



Process for PRF

Abstracts

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The heat-compression technique for the conversion of platelet-rich fibrin preparation to a barrier membrane with a reduced rate of biodegradation.

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Abstract

Platelet-rich fibrin (PRF) was developed as an advanced form of platelet-rich plasma to eliminate xenofactors, such as bovine thrombin, and it is mainly used as a source of growth factor for tissue regeneration. Furthermore, although a minor application, PRF in a compressed membrane-like form has also been used as a substitute for commercially available barrier membranes in guided-tissue regeneration (GTR) treatment. However, the PRF membrane is resorbed within 2 weeks or less at implantation sites; therefore, it can barely maintain sufficient space for bone regeneration. In this study, we developed and optimized a heat-compression technique and tested the feasibility of the resulting PRF membrane. Freshly prepared human PRF was first compressed with dry gauze and subsequently with a hot iron. Biodegradability was microscopically examined in vitro by treatment with plasmin at 37°C or in vivo by subcutaneous implantation in nude mice. Compared with the control gauze-compressed PRF, the heat-compressed PRF appeared plasmin-resistant and remained stable for longer than 10 days in vitro. Additionally, in animal implantation studies, the heat-compressed PRF was observed at least for 3 weeks postimplantation in vivo whereas the control PRF was completely resorbed within 2 weeks. Therefore, these findings suggest that the heat-compression technique reduces the rate of biodegradation of the PRF membrane without sacrificing its biocompatibility and that the heat-compressed PRF membrane easily could be prepared at chair-side and applied as a barrier membrane in the GTR treatment.

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Leucocyte-rich and platelet-rich fibrin for the treatment of bisphosphonate-related osteonecrosis of the jaw: a prospective feasibility study.

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Abstract

Our aim was to assess the feasibility of using leucocyte-rich and platelet-rich fibrin (L-PRF) for the treatment of bisphosphonate-related osteonecrosis of the jaw (BRONJ) in a single group study. After treatment with L-PRF, the response of each patient was recorded 1 month and 4 months postoperatively. Further assessments were made of the site, stage, concentration of c-terminal crosslinked telopeptide of type 1 collagen, and actinomycosis. Among the total of 34 patients, 26 (77%) showed complete resolution, 6 (18%) had delayed resolution, and 2 (6%) showed no resolution. There was a significant association between the response to treatment and the stage of BRONJ ($p=0.002$) but no other significant associations were detected. This study has shown that it is feasible to use L-PRF for the treatment of BRONJ, but the effectiveness cannot be judged with this study design. Randomised prospective trials are needed to confirm this.

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Additive effect of autologous platelet concentrates in treatment of intrabony defects: a systematic review and meta-analysis.

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Abstract

The aim of the present review is to systematically evaluate the additive effect of autologous platelet concentrates (APCs) in treatment of intrabony defects when used along with other regenerative procedures and when used alone in terms of clinical and radiological outcomes. A search was performed in electronic databases (i.e., MEDLINE and the Cochrane Central Register of Controlled Trials) in order to identify randomized clinical trials (RCTs) assessing the additive efficacy of APCs for healing and regeneration of hard and soft tissues in patients undergoing regenerative surgical procedures for the treatment of intrabony defects, having a follow-up of at least 9 months. Included studies underwent risk of bias assessment and data extraction. The main variables evaluated for efficacy were: pocket depth (PD), clinical attachment level (CAL), radiographic bone filling, and postoperative pain. The effect of APCs adjunct was evaluated for the following procedures: open flap debridement (OFD) alone, OFD plus grafting of the defect with autogenous bone or bone substitutes, and grafting in combination with a covering membrane for guided tissue regeneration (GTR). Platelet-rich fibrin (PRF) has a significant additive effect when used along with OFD. Platelet-rich plasma (PRP) has a significant additive effect when used along with bone grafts. Conversely, PRP was found to be ineffective when used in combination with GTR procedures. No study evaluated the effect of APCs on postoperative pain. Platelet-rich plasma may be used advantageously as an adjunct to grafting materials, but not in combination with GTR, for treatment of intrabony defects. Moreover, PRF can be effective as a sole regenerative material, in combination with OFD. There is still a lack of evidence regarding the effect of PRF in combination with grafting materials and GTR, the effect of other types of APCs such as plasma rich in growth factors, and the effect of APCs on postoperative pain.

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Treatment of Refractory Apical Peri-implantitis: A Case Report.

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Abstract

Abstract An implant periapical lesion (IPL) is an infectious-inflammatory alteration surrounding an implant apex, and can be caused by a number of situations. The diagnosis is based on the clinical manifestations and radiological findings. A 42-year-old female patient underwent the placement of a screw-shaped titanium dental implant in the anterior region of the left maxilla. Six months after implant insertion, the patient presented with a persistent pain resistant to medications and a fistula was present at the apical region in the clinical intraoral examination. Presence of lesion was confirmed by radiographic images. In the present study, alone surgical debridement with regenerative treatment could not achieve resolution of the lesion. Due to the refractory infection, a surgical approach with apical resection of the affected implant that supported with regenerative treatment combined with platelet rich fibrin is suggested. Our experience was that partially resected oral implants remain osseointegrated and also function well clinically.

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Platelet-rich preparations to improve healing. Part II: platelet activation and enrichment, leukocyte inclusion, and other selection criteria.

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Abstract

Multiple platelet-rich preparations have been reported to improve wound and bone healing, such as platelet-rich plasma (PRP) and platelet rich fibrin (PRF). The different methods employed during their preparation are important, as they influence the quality of the product applied to a wound or surgical site. Besides the general protocol for preparing the platelet-rich product (discussed in Part 1 of this review), multiple choices need to be considered during its preparation. For example, activation of the platelets is required for the release and enrichment of growth factors, but the method of activation may influence the resulting matrix, growth factor availability, and healing. Additionally, some methods enrich leukocytes as well as platelets, but others are designed to be leukocyte-poor. Leukocytes have many important roles in healing and their inclusion in PRP results in increased platelet concentrations. Platelet and growth factor enrichment reported for the different types of platelet-rich preparations are also compared. Generally, TGF- β 1 and PDGF levels were higher in preparations that contain leukocytes compared to leukocyte-poor PRP. However, platelet concentration may be the most reliable criterion for comparing different preparations. These and other criteria are described to help guide dental and medical professionals, in large and small practices, in selecting the best procedures for their patients. The healing benefits of platelet-rich preparations along with the low risk and availability of simple preparation procedures should encourage more clinicians to incorporate platelet-rich products in their practice to accelerate healing, reduce adverse events, and improve patient outcomes.

KEYWORDS:

bovine thrombin; growth factors; leukocytes; platelet activation; platelet-rich plasma; wound healing

PMID: 25106017 [PubMed - indexed for MEDLINE]

The combination use of platelet-rich fibrin and treated dentin matrix for tooth root regeneration by cell homing.

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Abstract

Endogenous regeneration through cell homing provides an alternative approach for tissue regeneration, except cell transplantation, especially considering clinical translation. However, tooth root regeneration through cell homing remains a provocative approach in need of intensive study. Both platelet-rich fibrin (PRF) and treated dentin matrix (TDM) are warehouses of various growth factors, which can promote cell homing. We hypothesized that endogenous stem cells are able to sense biological cues from PRF membrane and TDM, and contribute to the regeneration of tooth root, including soft and hard periodontal tissues. Therefore, the biological effects of canine PRF and TDM on periodontal ligament stem cells (PDLSCs) and bone marrow mesenchymal stem cells (BMSCs) were evaluated respectively in vitro. Beagle dogs were used as orthotopic transplantation model. It was found that PRF significantly recruited and stimulated the proliferation of PDLSCs and BMSCs in vitro. Together, PRF and TDM induced cell differentiation by upregulating the mineralization-related gene expression of bone sialoprotein (BSP) and osteopontin (OPN) after 7 days coculture. In vivo, transplantation of autologous PRF and allogeneic TDM into fresh tooth extraction socket achieved successful root regeneration 3 months postsurgery, characterized by the regeneration of cementum and periodontal ligament (PDL)-like tissues with orientated fibers, indicative of functional restoration. The results suggest that tooth root connected to the alveolar bone by cementum-PDL complex can be regenerated through the implantation of PRF and TDM in a tooth socket microenvironment, probably by homing of BMSCs and PDLSCs. Furthermore, bioactive cues and inductive microenvironment are key factors for endogenous regeneration. This approach provides a tangible pathway toward clinical translation.

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Advanced platelet-rich fibrin: a new concept for cell-based tissue engineering by means of inflammatory cells.

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Abstract

Choukroun's platelet-rich fibrin (PRF) is obtained from blood without adding anticoagulants. In this study, protocols for standard platelet-rich fibrin (S-PRF) (2700 rpm, 12 minutes) and advanced platelet-rich fibrin (A-PRF) (1500 rpm, 14 minutes) were compared to establish by histological cell detection and histomorphometrical measurement of cell distribution the effects of the centrifugal force (speed and time) on the distribution of cells relevant for wound healing and tissue regeneration. Immunohistochemistry for monocytes, T and B -lymphocytes, neutrophilic granulocytes, CD34-positive stem cells, and platelets was performed on clots produced from four different human donors. Platelets were detected throughout the clot in both groups, although in the A-PRF group, more platelets were found in the distal part, away from the buffy coat (BC). T- and B-lymphocytes, stem cells, and monocytes were detected in the surroundings of the BC in both groups. Decreasing the rpm while increasing the centrifugation time in the A-PRF group gave an enhanced presence of neutrophilic granulocytes in the distal part of the clot. In the S-PRF group, neutrophils were found mostly at the red blood cell (RBC)-BC interface. Neutrophilic granulocytes contribute to monocyte differentiation into macrophages. Accordingly, a higher presence of these cells might be able to influence the differentiation of host macrophages and macrophages within the clot after implantation. Thus, A-PRF might influence bone and soft tissue regeneration, especially through the presence of monocytes/macrophages and their growth factors. The relevance and feasibility of this tissue-engineering concept have to be proven through in vivo studies.

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Effect of platelet-rich fibrin on frequency of alveolar osteitis following mandibular third molar surgery: a double-blinded randomized clinical trial.

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Abstract

PURPOSE:

To evaluate the effectiveness of platelet-rich fibrin (PRF) in preventing the development of alveolar osteitis (AO).

MATERIALS AND METHODS:

In a double-blinded study, patients with bilateral impacted mandibular third molars underwent surgical extractions, with one socket receiving PRF and the other one serving as a control. The surgeon and patient were unaware of the study or control side. The predictor variable was the PRF application and was categorized as PRF and non-PRF. The outcome variable was the development of AO during the first postoperative week. Other study variables included age, gender, smoking status, irrigation volume, extraction difficulty, surgeon experience, and number of anesthetic cartridges. Data were analyzed using χ^2 and t tests, with the significance level set at a P value less than .05.

RESULTS:

Seventy-eight patients (mean age, 25 yr) underwent 156 impacted third molar surgeries. The overall frequency of AO was 14.74% for all surgeries. The frequency of AO in the PRF group was significantly lower than in the non-PRF group (odds ratio = 0.44; $P < .05$).

