) were recorded. As a reference for CAL and GMP, the cementoenamel junction or the apical borders of restorations when cementoenamel junction was not visible were used. Clinical parameters were measured circumferentially around the tooth (to the nearest millimeter) by using William's periodontal probe. Defects involving the proximal root surface were excluded. Only the deepest measurements were recorded.

Radiographic examination was performed at 0, 3, 6, 9, and 12 months by using Rinn (XCP Instruments, Elgin, IL) paralleling technique and digitized by using Kodak RVG 6000 (Kodak Digital Radiography System, Pt Husada Intra Care, Banten, Indonesia). A customized jig was prepared by using addition of silicone putty and preserved for future radiographic references.

Randomization

Randomization was developed to eliminate any bias on the part of the investigator and to balance the number of patients between the

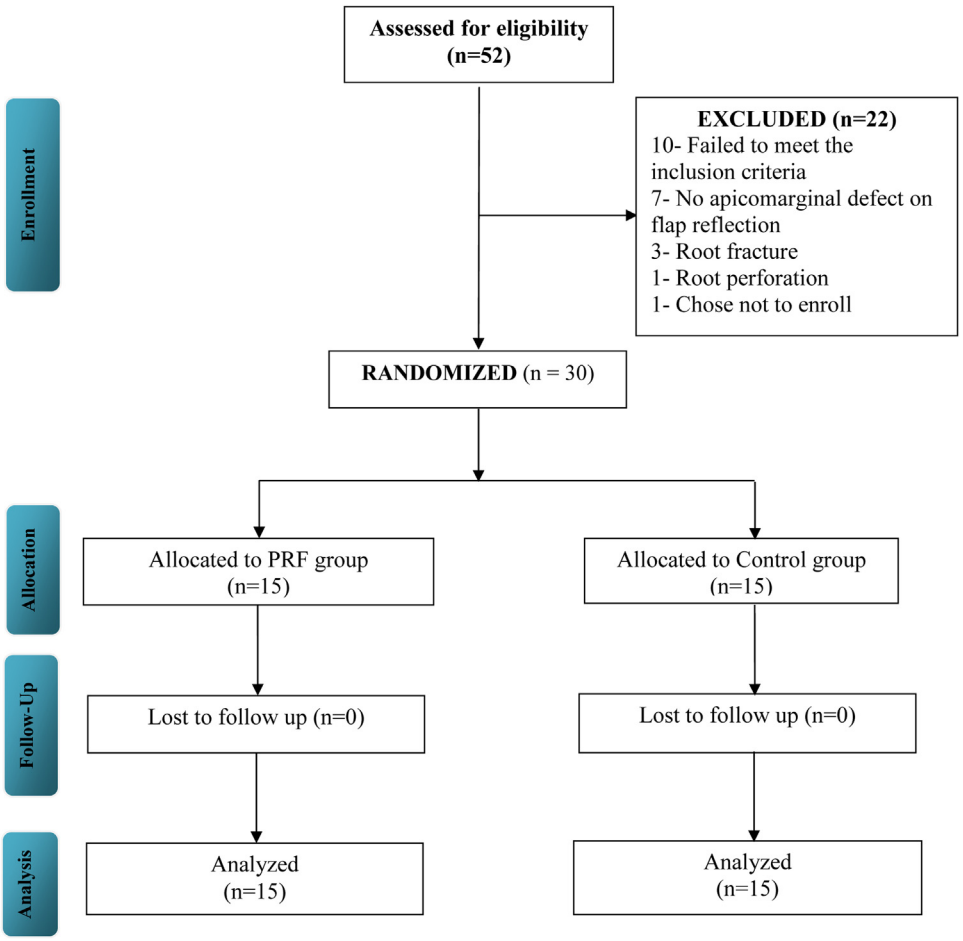

Figure 1. A CONSORT diagram showing the flow of participants through each stage of trial.