CONCLUSION:

Based on the results of the present study, PRF application may decrease the risk of AO development after mandibular third molar surgery.

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Direct implantation versus platelet-rich fibrin-embedded adipose-derived mesenchymal stem cells in treating rat acute myocardial infarction.

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Abstract

BACKGROUND:

This study tested whether adipose-derived mesenchymal stem cells (ADMSC) embedded in platelet-rich fibrin (PRF) scaffold is superior to direct ADMSC implantation in improving left ventricular (LV) performance and reducing LV remodeling in a rat acute myocardial infarction (AMI) model of left anterior descending coronary artery (LAD) ligation.

METHODS:

Twenty-eight male adult Sprague Dawley rats equally divided into group 1 [sham control], group 2 (AMI only), group 3 (AMI+direct ADMSC implantation), and group 4 (AMI+PRF-embedded autologous ADMSC) were sacrificed on day 42 after AMI.

RESULTS:

LV systolic and diastolic dimensions and volumes, and infarct/fibrotic areas were highest in group 2, lowest in group 1 and significantly higher in group 3 than in group 4, whereas LV performance and LV fractional shortening exhibited a reversed pattern ($p < 0.005$). Protein expressions of inflammation (oxidative stress, IL-1 β , MMP-9), apoptosis (mitochondrial Bax, cleaved PARP), fibrosis (Smad3, TGF- β), and pressure-overload biomarkers (BNP, MHC- β) displayed a pattern similar to that of LV dimensions, whereas anti-inflammatory (IL-10), anti-apoptotic (Bcl-2), and anti-fibrotic (Smad1/5, BMP-2) indices showed a pattern similar to that of LV performance among the four groups (all $p < 0.05$). Angiogenesis biomarkers at protein (CXCR4, SDF-1 α , VEGF), cellular (CD31+, CXCR4+, SDF-1 α), and immunohistochemical (small vessels) levels, and cardiac stem cell markers (C-kit+, Sca-1+) in infarct myocardium were highest in group 4, lowest in group 1, and significantly higher in group 3 than in group 2 (all $p < 0.005$).

CONCLUSION:

PRF-embedded ADMSC is superior to direct ADMSC implantation in preserving LV function and attenuating LV remodeling.

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Platelet rich fibrin and alloplast in the treatment of intrabony defect.

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Abstract

Periodontal regeneration is defined as the reproduction or reconstitution of a lost or injured part to restore the architecture and function of the periodontium. The ultimate goal of periodontal therapy is to regenerate the lost periodontal tissues caused by periodontitis. The most positive outcome of periodontal regenerative procedures in intra bony defect has been achieved with bone grafts. For complete regeneration, delivery of growth factors in a local environment holds a great deal in adjunct to bone grafts. Platelet rich fibrin (PRF) is considered as second generation platelet concentrate, consisting of viable platelets, releasing various growth factors. Hence, this case report aims to investigate the clinical and radiological (bone fill) effectiveness of autologous PRF along with the use of alloplastic bone mineral in the treatment of intra bony defects.

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PMCID: PMC3983743 [Free PMC Article](#)



[Compend Contin Educ Dent.](#) 2014 Mar;35(3):192-8.

Guided bone regeneration (GBR) using cortical bone pins in combination with leukocyte- and platelet-rich fibrin (L-PRF).

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Abstract

Two of the fundamental requisites for guided bone regeneration (GBR) are space maintenance and primary soft-tissue closure. Allogeneic cortical bone pins measuring 2 mm in diameter in customized lengths can protect surrounding graft materials, support bioresorbable membrane barriers, and resist wound compression from the overlying soft tissues. In addition, a second-generation platelet concentrate, leukocyte- and platelet-rich fibrin (L-PRF), may be incorporated into the augmentation procedure to provide multiple growth factors, accelerate wound healing, and aid in the maintenance of primary closure over the grafted materials. Highlighting two case reports, this article features a GBR technique that uses bone pins in combination with L-PRF membranes to provide both horizontal and vertical ridge augmentation at severely compromised implant sites.

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Use of platelet-rich fibrin as an autologous biologic rejuvenating media for avulsed teeth - an in vitro study.

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Author information

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Abstract

AIM:

The prognosis of replanted avulsed tooth depends on the existence of viable cells in the periodontal ligament and also on those cells which are able to proliferate on the damaged areas of the root. The purpose of this study was to evaluate the survival of periodontal ligament cells (PDL) when soaked in an autologous biologic rejuvenating media after an extra-oral dry time of 40 min.

METHOD:

Thirty teeth were selected with intact crown which were advised for Orthodontic extraction having healthy PDL. They were divided into two experimental and two control groups. The positive and negative controls corresponded to 0-min and 1-h dry time, respectively. The experimental teeth were stored dry for 40 min and then immersed in one of the two media, combination of platelet-rich fibrin and platelet poor plasma (PRF+PPP) and PPP for 45 min. The teeth in each group were treated with dispase II and collagenase for 30 min and later centrifuged for 5 min at 50.17 g. The supernatant was removed with sterile micropipette, the cells labelled with 0.4% trypan blue, and the number of viable PDL cells was counted with a haemocytometer, under a light microscope.

RESULTS:

anova and Mann-Whitney U-test demonstrated statistically significant differences in the viability of PDL cells among experimental groups.

CONCLUSION:

Within the parameters of this study, a combination of platelet-rich fibrin and PPP demonstrated higher number of viable PDL cells and hence could be a good biologic rejuvenating media for avulsed teeth.

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Effect of autologous platelet rich fibrin on the healing of experimental articular cartilage defects of the knee in an animal model.

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Abstract

The effect of autologous platelet rich fibrin (PRF), a second generation platelet product, on the healing of experimental articular cartilage lesions was evaluated in an animal model. Full thickness cartilage lesions with a diameter of 6 mm and depth of 5 mm were created in the weight bearing area of femoral condyles of both hind limbs in 12 adult mixed breed dogs. Defects in the left hind limb of each dog were repaired by PRF implantation whereas those in the right hind limb were left empty. The animals were euthanized at 4, 16, and 24 weeks following surgery and the resultant repair tissue was investigated macroscopically and microscopically. The results of macroscopic and histological evaluations indicated that there were significant differences between the PRF treated and untreated defects. In conclusion, the present study indicated that the use of platelet rich fibrin as a source of autologous growth factors leads to improvement in articular cartilage repair.

PMID: 25028656 [PubMed - indexed for MEDLINE]

PMCID: PMC4083211 [Free PMC Article](#)

Lyophilized platelet-rich fibrin (PRF) promotes craniofacial bone regeneration through Runx2.

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Abstract

Freeze-drying is an effective means to control scaffold pore size and preserve its composition. The purpose of the present study was to determine the applicability of lyophilized Platelet-rich fibrin (LPRF) as a scaffold for craniofacial tissue regeneration and to compare its biological effects with commonly used fresh Platelet-rich fibrin (PRF). LPRF caused a 4.8-fold \pm 0.4-fold elevation in Runt-related transcription factor 2 (Runx2) expression in alveolar bone cells, compared to a 3.6-fold \pm 0.2-fold increase when using fresh PRF, and a more than 10-fold rise of alkaline phosphatase levels and mineralization markers. LPRF-induced Runx2 expression only occurred in alveolar bone and not in periodontal or dental follicle cells. LPRF also caused a 1.6-fold increase in osteoblast proliferation ($p < 0.001$) when compared to fresh PRF. When applied in a rat craniofacial defect model for six weeks, LPRF resulted in 97% bony coverage of the defect, compared to 84% for fresh PRF, 64% for fibrin, and 16% without scaffold. Moreover, LPRF thickened the trabecular diameter by 25% when compared to fresh PRF and fibrin, and only LPRF and fresh PRF resulted in the formation of interconnected trabeculae across the defect. Together, these studies support the application of lyophilized PRF as a biomimetic scaffold for craniofacial bone regeneration and mineralized tissue engineering.

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PMCID: PMC4057745 [Free PMC Article](#)

Platelet-rich fibrin as an adjunct to palatal wound healing after harvesting a free gingival graft: A case series.

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Abstract

BACKGROUND:

Owing to its stimulatory effect on angiogenesis and epithelialization, platelet-rich fibrin (PRF) is an excellent material for enhancing wound healing. The use of PRF dressings may be a simple and effective method of reducing the morbidity associated with donor sites of autogenous free gingival grafts (FGGs). The purpose of this case series is to document the beneficial role of PRF in the healing of FGG donor sites.

MATERIALS AND METHODS:

A total of 18 patients treated with FGGs could be classified into two groups. PRF was prepared, compressed and used to dress the palatal wound followed by a periodontal pack in one group (10 patients) and only a periodontal pack was used in the other group (8 patients). Post-operative healing was assessed clinically at 7, 14 and 21 days and the morbidity was assessed qualitatively by an interview.

RESULTS:

Sites where PRF was used showed complete wound closure by 14 days and these patients reported lesser post-operative morbidity than patients in whom PRF was not used.

CONCLUSIONS:

PRF as a dressing is an effective method of enhancing the healing of the palatal donor site and consequently reducing the post-operative morbidity.

PMID: 25024559 [PubMed]

PMCID: PMC4095638 [Free PMC Article](#)

Improvement in the repair of defects in maxillofacial soft tissue in irradiated minipigs by a mixture of adipose-derived stem cells and platelet-rich fibrin.

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Abstract

To find out if adipose-derived stem cells (ASC) and platelet-rich fibrin (PRF), alone or combined, had any effect on the repair of maxillofacial soft tissue defects in irradiated minipigs, ASC were isolated, characterised, and expanded. Twenty female minipigs, the right parotid glands of which had been irradiated, were randomly divided into 4 groups of 5 each: those in the first group were injected with both ASC and PRF (combined group), the second group was injected with ASC alone (ASC group), the third group with PRF alone (PRF group), and the fourth group with phosphate buffer saline (PBS) (control group). Six months after the last injection, the size and depth of each defect were assessed, and subcutaneous tissues were harvested, stained with haematoxylin and eosin, and examined immunohistologically and for apoptosis. Expanded cells were successfully isolated and identified. Six months after injection the defects in the 3 treated groups were significantly smaller ($p < 0.001$) and shallower ($p < 0.001$) than those in the control group. Those in the combined group were the smallest and shallowest. Haematoxylin and eosin showed that the 3 treated groups contained more subcutaneous adipose tissue than the control group, and also had significantly greater vascular density ($p < 0.001$) and fewer apoptotic cells ($p < 0.001$). Both ASC and PRF facilitate the repair of defects in maxillofacial soft tissue in irradiated minipigs, and their combined use is more effective than their use as single agents.

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Management of radicular cysts using platelet-rich fibrin and bioactive glass: a report of two cases.

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Abstract

Platelet-rich fibrin (PRF) created by Choukroun's protocol concentrates most platelets and leukocytes from a blood harvest into a single autologous fibrin biomaterial. However, no current data is available concerning the use of PRF for the treatment of periapical lesions. Two cases of radicular cysts were reported using an interdisciplinary approach, including regular endodontic therapy followed by surgical management with PRF and bioactive glass. Two cases of radicular cysts presented as an incidental radiographic finding, appearing as an apical radiolucency with well-circumscribed sclerotic borders. After regular endodontic retreatment, cystic lining/granulation tissues were enucleated and the periradicular bony defect was grafted using PRF and bioactive glass. Then, PRF was applied to serve as a membrane over the grafted defects. Recall periapical radiographs of Case 1 and cone beam computer tomography of Case 2 showed satisfactory healing of the periapical pathosis. In Case 2, the bony defect appeared completely healed at 4 months surgical reentry and the new bone was clinically very dense and mature. The results of these case reports show that the combination of PRF and bioactive glass is an effective modality of regenerative treatment for radicular cysts.

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Platelet-rich fibrin has a healing effect on chemotherapy-induced mucositis in hamsters.

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Abstract

OBJECTIVE:

The aim of this study was to evaluate the healing effect of topically applied platelet-rich fibrin (PRF) on experimental oral mucositis induced by chemotherapy in hamsters.

STUDY DESIGN:

Oral mucositis was induced in 93 Syrian golden hamsters by an intraperitoneal injection of 5-fluorouracil, which was followed by light scratching of the cheek pouch. The hamsters were randomly divided into a PRF group, a fibrin group, and an untreated control group. The recovery stage of oral mucositis was evaluated through daily weighing, measurements of the ulcer area, histopathologic analysis, and a myeloperoxidase activity assay.

RESULTS:

The PRF group exhibited significant improvements in the size and histologic features of the ulcer and in the myeloperoxidase activity compared with the control group ($P < .05$).

CONCLUSIONS:

The current findings suggest the consideration for future clinical trials in humans.

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[Am J Vet Res.](#) 2014 Apr;75(4):392-401. doi: 10.2460/ajvr.75.4.392.

Ultrastructure and growth factor content of equine platelet-rich fibrin gels.

[Textor JA](#)¹, [Murphy KC](#), [Leach JK](#), [Tablin F](#).

Author information

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Erratum in

- Am J Vet Res. 2014 May;75(5):499.

Abstract

OBJECTIVE:

To compare fiber diameter, pore area, compressive stiffness, gelation properties, and selected growth factor content of platelet-rich fibrin gels (PRFGs) and conventional fibrin gels (FGs).

SAMPLE:

PRFGs and conventional FGs prepared from the blood of 10 healthy horses.

PROCEDURES:

Autologous fibrinogen was used to form conventional FGs. The PRFGs were formed from autologous platelet-rich plasma of various platelet concentrations (100×10^3 platelets/ μL , 250×10^3 platelets/ μL , 500×10^3 platelets/ μL , and $1,000 \times 10^3$ platelets/ μL). All gels contained an identical fibrinogen concentration (20 mg/mL). Fiber diameter and pore area were evaluated with scanning electron microscopy. Maximum gelation rate was assessed with spectrophotometry, and gel stiffness was determined by measuring the compressive modulus. Gel weights were measured serially over 14 days as an index of contraction (volume loss). Platelet-derived growth factor-BB and transforming growth factor- β 1 concentrations were quantified with ELISAs.

RESULTS:

Fiber diameters were significantly larger and mean pore areas were significantly smaller in PRFGs than in conventional FGs. Gel weight decreased significantly over time, differed significantly between PRFGs and conventional FGs, and was significantly correlated with platelet concentration. Platelet-derived growth factor-BB and transforming growth factor- β 1 concentrations were highest in gels and releasates derived from $1,000 \times 10^3$ platelets/ μL .

CONCLUSIONS AND CLINICAL RELEVANCE:

The inclusion of platelets in FGs altered the architecture and increased the growth factor content of the resulting scaffold. Platelets may represent a useful means of modifying these gels for applications in veterinary and human regenerative medicine.

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Direct implantation versus platelet-rich fibrin-embedded adipose-derived mesenchymal stem cells in treating rat acute myocardial infarction.

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Abstract

BACKGROUND:

This study tested whether adipose-derived mesenchymal stem cells (ADMSC) embedded in platelet-rich fibrin (PRF) scaffold is superior to direct ADMSC implantation in improving left ventricular (LV) performance and reducing LV remodeling in a rat acute myocardial infarction (AMI) model of left anterior descending coronary artery (LAD) ligation.

METHODS:

Twenty-eight male adult Sprague Dawley rats equally divided into group 1 [sham control], group 2 (AMI only), group 3 (AMI+direct ADMSC implantation), and group 4 (AMI+PRF-embedded autologous ADMSC) were sacrificed on day 42 after AMI.

RESULTS:

LV systolic and diastolic dimensions and volumes, and infarct/fibrotic areas were highest in group 2, lowest in group 1 and significantly higher in group 3 than in group 4, whereas LV performance and LV fractional shortening exhibited a reversed pattern ($p < 0.005$). Protein expressions of inflammation (oxidative stress, IL-1 β , MMP-9), apoptosis (mitochondrial Bax, cleaved PARP), fibrosis (Smad3, TGF- β), and pressure-overload biomarkers (BNP, MHC- β) displayed a pattern similar to that of LV dimensions, whereas anti-inflammatory (IL-10), anti-apoptotic (Bcl-2), and anti-fibrotic (Smad1/5, BMP-2) indices showed a pattern similar to that of LV performance among the four groups (all $p < 0.05$). Angiogenesis biomarkers at protein (CXCR4, SDF-1 α , VEGF), cellular (CD31+, CXCR4+, SDF-1 α), and immunohistochemical (small vessels) levels, and cardiac stem cell markers (C-kit+, Sca-1+) in infarct myocardium were highest in group 4, lowest in group 1, and significantly higher in group 3 than in group 2 (all $p < 0.005$).

CONCLUSION:

PRF-embedded ADMSC is superior to direct ADMSC implantation in preserving LV function and attenuating LV remodeling.

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[Knee Surg Sports Traumatol Arthrosc.](#) 2015 Apr;23(4):1215-21. doi: 10.1007/s00167-014-2949-x. Epub 2014 Mar 21.

Dynamic intraligamentary stabilization: novel technique for preserving the ruptured ACL.

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Abstract

PURPOSE:

Replacement of the torn anterior cruciate ligament (ACL) with a transplant is today's gold standard. A new technique for preserving and healing the torn ACL is presented.

HYPOTHESIS:

a dynamic intraligamentary stabilization (DIS) that provides continuous postinjury stability of the knee and ACL in combination with biological improvement of the healing environment [leucocyte- and platelet-rich fibrin (L-PRF) and microfracturing] should enable biomechanically stable ACL self-healing.

METHODS:

Ten sportive patients were treated by DIS employing an internal stabilizer to keep the unstable knee in a posterior translation, combined with microfracturing and platelet-rich fibrin induction at the rupture site to promote self-healing. Postoperative clinical [Tegner, Lysholm, International Knee Documentation Committee (IKDC), visual analogue scale patient satisfaction score] and radiological evaluation, as well as assessment of knee laxity was performed at 6 weeks, 3, 6, 12, and 24 months.

RESULTS:

One patient had a re-rupture 5 months postoperative and was hence excluded from further follow-ups. The other nine patients presented the following outcomes at 24 months: median Lysholm score of 100; IKDC score of 98 (97-100); median Tegner score of 6 (range 9-5); anterior translation difference of 1.4 mm (-1 to 3 mm); median satisfaction score of 9.8 (9-10). MRI showed scarring and continuity of the ligament in all patients.

CONCLUSIONS:

DIS combined with microfracturing and L-PRF resulted in stable clinical and radiological healing of the torn ACL in all but one patient of this first series. They attained normal knee scores, reported excellent satisfaction and could return to their previous levels of sporting activity.

LEVEL OF EVIDENCE:

Case series with no comparison group, Level IV.

PMID: 24651979 [PubMed - in process]

PMCID: PMC4371814 [Free PMC Article](#)

Properties of biologic scaffolds and their response to mesenchymal stem cells.

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Abstract

PURPOSE:

The purpose of this study was to examine, in vitro, the cellular response of human mesenchymal stem cells (MSCs) to sample types of commercially available scaffolds in comparison with control, native tendon tissue (fresh-frozen rotator cuff tendon allograft).

METHODS:

MSCs were defined by (1) colony-forming potential; (2) ability to differentiate into tendon, cartilage, bone, and fat tissue; and (3) fluorescence-activated cell sorting analysis (CD73, CD90, CD45). Samples were taken from fresh-frozen human rotator cuff tendon (allograft), human highly cross-linked collagen membrane (Arthroflex; LifeNet Health, Virginia Beach, VA), porcine non-cross-linked collagen membrane (Mucograft; Geistlich Pharma, Lucerne, Switzerland), a human platelet-rich fibrin matrix (PRF-M), and a fibrin matrix based on platelet-rich plasma (ViscoGel; Arthrex, Naples, FL). Cells were counted for adhesion (24 hours), thymidine assay for cell proliferation (96 hours), and live/dead stain for viability (168 hours). Histologic analysis was performed after 21 days, and the unloaded scaffolds were scanned with electron microscopy.

RESULTS:

MSCs were successfully differentiated into all cell lines. A significantly greater number of cells adhered to both the non-cross-linked porcine collagen scaffold and PRF-M. Cell activity (proliferation) was significantly higher in the non-cross-linked porcine collagen scaffold compared with PRF-M and fibrin matrix based on platelet-rich plasma. There were no significant differences found in the results of the live/dead assay.

CONCLUSIONS:

Significant differences in the response of human MSCs to biologic scaffolds existed. MSC adhesion, proliferation, and scaffold morphology evaluated by histologic analysis and electron microscopy varied throughout the evaluated types of scaffolds. Non-cross-linked porcine collagen scaffolds showed superior results for cell adhesion and proliferation, as well as on histologic evaluation.

CLINICAL RELEVANCE:

This study enables the clinician and scientist to choose scaffold materials according to their specific interaction with MSCs.

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Comparison of platelet-rich plasma (PRP), platelet-rich fibrin (PRF), and concentrated growth factor (CGF) in rabbit-skull defect healing.

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Abstract

OBJECTIVES:

The objective of this study was to evaluate the effect of platelet-rich plasma (PRP), platelet-rich fibrin (PRF), and concentrated growth factor (CGF) on bone healing.

STUDY DESIGN:

Twelve rabbits were included in this randomized, blinded, prospective study. 15-mm×10-mm-sized defects were created in the parietal bone, filled with PRP, PRF, CGF, and void. The bone mineral density and bone volume were analyzed with microscopic computed tomography (micro-CT) and histomorphometrics at the 6th and 12th week.

RESULTS:

In micro-CT analysis, bone mineral density and bone volume were greater in the experimental group than in controls at both 6th and 12th week, but not among the experimental groups. Similarly, histomorphometric examination revealed that more bone formation was seen in the experimental group.

CONCLUSION:

The addition of PRP, PRF, and CGF had significantly increased bone formation at the 6th week. The effect of PRP, PRF, and CGF was similar and may be useful in the future to increase the success rate of bone grafting.

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Buccal bone deficiency in fresh extraction sockets: a prospective single cohort study.

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Abstract

OBJECTIVE:

The purpose of this prospective single cohort study was to evaluate the use of xenograft and collagen membranes in treating full or partial buccal bone defects of fresh extraction sockets in the esthetic zone.

MATERIALS AND METHODS:

Thirty-three patients requiring tooth extraction in the anterior maxillary area and showing a complete or partial buccal bone plate deficiency (more than 2 mm) were consecutively enrolled and treated. Corticocancellous porcine bone and platelet-rich fibrin (PRF) with a collagen membrane were used to graft the extraction sockets, and the membranes were left exposed to the oral cavity with a secondary soft tissue healing. The outcome variables were as follows: width of keratinized mucosa, facial soft tissue levels, clinical bone changes (measured with a clinical splint), implant and prosthesis failures, and peri-implant marginal bone changes.

RESULTS:

All treated sites allowed the placement of implants; the width of keratinized mucosa at the mid-facial aspect showed an increase of 2.3 mm 5 months after the grafting procedure, and its value was 3.2 ± 0.6 mm at 1-year follow-up. The mean values of the facial soft tissue level indicated an increase over time. The bone level showed an improvement of 0.8 ± 0.1 mm and 0.7 ± 0.1 mm at mesial and distal sites, respectively, when compared to the baseline measurements. Finally, in the palatal area, no bone changes were observed. No implant failed during the entire observation period.

CONCLUSIONS:

Findings from this study showed that xenograft and PRF, used for ridge preservation of the extraction sockets with buccal bone plate dehiscence in the esthetic zone, can be considered effective in repairing bone defects before implant placement. The secondary soft tissue healing over the grafted sockets did not compromise bone formation; moreover, the soft tissue level and the width of keratinized gingiva showed a significant improvement over time.

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KEYWORDS:

alveolar socket; bone augmentation; bone remodeling; platelet-rich fibrin; ridge preservation

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Maxillary sinus grafting with a synthetic, nanocrystalline hydroxyapatite-silica gel in humans: histologic and histomorphometric results.

[Bosshardt DD](#), [Bornstein MM](#), [Carrel JP](#), [Buser D](#), [Bernard JP](#).

Abstract

The aim of this study was to evaluate in humans the amount of new bone after sinus floor elevation with a synthetic bone substitute material consisting of nanocrystalline hydroxyapatite embedded in a highly porous silica gel matrix. The lateral approach was applied in eight patients requiring sinus floor elevation to place dental implants. After elevation of the sinus membrane, the cavities were filled with 0.6-mm granules of nanocrystalline hydroxyapatite mixed with the patient's blood. A collagen membrane (group 1) or a platelet-rich fibrin (PRF) membrane (group 2) was placed over the bony window. After healing periods between 7 and 11 months (in one case after 24 months), 16 biopsy specimens were harvested with a trephine bur during implant bed preparation. The percentage of new bone, residual filler material, and soft tissue was determined histomorphometrically. Four specimens were excluded from the analysis because of incomplete biopsy removal. In all other specimens, new bone was observed in the augmented region. For group 1, the amount of new bone, residual graft material, and soft tissue was $28.7\% \pm 5.4\%$, $25.5\% \pm 7.6\%$, and $45.8\% \pm 3.2\%$, respectively. For group 2, the values were $28.6\% \pm 6.90\%$, $25.7\% \pm 8.8\%$, and $45.7\% \pm 9.3\%$, respectively. All differences between groups 1 and 2 were not statistically significant. The lowest and highest values of new bone were 21.2% and 34.1% for group 1 and 17.4% and 37.8% for group 2, respectively. The amount of new bone after the use of nanocrystalline hydroxyapatite for sinus floor elevation in humans is comparable to values found in the literature for other synthetic or xenogeneic bone substitute materials. There was no additional beneficial effect of the PRF membrane over the non-cross-linked collagen membrane.

PMID: 24600662 [PubMed - in process]

[Surgery](#). 2014 Mar;155(3):434-41. doi: 10.1016/j.surg.2013.09.001. Epub 2013 Oct 29.

Autologous platelet rich fibrin glue for sealing of low-output enterocutaneous fistulas: an observational cohort study.

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Abstract

BACKGROUND:

Glue sealing has become an alternative option for occlusion of enterocutaneous fistula (ECF) because of its minimal invasiveness and simplicity. This study aimed to determine efficacy and safety of autologous, platelet-rich fibrin glue (PRFG) in promoting closure of ECFs.

METHODS:

This was a nonrandomized cohort study, recruiting patients who had low-output ECFs (<200 mL/24 h). Beside standard of care, patients were assigned to either the PRFG or control group. Clinical efficacy and safety were determined prospectively. Moreover, a well-balanced subcohort was generated by propensity score (PS) matching. Unadjusted and adjusted Cox proportional hazard models were employed to determine hazard ratios (HRs) of ECF closure in both cohorts.

RESULTS:

From January 2008 to January 2012, 145 patients were enrolled initially, with 70 in the control group and 75 in the PRFG-treated group. Compared with the control group, patients in the PRFG group had lesser median time of fistula closure (7 vs 23 days; $P = .0010$). In addition, PRFG healed more fistulas within the first 28 days (77% vs 57%; $P = .0127$). For all fistulas included, PRFG-treated fistulas were 3.13 (95% confidence interval [CI], 1.82-5.36) times more likely to achieve closure than those with the non-PRFG approach in the adjusted Cox model. In a PS-matched cohort with 28 paired fistulas, HRs were 3.41 (95% CI, 1.91-6.07) for all fistulas regardless of location. No adverse events related to glue applications were observed.

CONCLUSION:

Autologous PRFG seems to be safe and effective in the treatment of low-output ECFs, and can lessen closure times and promote closure rates.

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PMID: 24183344 [PubMed - indexed for MEDLINE]

[Platelets](#). 2014;25(8):562-6. doi: 10.3109/09537104.2013.856398. Epub 2014 Jan 16.

The bone integration effects of platelet-rich fibrin by removal torque of titanium screw in rabbit tibia.

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Abstract

Platelet-rich fibrin (PRF) is nowadays often used in various fields, but no removal torque studies have yet been done to evaluate the effects of the platelet-rich fibrin on the bone integration at the initial healing period. An experimental study have been performed in rabbits to evaluate whether the complete PRF clots can accelerate the bone integration of implants at the initial healing period after creating bone defects in tibias. The effect of the complete PRF clots on bone integration was studied in two rabbit groups, 4-week group (group A) and 6-week group (group B) after preparing bony defects. Artificial bony defects were prepared in the tibias of rabbits. The complete PRF clots was applied to the defects in the experimental group, whereas the defects were unfilled in the control group. Four weeks later, machined implants were installed into the rabbit tibias (group A). Six weeks after installation, the removal torque from nine rabbits was measured to examine the bone healing effect of PRF. In another rabbits (group B), 6 weeks after preparing bony defects, installation was performed, and another 6 weeks after installation, the removal torque from nine rabbits was measured. The authors found a positive significant effect of the complete PRF clots on bone integration (higher bone density) in group A installed at 4 weeks after preparing bony defects ($p = 0.008$; t-test), but not in group B installed at 6 weeks after preparing bony defects ($p = 0.677$).

KEYWORDS:

Installation; PRF; rabbit tibia; removal torque

PMID: 24433149 [PubMed - in process]

Effect of platelet rich fibrin and beta tricalcium phosphate on bone healing. A histological study in pigs.

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Abstract

PURPOSE:

To investigate the effect of platelet rich fibrin (PRF) and beta tricalcium phosphate (β -TCP), alone or in combination, on bone regeneration in pig tibial defects.

METHODS:

Four standardized defects were prepared in both tibiae of three adult male pigs. The first defect was left unfilled as a control; the others were grafted with either PRF, β -TCP or PRF mixed with β -TCP. All animals were sacrificed on the 12th postoperative week and the tibial bones were removed, histologic sections were prepared and the experimental sites were examined microscopically and stereologically.

RESULTS:

Histologic and stereologic examination revealed more new bone formation in the defects filled with PRF mixed β -TCP than in the defects grafted with either β -TCP or PRF alone.

CONCLUSION:

The platelet rich fibrin and beta tricalcium phosphate combination effectively induces new bone formation.

PMID: 24474179 [PubMed - indexed for MEDLINE] **Free full text**



[J Indian Soc Periodontol.](#) 2013 Nov;17(6):801-5. doi: 10.4103/0972-124X.124525.

Lateral sliding bridge flap technique along with platelet rich fibrin and guided tissue regeneration for root coverage.

[Agarwal K¹](#), [Chandra C²](#), [Agarwal K²](#), [Kumar N³](#).

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Abstract

Gingival recession is defined as the apical migration of the gingival margin with exposure of root surfaces. The etiology of the condition is multifactorial. Given the high rate of gingival recession defects among the general population, it is imperative that dental practitioners have an understanding of the etiology, complications and management of the condition. A recent innovation in dentistry is the preparation and use of platelet-rich fibrin (PRF) for recession defects. The article presents a case report, which highlights the use of lateral sliding bridge flap along with PRF in a collagen membrane carrier (guided tissue regeneration) for the treatment of multiple recession defects.

PMID: 24554895 [PubMed]

PMCID: PMC3917215 [Free PMC Article](#)



[J Conserv Dent.](#) 2014 Jan;17(1):75-9. doi: 10.4103/0972-0707.124156.

An innovative approach in the management of palatogingival groove using Biodentine™ and platelet-rich fibrin membrane.

[Johns DA](#)¹, [Shivashankar VY](#)¹, [Shobha K](#)², [Johns M](#)³.

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- ³Department of Prosthodontics, KVG College, Sullia, Karnataka, India.

Abstract

Palatogingival groove is an anatomical malformation that often causes severe periodontal defects. Treatments of such an anomaly present a clinical challenge to the operator. Careful endodontic and periodontal procedures may restore the form and function. In the present case; root canal therapy, apicectomy, and sealing of the groove with Biodentine™ were done. Bone graft was placed followed by platelet-rich fibrin (PRF) membrane. This treatment modality resulted in gain in attachment, reduction in pocket depth, and deposition of bone in the osseous defect. A 24 month follow-up is included.

PMID: 24554867 [PubMed]

PMCID: PMC3915392 [Free PMC Article](#)

The influence of platelet-rich fibrin on angiogenesis in guided bone regeneration using xenogenic bone substitutes: a study of rabbit cranial defects.

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Abstract

PURPOSE:

The purpose of this study was to investigate the influence of platelet-rich fibrin (PRF) on angiogenesis and osteogenesis in guided bone regeneration (GBR) using xenogenic bone in rabbit cranial defects.

MATERIALS AND METHODS:

In each rabbit, 2 circular bone defects, one on either side of the midline, were prepared using a reamer drill. Each of the experimental sites received bovine bone with PRF, and each of the control sites received bovine bone alone. The animals were sacrificed at 1 week (n = 4), 2 weeks (n = 3) and 4 weeks (n = 3). Biopsy samples were examined histomorphometrically by light microscopy, and expression of vascular endothelial growth factor (VEGF) was determined by immunohistochemical staining.

RESULTS:

At all experimental time points, immunostaining intensity for VEGF was consistently higher in the experimental group than in the control group. However, the differences between the control group and the experimental group were not statistically significant in the histomorphometrical and immunohistochemical examinations.

CONCLUSIONS:

The results of this study suggest that PRF may increase the number of marrow cells. However, PRF along with xenogenic bone substitutes does not show a significant effect on bony regeneration. Further large-scale studies are needed to confirm our results.

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PMID: 24530076 [PubMed - in process]



[J Oral Maxillofac Surg.](#) 2014 Feb;72(2):322-6. doi: 10.1016/j.joms.2013.07.027. Epub 2013 Sep 25.

Management of bisphosphonate-related osteonecrosis of the jaw with a platelet-rich fibrin membrane: technical report.

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Abstract

Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is a challenging complication resulting from the long-term application of bisphosphonates. In most cases, BRONJ occurs after a surgical procedure involving the jawbone. Currently, the management of BRONJ remains controversial, and there is no definitive treatment other than palliative methods. Platelet-rich fibrin (PRF) represents a relatively new biotechnology for the stimulation and acceleration of tissue healing and bone regeneration. This technical note describes the total closure of moderate bone exposure in persistent BRONJ in 2 weeks with a double-layer PRF membrane. PRF may stimulate gingival healing and act as a barrier membrane between the alveolar bone and the oral cavity. PRF may offer a fast, easy, and effective alternative method for the closure of bone exposure in BRONJ.

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PMID: 24075235 [PubMed - indexed for MEDLINE]



[Restor Dent Endod.](#) 2014 Feb;39(1):51-5. doi: 10.5395/rde.2014.39.1.51. Epub 2014 Jan 20.

Clinical effectiveness of combining platelet rich fibrin with alloplastic bone substitute for the management of combined endodontic periodontal lesion.

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Author information

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Abstract

The term "endo-perio" lesion has been proposed to describe the destructive lesion resulting from inflammatory products found in varying degrees in both the periodontium and the pulpal tissues. In most of the cases, clinical symptoms disappear following successful endodontic therapy. However failure after conventional root canal treatment calls for surgical intervention. A 35 year old male patient with endo-perio lesion in right maxillary lateral incisor was treated with platelet rich fibrin (PRF) and alloplastic bone substitute after conventional endodontic therapy. At the end of 6 months there was gain in clinical attachment, increased radiographic bone fill and reduction in probing depth which was maintained till 18 month follow-up. Present case report aims to evaluate the efficacy of PRF and alloplastic bone substitute in the management of intrabony defect associated with endo-perio lesion in maxillary lateral incisor because the healing potential of PRF and bone graft has not been widely studied in endodontics. The use of PRF allows the clinician to optimize tissue remodelling, wound healing and angiogenesis by the local delivery of growth factors and proteins. The novel technique described here enables the clinician to be benefited from the full regenerative capacity of this autologous biologic material.

PMID: 24516830 [PubMed]

PMCID: PMC3916506 [Free PMC Article](#)



[Restor Dent Endod.](#) 2014 Feb;39(1):1-6. doi: 10.5395/rde.2014.39.1.1. Epub 2014 Jan 20.

Platelet rich fibrin - a novel acumen into regenerative endodontic therapy.

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Abstract

Research into regenerative dentistry has added impetus onto the field of molecular biology. It can be documented as a prototype shift in the therapeutic armamentarium for dental disease. Regenerative endodontic procedures are widely being added to the current armamentarium of pulp therapy procedures. The regenerative potential of platelets has been deliberated. A new family of platelet concentrates called the platelet rich fibrin (PRF) has been recently used by several investigators and has shown application in diverse disciplines of dentistry. This paper is intended to add light on the various prospects of PRF and clinical insights to regenerative endodontic therapy.

PMID: 24516822 [PubMed]

PMCID: PMC3916499 [Free PMC Article](#)

Simultaneous sinus lift and implantation using platelet-rich fibrin as sole grafting material.

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Abstract

Recently, several authors have shown that simultaneous sinus lift and implantation using autologous platelet-rich fibrin as the sole filling material is a reliable procedure promoting bone augmentation in the maxillary sinus. The aim of this study was to examine the effect of simultaneous sinus lift and implantation using platelet-rich fibrin as the sole grafting material on bone formation in a canine sinus model. An implant was placed after sinus membrane elevation in the maxillary sinus of six adult female mongrel dogs. The resulting space between the membrane and sinus floor was filled with autologous platelet-rich fibrin retrieved from each dog. The implants were left in place for six months. Bone tissue was seen at the lower part of the implants introduced into the sinus cavity. The height of the newly formed bone around the implants ranged from 0 mm to 4.9 mm (mean; 2.6 ± 2.0 mm) on the buccal side and from 0 mm to 4.2 mm (mean; 1.3 ± 1.8 mm) on the palatal side. The findings from this study suggest that simultaneous sinus lift and implantation using platelet-rich fibrin as sole grafting material is not a predictable and reproducible procedure, especially with respect to the bone formation around the implants in the sinus cavity.

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PMID: 24503388 [PubMed - indexed for MEDLINE]

Increased vascularization during early healing after biologic augmentation in repair of chronic rotator cuff tears using autologous leukocyte- and platelet-rich fibrin (L-PRF): a prospective randomized controlled pilot trial.

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Abstract

HYPOTHESIS:

We hypothesized that arthroscopic rotator cuff repairs using leukocyte- and platelet-rich fibrin (L-PRF) in a standardized, modified protocol is technically feasible and results in a higher vascularization response and watertight healing rate during early healing.

METHODS:

Twenty patients with chronic rotator cuff tears were randomly assigned to 2 treatment groups. In the test group (N = 10), L-PRF was added in between the tendon and the bone during arthroscopic rotator cuff repair. The second group served as control (N = 10). They received the same arthroscopic treatment without the use of L-PRF. We used a double-row tension band technique. Clinical examinations including subjective shoulder value, visual analog scale, Constant, and Simple Shoulder Test scores and measurement of the vascularization with power Doppler ultrasonography were made at 6 and 12 weeks.

RESULTS:

There have been no postoperative complications. At 6 and 12 weeks, there was no significant difference in the clinical scores between the test and the control groups. The mean vascularization index of the surgical tendon-to-bone insertions was always significantly higher in the L-PRF group than in the contralateral healthy shoulders at 6 and 12 weeks (P = .0001). Whereas the L-PRF group showed a higher vascularization compared with the control group at 6 weeks (P = .001), there was no difference after 12 weeks of follow-up (P = .889). Watertight healing was obtained in 89% of the repaired cuffs.

DISCUSSION/CONCLUSIONS:

Arthroscopic rotator cuff repair with the application of L-PRF is technically feasible and yields higher early vascularization. Increased vascularization may potentially predispose to an increased and earlier cellular response and an increased healing rate.

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KEYWORDS:

Level I; Randomized Controlled Trial; Shoulder arthroscopy; Treatment Study; leukocyte- and platelet-rich fibrin (L-PRF); rotator cuff; vascularization

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Process for PRF

Abstracts

Published in 2015

Treatment of Oral Mucosal Lesions by Scalpel Excision and Platelet-Rich Fibrin Membrane Grafting: A Review of 26 Sites.

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Abstract

PURPOSE:

One of the preferred treatment options for oral mucosal lesions (eg, leukoplakia and lichen planus) is excision, with or without the use of a coverage agent. Platelet-rich fibrin (PRF) membranes are popular fibrin scaffolds with entrapped platelets that release various growth factors and cytokines to support and enhance wound healing. The aim of the present report was to describe the technique, postoperative wound care, and clinical results of PRF membrane grafting after excision of superficial potentially malignant oral lesions.

MATERIALS AND METHODS:

Autologous PRF membrane was fabricated and grafted over 26 wounds created by excision of small, superficial, potentially malignant lesions of oral mucosa (or fiberotomy in cases of oral submucous fibrosis) and assessed clinically at 7, 15, 30, and 60 days.

RESULTS:

Healing was satisfactory in all cases, with minimal and manageable complication at 1 site.

CONCLUSION:

The results of the present study suggest that PRF membrane is a successful coverage agent that aids in the healing of superficial oral mucosal wounds. Additional comparative studies are required to establish its efficacy compared with that of other agents.

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PMID: 25891657 [PubMed - as supplied by publisher]



[Shanghai Kou Qiang Yi Xue](#). 2015 Feb;24(1):61-4.

[The effect of platelet-rich fibrin on biologic characteristics of osteoblasts].

[Article in Chinese]

[Sun XL](#)¹, [Zhou YM](#), [Zhao JH](#), [Zheng L](#), [Yang TT](#).

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Abstract

PURPOSE:

To investigate the effect of platelet-rich fibrin on biologic characteristics of osteoblasts.

METHODS:

Osteoblasts were cultured with or without a PRF membrane. The cell proliferation was detected by MTT. The alkaline phosphatase (ALP) stain and the positive expression of collagen type I, osteoprotegerin and RANKL were measured. The data was statistically analyzed with SPSS17.0 software package.

RESULTS:

PRF promoted cell proliferation and increased expression of ALP, collagen type I and OPG significantly, but there was no significant impact on expression of RANKL.

CONCLUSIONS:

PRF promotes osteoblasts proliferation, differentiation and OPG expression. PRF is involved in bone remodeling via regulating expression of OPG and RANKL.

PMID: 25858372 [PubMed - in process]

Enhancement of the repair of dog alveolar cleft by an autologous iliac bone, bone marrow-derived mesenchymal stem cell, and platelet-rich fibrin mixture.

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Abstract

BACKGROUND:

Autologous bone graft has been regarded as the criterion standard for the repair of alveolar cleft. However, the most prominent issue in alveolar cleft treatment is the high absorption rate of the bone graft. The authors' objective was to investigate the effects of an autologous iliac bone, bone marrow-derived mesenchymal stem cell, and platelet-rich fibrin mixture on the repair of dog alveolar cleft.

METHODS:

Twenty beagle dogs with unilateral alveolar clefts created by surgery were divided randomly into four groups: group A underwent repair with an autologous iliac bone, bone marrow-derived mesenchymal stem cell, and platelet-rich fibrin mixture; group B underwent repair with autologous iliac bone and bone marrow-derived mesenchymal stem cells; group C underwent repair with autologous iliac bone and platelet-rich fibrin; and group D underwent repair with autologous iliac bone as the control. One day and 6 months after transplantation, the transplant volumes and bone mineral density were assessed by quantitative computed tomography. All of the transplants were harvested for hematoxylin and eosin staining 6 months later.

RESULTS:

Bone marrow-derived mesenchymal stem cells and platelet-rich fibrin transplants formed the greatest amounts of new bone among the four groups. The new bone formed an extensive union with the underlying maxilla in groups A, B, and C. Transplants with the bone marrow-derived mesenchymal stem cells, platelet-rich fibrin, and their mixture retained the majority of their initial volume, whereas the transplants in the control group showed the highest absorption rate. Bone mineral density of transplants with the bone marrow-derived mesenchymal stem cells, platelet-rich fibrin, and their mixture 6 months later was significantly higher than in the control group ($p < 0.05$), and was the highest in bone marrow-derived mesenchymal stem cells and platelet-rich fibrin mixed transplants. Hematoxylin and eosin staining showed that the structure of new bones formed the best in group A.

CONCLUSION:

Both bone marrow-derived mesenchymal stem cells and platelet-rich fibrin are capable of improving the repair of dog alveolar cleft, and the mixture of them is more potent than each one of them used singly for enhancing new bone regeneration.

PMID: 25835246 [PubMed - in process]

Autologus Platelet Rich Fibrin aided Revascularization of an immature, non-vital permanent tooth with apical periodontitis: A case report.

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Author information

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Abstract

Caries or trauma induced non-vital immature permanent tooth with blunderbuss, thin root which are very common among childrens are corrected using regenerative endodontic (revascularization) procedures. In the presented case, a 16-year-old boy reported with chief complaint of pain in maxillary left central incisor (Tooth #21). Tooth #21 showed grade III mobility, draining labial sinus, and short blunderbuss root with diffuse periapical radiolucency. Patient was explained the treatment plan and written informed consent was taken. Platelet rich fibrin (PRF) was prepared according to standard protocol. Autologous PRF was carried to the apical portion of the root canal after inducing revascularization. Access opening was double sealed with MTA and resin modified glass ionomer cement (RMGI). Baseline, 12 month and 18 month follow-up intraoral radiographs were taken. Clinically case was asymptomatic with complete resolution of intraoral sinus. Periapical healing, apical closure, root lengthening and dentinal wall thickening were uneventful. Thus PRF supplementation hastens the predictability and rate of revascularization in non-vital immature permanent teeth.

PMID: 25810668 [PubMed]

PMCID: PMC4367043 [Free PMC Article](#)

Comparative clinical evaluation of coronally advanced flap with or without platelet rich fibrin membrane in the treatment of isolated gingival recession.

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Abstract

AIM:

The aim of this study was to determine whether the addition of an autologous platelet rich fibrin (PRF) membrane to a coronally advanced flap (CAF) would improve the clinical outcome in terms of root coverage, in the treatment of isolated gingival recession.

MATERIALS AND METHODS:

Systemically healthy 20 subjects each with single Miller's class I or II buccal recession defect were randomly assigned to control (CAF) or test (CAF + PRF) group. Clinical outcome was determined by measuring the following clinical parameters such as recession depth (RD), recession width (RW), probing depth (PD), clinical attachment level (CAL), width of keratinized tissue (WKT), gingival thickness (GTH), plaque index (PI), and gingival index (GI) at baseline, 3(rd), and 6(th) month postsurgery.

RESULTS:

The root coverage was $65.00 \pm 44.47\%$ in the control group and $74.16 \pm 28.98\%$ in the test group at 6(th) month, with no statistically significant difference between them. Similarly, CAL, PD, and WKT between the groups were not statistically significant. Conversely, there was statistically significant increase in GTH in the test group.

CONCLUSION:

CAF is a predictable treatment for isolated Miller's class I and II recession defects. The addition of PRF to CAF provided no added advantage in terms of root coverage except for an increase in GTH.

PMID: 25810596 [PubMed]

PMCID: PMC4365161 [Free PMC Article](#)

Clinical and radiographic evaluation of nanocrystalline hydroxyapatite with or without platelet-rich fibrin membrane in the treatment of periodontal intrabony defects.

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Abstract

BACKGROUND:

Nano-sized ceramics may represent a promising class of bone graft substitutes due to their improved osseointegrative properties. Nanocrystalline hydroxyapatite (NcHA) binds to bone and stimulate bone healing by stimulation of osteoblast activity. Platelet-rich fibrin (PRF), an intimate assembly of cytokines, glycan chains, and structural glycoproteins enmeshed within a slowly polymerized fibrin network, has the potential to accelerate soft and hard tissue healing. The present study aims to explore the clinical and radiographical outcome of NcHA bone graft with or without PRF, in the treatment of intrabony periodontal defects.

MATERIALS AND METHODS:

In a split-mouth study design, 20 patients having two almost identical intrabony defects with clinical probing depth of at least 6 mm were selected for the study. Selected sites were randomly divided into two groups. In Group I, mucoperiosteal flap elevation followed by the placement of NcHA was done. In Group II, mucoperiosteal flap elevation, followed by the placement of NcHA with PRF was done. Clinical and radiographic parameters were recorded at baseline and at 6-month postoperatively.

RESULTS:

Both treatment groups showed a significant probing pocket depth (PPD) reduction, clinical attachment gain, increase bone density 6-month after surgery compared with baseline. However, there was a significantly greater PPD reduction and clinical attachment gain when PRF was added to NcHA.

CONCLUSION:

The NcHA bone graft in combination with PRF demonstrated clinical advantages beyond that achieved by the NcHA alone.

PMID: 25810595 [PubMed]

PMCID: PMC4365160 [Free PMC Article](#)

Comparative evaluation of platelet-rich fibrin with demineralized freeze-dried bone allograft in periodontal infrabony defects: A randomized controlled clinical study.

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Abstract

INTRODUCTION:

Several bone graft materials have been used in the treatment of infrabony defects. Demineralized freeze-dried bone allograft (DFDBA) has been histologically proven to be the material of choice for regeneration. However, platelet-rich fibrin (PRF) has been said to have several properties that aid in healing and regeneration. Hence, this study focuses on the regenerative capacity of PRF when compared with DFDBA.

MATERIALS AND METHODS:

A total of 40 sites with intrabony defects were selected and were assigned to the test group (open flap debridement [OFD] and PRF, n = 20) and the control group (OFD + DFDBA, n = 20). At the test sites, two PRF plugs were placed in the intrabony defect after debridement of the site and flap was sutured in place. The parameters measured were probing depth (PD), relative attachment level (RAL), and gingival marginal level (GML). These parameters were measured just before surgery (baseline) and at 6 months postsurgery. The changes in PD, RAL, and GML were analyzed at baseline and postsurgically after 6 months in each group with paired t-test and between the two groups with unpaired t-test.

RESULTS:

The mean reduction in PD after 6 months in the test PRF group is 3.67 ± 1.48 mm where in control DFDBA group is 3.70 ± 1.78 mm. Gain in RAL in the test PRF group is 2.97 ± 1.42 mm where in control DFDBA group, it is 2.97 ± 1.54 mm. Gingival margin migrated apically in the test PRF group by 0.43 ± 1.31 mm where in control DFDBA group by 0.72 ± 2.3 mm. It was seen that the differences in terms of PD (P = 0.96), RAL (P = 1.00) and GML (P = 0.62) were not significant.

CONCLUSION:

Platelet-rich fibrin has shown significant results after 6 months, which is comparable to DFDBA for periodontal regeneration in terms of clinical parameters. Hence, it can be used in the treatment of intrabony defects.

PMID: 25810594 [PubMed]

PMCID: PMC4365159 [Free PMC Article](#)

In vitro evaluation of mechanical properties of platelet-rich fibrin membrane and scanning electron microscopic examination of its surface characteristics.

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Abstract

BACKGROUND:

The aim of this study was to evaluate the mechanical properties of the platelet-rich fibrin (PRF) membrane and to compare these properties with that of commercially available collagen membranes used for guided tissue regeneration (GTR) procedures. Scanning electron microscopic (SEM) examination of PRF membrane was also performed to determine the cell distribution pattern within the different regions of the membrane.

MATERIALS AND METHODS:

Modulus of elasticity and hardness of (i) PRF membrane (ii) bovine collagen membrane and (iii) fish collagen membrane were assessed by performing surface indentation test using T1 950 Triboindenter. The in vitro degradation tests were conducted by placing the (i) PRF membrane (ii) bovine collagen membrane and (iii) fish collagen membrane of equal sizes (10 mm × 5 mm) in 5 ml of pH 7.4 phosphate buffer solution on a shaker set at 40 rpm for 1-week. The degradation profiles were expressed as the accumulated weight losses of the membrane. SEM evaluation of the PRF membrane was done under both low and high magnification.

RESULTS:

Young's Modulus of elasticity was found to be 0.35 GPa for PRF membrane, 2.74 GPa for bovine collagen membrane and 1.92 GPa for fish collagen. The hardness was 10.67 MPa for PRF membrane, 110.7 MPa for bovine collagen membrane and 90.5 MPa for fish collagen membrane. PRF membrane degraded by about 36% of initial weight after a 1-week in vitro shaking test. Fish collagen membrane degraded by about 8% of initial weight, bovine collagen membrane degraded by about 3% of initial weight. Dense clusters of platelets formed due to extensive aggregation, and few leukocytes were observed in buffy coat area.

CONCLUSIONS:

The preliminary findings from the assessment of the mechanical properties of PRF membrane showed that it was lacking in several desired properties when compared to commercially available collagen membranes. Lack of rigidity and faster degradation may limit its application in GTR procedures.

PMID: 25810590 [PubMed]

PMCID: PMC4365153 [Free PMC Article](#)

Potential dental pulp revascularization and odonto-/osteogenic capacity of a novel transplant combined with dental pulp stem cells and platelet-rich fibrin.

[Chen YJ](#)¹, [Zhao YH](#), [Zhao YJ](#), [Liu NX](#), [Lv X](#), [Li Q](#), [Chen FM](#), [Zhang M](#).

Author information

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Abstract

Our aim is to investigate the cytobiological effects of autologous platelet-rich fibrin (PRF) on dental pulp stem cells (DPSCs) and to explore the ectopic and orthotopic possibilities of dental pulp revascularization and pulp-dentin complex regeneration along the root canal cavities of the tooth by using a novel tissue-engineered transplant composed of cell-sheet fragments of DPSCs and PRF granules. Canine DPSCs were isolated and characterized by assaying their colony-forming ability and by determining their cell surface markers and osteogenic/adipogenic differentiation potential. The biological effects of autologous PRF on DPSCs, including cell proliferation, alkaline phosphatase (ALP) activity and odonto-/osteogenic gene expression, were then investigated and quantified. A novel transplant consisting of cell-sheet fragments of DPSCs and PRF granules was adopted to regenerate pulp-dentin-like tissues in the root canal, both subcutaneously in nude mice and in the roots of canines. PRF promoted the proliferation of DPSCs in a dose- and time-dependent manner and induced the differentiation of DPSCs to odonto-/osteoblastic fates by increasing the expression of the *Alp*, *Dspp*, *Dmp1* and *Bsp* genes. Transplantation of the DPSC/PRF construct led both to a favorable regeneration of homogeneous and compact pulp-like tissues with abundantly distributed blood capillaries and to the deposition of regenerated dentin along the intracanal walls at 8 weeks post-operation. Thus, the application of DPSC/PRF tissue constructs might serve as a potential therapy in regenerative endodontics for pulp revitalization or revascularization.

PMID: 25797716 [PubMed - as supplied by publisher]

Novel use of platelet-rich fibrin matrix and MTA as an apical barrier in the management of a failed revascularization case.

[Yadav P](#)¹, [Pruthi PJ](#), [Naval RR](#), [Talwar S](#), [Verma M](#).

Author information

- ¹Department of Conservative Dentistry and Endodontics, Maulana Azad Institute of Dental Sciences, New Delhi, India.

Abstract

METHOD:

We report management of a failed revascularization/revitalization case, which could be due to inadequate removal of biofilm and bacteria in dentinal tubules. The use of an apical matrix barrier in form of a platelet-rich fibrin (PRF) membrane for stabilization of MTA in root end apexification procedure is described. The canal was cleansed of old MTA present in the cervical third using H files, irrigated using saline and finally irrigated with 2.5% NaOCl and saline. To obtain canal disinfection, calcium hydroxide paste was temporized in the canal. In subsequent appointments, PRF was placed at the root tip followed by 5-mm apical plug with mineral trioxide aggregate. One week later, the root canal was obturated with thermoplasticized gutta-percha. A 6-month and a 2-year follow ups showed reduction of periapical radiolucency and adequately functional tooth.

RESULTS:

One-visit apexification techniques provide an alternative treatment for failed revascularization cases. Follow up confirmed complete healing periradicularly.

CONCLUSION:

Apexification in one step using an apical barrier of PRF and a plug of MTA can be considered a predictable treatment and may be an alternative to long-term revascularization failures.

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PMID: 25787690 [PubMed - as supplied by publisher]

Platelet-rich fibrin with 1% metformin for the treatment of intrabony defects in chronic periodontitis: a randomized controlled clinical trial.

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Abstract

BACKGROUND:

Platelet-rich fibrin (PRF) is a second-generation platelet concentrate that releases various growth factors that promote tissue regeneration. Metformin (MF), a member of the biguanide group, has been shown to facilitate osteoblast differentiation and thus may exhibit a favorable effect on alveolar bone. The current study is designed to evaluate the efficacy of open-flap debridement (OFD) combined with PRF, 1% MF gel, and PRF + 1% MF gel in the treatment of intrabony defects (IBDs) in patients with chronic periodontitis (CP).

METHODS:

One hundred twenty patients with single defects were categorized into four treatment groups: OFD alone, OFD with PRF, OFD with 1% MF, and OFD with PRF plus 1% MF. Clinical parameters such as site-specific plaque index (PI), modified sulcus bleeding index (mSBI), probing depth (PD), relative attachment level (RAL), and gingival marginal level (GML) were recorded at baseline (before surgery) and 9 months postoperatively. Percentage radiographic IBD depth reduction was evaluated using computer-aided software at baseline and 9 months.

RESULTS:

PRF, 1% MF, and PRF + 1% MF groups showed significantly more PD reduction and RAL gain than the OFD-only group. Mean PD reduction and mean RAL gain were found to be greater in the PRF + 1% MF group compared to just PRF or MF at 9 months. Furthermore, PRF + 1% MF group sites showed a significantly greater percentage of radiographic defect depth reduction ($52.65\% \pm 0.031\%$) compared to MF ($48.69\% \pm 0.026\%$), PRF ($48\% \pm 0.029\%$), and OFD alone ($9.14\% \pm 0.04\%$) at 9 months.

CONCLUSION:

The PRF + 1% MF group showed greater improvements in clinical parameters, with greater percentage radiographic defect depth reduction compared to MF, PRF, or OFD alone in treatment of IBDs in patients with CP.

PMID: 25762357 [PubMed - in process]

Management of large periapical lesion with the combination of second generation platelet extract and hydroxyapatite bone graft: a report of three cases.

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Abstract

The pulp tissue necrosis and extensive periodontal diseases leads to the development of the inflammatory periapical lesion which causes a local response of bone around the apex of the tooth. Depends upon the nature of wound and available biological growth factors the outcome will be either regeneration or repair. Being a rich source of growth factors, platelet rich fibrin (PRF) posses many advantages in bone regeneration. The purpose of this case report is to present an attempt to evaluate the healing potential of the combination of PRF and Hydroxyapatite bone graft as opposed to using these materials alone. A periapical endodontic surgery was performed on three patients with a large periapical inflammatory lesion and a large bony defect. The defect was then filled with a combination of PRF and Hydroxyapatite bone graft crystals. Clinical examination exhibited uneventful wound healing. The HA crystals have been replaced by new bone radiographically at the end of two years in Case 1 and Case 2, Case 3 were followed upto one year. On the basis of our cases outcome, we conclude the use of PRF in combination with HA crystals might have accelerate the bone regeneration.

PMID: 25738094 [PubMed]

PMCID: PMC4347185 [Free PMC Article](#)

Clinical evaluation of autologous platelet-rich fibrin in the treatment of multiple adjacent gingival recession defects: a 12-month study.

[Tunali M](#), [Özdemir H](#), [Arabacı T](#), [Gürbüzer B](#), [Pikdöken L](#), [Firatli E](#).

Abstract

Leukocyte- and platelet-rich fibrin (L-PRF) belongs to a new generation of platelet concentrates. There are limited numbers of studies focused on the use of L-PRF in gingival recession defects. This study evaluated the safety and effectiveness of using L-PRF membranes as a substitute for free connective tissue grafts (CTGs) as a treatment method for gingival recession defects. A total of 44 Miller Class I/II gingival recessions that were bilateral, adjacent, and greater than 3 mm in size were selected. Each recession site was randomly assigned to the test group (L-PRF) or the control group (CTG). After 12 months, root coverage was 76.63% and 77.36% in the L-PRF and CTG groups, respectively. It is suggested that L-PRF membrane may be an alternative graft material for treating multiple adjacent recessions greater than 3 mm in size without a requirement for additional surgery.

PMID: 25734713 [PubMed - in process]

Evaluation of intrabony defects treated with platelet-rich fibrin or autogenous bone graft: A comparative analysis.

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Abstract

OBJECTIVE:

The primary objective of this study was to compare clinically and radiographically the efficacy of autologous platelet rich fibrin (PRF) and autogenous bone graft (ABG) obtained using bone scrapper in the treatment of intrabony periodontal defects.

MATERIALS AND METHODS:

Thirty-eight intrabony defects (IBDs) were treated with either open flap debridement (OFD) with PRF or OFD with ABG. Clinical parameters were recorded at baseline and 6 months postoperatively. The defect-fill and defect resolution at baseline and 6 months were calculated radiographically (intraoral periapical radiographs [IOPA] and orthopantomogram [OPG]).

RESULTS:

Significant probing pocket depth (PPD) reduction, clinical attachment level (CAL) gain, defect fill and defect resolution at both PRF and ABG treated sites with OFD was observed. However, inter-group comparison was non-significant ($P > 0.05$). The bivariate correlation results revealed that any of the two radiographic techniques (IOPA and OPG) can be used for analysis of the regenerative therapy in IBDs.

CONCLUSION:

The use of either PRF or ABG were effective in the treatment of three wall IBDs with an uneventful healing of the sites.

PMID: 25713492 [PubMed]

PMCID: PMC4319284 [Free PMC Article](#)

Platelet-rich concentrates differentially release growth factors and induce cell migration in vitro.

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Abstract

BACKGROUND:

Platelet-rich concentrates are used as a source of growth factors to improve the healing process. The diverse preparation protocols and the gaps in knowledge of their biological properties complicate the interpretation of clinical results.

QUESTIONS/PURPOSES:

In this study we aimed to (1) analyze the concentration and kinetics of growth factors released from leukocyte- and platelet-rich fibrin (L-PRF), leukocyte- and platelet-rich plasma (L-PRP), and natural blood clot during in vitro culture; (2) investigate the migration of mesenchymal stem cells (MSCs) and human umbilical vein endothelial cells (HUVECs) as a functional response to the factors released; and (3) uncover correlations between individual growth factors with the initial platelet/leukocyte counts or the induced cell migration.

METHODS:

L-PRF, L-PRP, and natural blood clot prepared from 11 donors were cultured in vitro for 28 days and media supernatants collected after 8 hours and 1, 3, 7, 14, and 28 days. Released transforming growth factor β 1 (TGF- β 1), vascular endothelial growth factor (VEGF), insulin growth factor (IGF-1), platelet-derived growth factor AB (PDGF-AB), and interleukin-1 β (IL-1 β) were measured in the supernatants with enzyme-linked immunosorbent assay. Migration of MSC and HUVEC induced by the supernatants was evaluated in Boyden chambers.

RESULTS:

More TGF- β 1 was released (mean \pm SD in pg/mL of blood) from L-PRF (37,796 \pm 5492) compared with L-PRP (23,738 \pm 6848; $p < 0.001$) and blood clot (3739 \pm 4690; $p < 0.001$), whereas more VEGF and IL-1 β were released from blood clot (1933 \pm 704 and 2053 \pm 908, respectively) compared with both L-PRP (642 \pm 208; $p < 0.001$ and 273 \pm 386; $p < 0.001$, respectively) and L-PRF (852 \pm 376; $p < 0.001$ and 65 \pm 56, $p < 0.001$, respectively). No differences were observed in IGF-1 and PDGF-AB released from any of the concentrates. TGF- β 1 release peaked at Day 7 in L-PRF and at 8 hours and Day 7 in L-PRP and 8 hours and Day 14 in blood clot. In all concentrates, main release of VEGF occurred between 3 and 7 days and of IL-1 β between Days 1 and 7. IGF-1 and PDGF-AB were released until Day 1 in L-PRP and blood clot, in contrast to sustained release over the first 3 days in L-PRF. The strongest migration of MSC occurred in response to L-PRF, and more HUVEC migration was seen in L-PRF and blood clot compared with L-PRP. TGF- β 1 correlated with initial platelet counts in L-PRF (Pearson $r = 0.66$, $p = 0.0273$) and initial leukocyte counts in L-PRP (Pearson $r = 0.83$, $p = 0.0016$). A positive correlation of IL-1 β on migration of MSC and HUVEC was revealed (Pearson $r = 0.16$, $p = 0.0208$; Pearson $r = 0.31$, $p < 0.001$).



CONCLUSIONS:

In comparison to L-PRP, L-PRF had higher amounts of released TGF- β 1, a long-term release of growth factors, and stronger induction of cell migration. Future preclinical studies should confirm these data in a defined injury model.

CLINICAL RELEVANCE:

By characterizing the biologic properties of different platelet concentrates in vitro, we may gain a better understanding of their clinical effects and develop guidelines for specific future applications.

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[Pediatr Dent.](#) 2015;37(1):1-6.

Revascularization of Immature, Nonvital Permanent Tooth Using Platelet-rich Fibrin in Children.

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Abstract

The purpose of this paper was to present a new approach wherein revascularization of the immature, nonvital permanent tooth was performed using platelet-rich fibrin (PRF) as a novel scaffold material. This was performed after disinfection of the root canal space using triple antibiotic paste followed by placing a PRF membrane in the root canal. The patient was followed up regularly at three-, six-, nine-, and 12-month intervals for review. After 12 months, clinical examination showed negative response to percussion and palpation tests but positive response to cold and electric pulp tests. Radiographic examination revealed continued thickening of the root dentinal walls, narrowing of root canal space, root lengthening, and closure of the root apex with normal periradicular architecture. However, more clinical research using large samples is necessary to prove it advantageous for regenerative endodontic therapy in children.

PMID: 25685966 [PubMed - in process]

A comparative evaluation of the blood clot, platelet-rich plasma, and platelet-rich fibrin in regeneration of necrotic immature permanent teeth: A clinical study.

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Author information

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Abstract

INTRODUCTION:

This study was designed as a clinical trial to evaluate and compare the regenerative potential of platelet-rich fibrin (PRF), platelet-rich plasma (PRP), and blood clot in immature necrotic permanent teeth with or without associated apical periodontitis.

METHODS:

Access preparation was done under rubber dam isolation. Copious irrigation was done with 2.5% NaOCl and triple antibiotic paste was placed as an intracanal medicament. After 4 weeks, the cases were divided into four groups with five patients in each group. The study design had three test arms and one control arm. Group I in which mineral trioxide aggregate apexification was carried out and it was kept as control group to evaluate the regenerative potential of blood clot and platelet concentrates, Group II in which blood clot was used as scaffold in the canal, Group III in PRF was used as scaffold, and Group IV in which PRP carried on collagen was used as a scaffold.

RESULTS:

The clinical and radiographic evaluation after 6 and 18 months was done by two independent observers who were blinded from the groups. The scoring was done as: None score was denoted by, Fair by 1, Good by 2, and Excellent by 3. The data were then analyzed statistically by Fisher's exact test using Statistics and Data 11.1 (PRP Using harvest Smart PRP2) which showed statistically significant values in Group III as compared to other Groups.

CONCLUSION:

PRF has huge potential to accelerate the growth characteristics in immature necrotic permanent teeth as compared to PRP and blood clot.

PMID: 25684914 [PubMed]

PMCID: PMC4319348 [Free PMC Article](#)

Micro-computed tomography and histomorphometric analysis of the effects of platelet-rich fibrin on bone regeneration in the rabbit calvarium.

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Abstract

OBJECTIVE:

The present study aimed to investigate the effectiveness of platelet-rich fibrin (PRF) on bone regeneration when used alone or in combination with hydroxyapatite (HA)/beta-tricalcium phosphate (β TCP).

DESIGN:

In this study, 20 New Zealand white rabbits were used and four calvarial defects were prepared in each animal. PRF, Straumann(®) Bone Ceramic (SBC), or PRF+SBC was applied to the defects; one defect was left untreated as a control. Ten rabbits were sacrificed at week 4 (T1) and 10 at week 8 (T2). After micro-computed tomography (micro-CT) scanning, the samples were sent for histological and histomorphometric analysis to evaluate and compare the volume and area of regenerated bone.

RESULTS:

Histomorphometric and micro-CT analysis showed that both PRF and SBC significantly increased bone regeneration at T1 and T2 ($P<0.01$). When PRF was used in combination with HA/ β TCP, a further significant increase in new bone formation was observed at T1 and T2 compared with that when PRF or SBC was used alone ($P<0.01$).

CONCLUSIONS:

PRF has a positive effect on bone formation when used alone and in combination with HA/ β TCP.

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PMID: 25621939 [PubMed - in process]

Management of an endo-perio lesion in an immature tooth using autologous platelet-rich fibrin: a case report.

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Author information

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Abstract

Treatment of an endo-perio lesion involving a non-vital young permanent tooth is a highly challenging task to Pediatric Dentists. There is a quest for the newer biological approach to management of these lesions as traditional methods have various disadvantages. Recently, platelet-rich fibrin (PRF), a second-generation platelet concentrate, is rich in growth factors have been used in the periodontal regeneration procedure. The purpose of this paper is to describe the efficacy of PRF in the treatment of a deep intra bony defect associated with an endo-perio lesion in an immature right mandibular first premolar of 12-year-old female patient. A freshly prepared autologous PRF membrane was placed in the bony defect following debridement. Clinical and radiographic follow-up were performed at regular intervals that revealed absence of pain, gain in clinical attachment level, reduction in probing depth, and excellent bone regeneration indicating successful outcome.

PMID: 25572379 [PubMed - in process]

Effect of osteogenic periosteal distraction by a modified Hyrax device with and without platelet-rich fibrin on bone formation in a rabbit model: a pilot study.

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Abstract

This study evaluated the effect of a modified Hyrax device and platelet-rich fibrin (PRF) on osteogenic periosteal distraction (OPD). Twelve adult male New Zealand white rabbits were separated into two main groups (six in each) according to the duration of the consolidation period (4 or 8 weeks). In each main group, the animals underwent OPD of the left and right sides of the mandible and were divided into four subgroups (three animals per group): device vs. device+PRF, and PRF vs. sham. Radiographic, histological, histomorphometric, and micro-computed tomography (micro-CT) analyses were performed. New bone formation was observed on the lateral and vertical sides of the mandible of all groups. Micro-CT and histomorphometry showed that the device+PRF group presented the highest percentages of bone volume and bone area at 4 weeks ($56.67 \pm 12.67\%$, $41.37 \pm 7.57\%$) and at 8 weeks ($49.67 \pm 8.33\%$, $55.46 \pm 10.67\%$; significantly higher than the other groups, $P < 0.001$), followed by the device group at 4 weeks ($33.00 \pm 1.73\%$, $33.21 \pm 11.00\%$) and at 8 weeks ($30.00 \pm 3.00\%$, $23.25 \pm 5.46\%$). In conclusion, the modified Hyrax device was used successfully for OPD in a rabbit model to gain vertical ridge augmentation, and greater bone maturation was achieved with the addition of PRF.

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Influence of the association between platelet-rich fibrin and bovine bone on bone regeneration. A histomorphometric study in the calvaria of rats.

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Abstract

This study aimed to investigate the effects of platelet-rich fibrin (PRF) associated or not with Bio-Oss on bone defects in the calvaria of rats. A critical-size defect of 5-mm diameter was performed in the calvaria of 48 rats. These animals were divided into six groups of eight animals each, according to the treatment received: homogeneous clot, autogenous clot, autogenous PRF, homogeneous PRF, Bio-Oss, or Bio-Oss associated with PRF. The animals were euthanized after 30 or 60 days. Bone regeneration was evaluated by histomorphometric analysis. The highest mean percentages of new bone formation at 30 days ($54.05\% \pm 5.78$) and 60 days ($63.58\% \pm 5.78$) were observed in the Bio-Oss associated with PRF group; in particular, the percentage of new bone at 30 days was significantly higher than that of all of the other groups ($P < 0.01$). At 60 days, the Bio-Oss associated with PRF ($63.58\% \pm 5.78$) and Bio-Oss ($57.34\% \pm 5.78$) groups had similar results, and both showed a statistical difference compared to the other groups. PRF had a positive effect on bone regeneration only when associated with Bio-Oss.

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Evaluation of osteoblastic activity in extraction sockets treated with platelet-rich fibrin.

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Abstract

OBJECTIVE:

The aim of this study was to determine whether the use of platelet rich fibrin (PRF) improved the healing of extraction sockets.

STUDY DESIGN:

A total of 20 patients with bilateral soft tissue impacted mandibular third molars were included in this study. The left and right third molars were extracted during the same session. Subsequently, the PRF membrane was randomly administered to one of the extraction sockets, whereas the contralateral sockets were left without treatment. On postoperative 30. and 90. days, panoramic images and bone scintigrams were taken to evaluate the bone healing between PRF-treated and non-PRF-treated sockets. Also, periodontal evaluation was performed in the same control sessions. Dependent group t test for paired samples was used for statistical analysis.

RESULTS:

The average increase in technetium-99m methylene diphosphonate uptake as an indication of enhanced bone healing did not differ significantly between PRF-treated and non-PRF-treated sockets 30 and 90 days postoperatively. Radio-opacity that can show the bone healing on panoramic images were measured by Image J programme and they did not differ significantly. Also periodontal values did not differ significantly.

CONCLUSIONS:

PRF might not lead to enhanced bone healing in impacted mandibular third molar extraction sockets 30 and 90 days after surgery. It is thought that PRF has the potential characteristics of an autologous fibrin matrix and can accelerate the healing. To better understand the effects of PRF on healing, further research is warranted with larger sample sizes.

PMID: 25475771 [PubMed - in process]

PMCID: PMC4320413 [Free PMC Article](#)

The heat-compression technique for the conversion of platelet-rich fibrin preparation to a barrier membrane with a reduced rate of biodegradation.

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Abstract

Platelet-rich fibrin (PRF) was developed as an advanced form of platelet-rich plasma to eliminate xenofactors, such as bovine thrombin, and it is mainly used as a source of growth factor for tissue regeneration. Furthermore, although a minor application, PRF in a compressed membrane-like form has also been used as a substitute for commercially available barrier membranes in guided-tissue regeneration (GTR) treatment. However, the PRF membrane is resorbed within 2 weeks or less at implantation sites; therefore, it can barely maintain sufficient space for bone regeneration. In this study, we developed and optimized a heat-compression technique and tested the feasibility of the resulting PRF membrane. Freshly prepared human PRF was first compressed with dry gauze and subsequently with a hot iron. Biodegradability was microscopically examined *in vitro* by treatment with plasmin at 37°C or *in vivo* by subcutaneous implantation in nude mice. Compared with the control gauze-compressed PRF, the heat-compressed PRF appeared plasmin-resistant and remained stable for longer than 10 days *in vitro*. Additionally, in animal implantation studies, the heat-compressed PRF was observed at least for 3 weeks postimplantation *in vivo* whereas the control PRF was completely resorbed within 2 weeks. Therefore, these findings suggest that the heat-compression technique reduces the rate of biodegradation of the PRF membrane without sacrificing its biocompatibility and that the heat-compressed PRF membrane easily could be prepared at chair-side and applied as a barrier membrane in the GTR treatment.

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PMID: 25132655 [PubMed - in process]

The combination use of platelet-rich fibrin and treated dentin matrix for tooth root regeneration by cell homing.

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Author information

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Abstract

Endogenous regeneration through cell homing provides an alternative approach for tissue regeneration, except cell transplantation, especially considering clinical translation. However, tooth root regeneration through cell homing remains a provocative approach in need of intensive study. Both platelet-rich fibrin (PRF) and treated dentin matrix (TDM) are warehouses of various growth factors, which can promote cell homing. We hypothesized that endogenous stem cells are able to sense biological cues from PRF membrane and TDM, and contribute to the regeneration of tooth root, including soft and hard periodontal tissues. Therefore, the biological effects of canine PRF and TDM on periodontal ligament stem cells (PDLSCs) and bone marrow mesenchymal stem cells (BMSCs) were evaluated respectively *in vitro*. Beagle dogs were used as orthotopic transplantation model. It was found that PRF significantly recruited and stimulated the proliferation of PDLSCs and BMSCs *in vitro*. Together, PRF and TDM induced cell differentiation by upregulating the mineralization-related gene expression of bone sialoprotein (BSP) and osteopontin (OPN) after 7 days coculture. *In vivo*, transplantation of autologous PRF and allogeneic TDM into fresh tooth extraction socket achieved successful root regeneration 3 months postsurgery, characterized by the regeneration of cementum and periodontal ligament (PDL)-like tissues with orientated fibers, indicative of functional restoration. The results suggest that tooth root connected to the alveolar bone by cementum-PDL complex can be regenerated through the implantation of PRF and TDM in a tooth socket microenvironment, probably by homing of BMSCs and PDLSCs. Furthermore, bioactive cues and inductive microenvironment are key factors for endogenous regeneration. This approach provides a tangible pathway toward clinical translation.

PMID: 25111570 [PubMed - in process]