Review Article

Platelet-Rich Plasma in Oral and Dental Surgery: A Review

Ahmed Salah Al-Noaman

Department of Oral Surgery, College of Dentistry, University of Babylon, Babylon City, Iraq

Abstract

Background: Platelet-rich plasma (PRP) has been employed widely in dental and oral surgery. However, there is considerable debate about its effect on wound healing and inflammatory response. **Materials and Methods:** PubMed, Google Scholar, Scopus data base, and manual search were performed to find out articles on the use of PRP in dental and oral surgery using keywords such as PRP , oral surgery, dental surgery, lower wisdom teeth, periodontal pocket, dental implant, tooth socket preservation, dry socket, cystic lesion, and ridge augmentation. These articles discussed the use of PRP (after surgical removal of wisdom teeth, treatment of periodontal pocket, ridge preservation, implant stability, prevention of dry socket, treatment of bony defect after cystic removal, and ridge augmentation). **Results:** Twenty-seven articles were found on the usage of PRP in dental and oral surgery. Six articles on the use of PRP after surgical removal of lower wisdom teeth, five articles in the treatment of periodontal pocket and implant stability, four article in ridge preservation, three articles in prevention of dry socket and two articles on the use of PRP after cystic removal and ridge augomentation. **Conclusion:** PRP enhanced bone regeneration and soft-tissue healing aftery lower wisdom tooth surgery. It decreased the depth of periodontal pocket, maintained implant stability, preserved ridge height and prevented dry socket. However, PRP had no effect on pain, swelling, and bleeding. There is no justification for the impact of PRP on bone augmentation and healing of bony defect after cystic removal of the jaws. More studies should be carried out to support the usage of PRP in oral and dental surgery.

Keywords: Bone, dental, oral, platlate-rich plasma, surgery

Introduction

Scientific research in dental and oral surgery usually comprises substances and maneuvers which have the capacity to improve clinical outcomes in terms of effective wound hraling. Platelets play an important role in the initial phases of soft-tissue healing and bone formation.[1] This is by discharging growth factors such as platelet-derived growth factor, transforming growth factor-beta and cytokines, chemokines, and other molecules which enhance cell-mediated soft-tissue healing and bone regeneration.[2]

Platelet-rich plasma (PRP) is a derivative of blood (plasma) that is rich in platelets. It is a modern path to tissue regeneration and is becoming a beneficial auxiliary to facilitate healing in various oral surgical maneuvers. This material can be achieved by centrifugation of patient's own blood[3] and different protocols have been suggested to prepare the final product. In general, anticoagulated blood was first subjected to soft spin to separate the plasma fraction from leukocyte. The plasma fraction then exposed to the second hard spin to split the platelets from the platelet-poor plasma (PPP). The platelet pellet containing leukocytes is hanging in a lower volume of PPP and activated by thrombin and calcium. From these two centrifugation process, platelets are within 2–5 times more than the normal blood.[4]

PRP acts as a fibrin tissue adhesive with tissue sealing property and a direct surgical hemostatic agent that is characterized by compatiblity, safety, and efficiency.[5] In addition to that, it speeds up endothelial and epithelial turn over, triggers angiogenesis, promotes collagen synthesis, facilitates soft-tissue recovery, encourages the hemostatic response to injury and inverses the prohibition of wound healing occurred due to exogenous steroids.[6]

Address for correspondence: Dr. Ahmed Salah Al-Noaman, Department of Oral Surgery, College of Dentistry, University of Babylon, Babylon City, Iraq.
E-mail: aalnoaman7@gmail.com

Submitted: 19-Nov-2020 **Accepted:** 20-Dec-2020 **Published:** 26-Jun-2021

Access this article online

Quick Response Code:

Website: www.medjbabylon.org

DOI: 10.4103/MJBL.MJBL_83_20

How to cite this article: Al-Noaman AS. Platelet-rich plasma in oral and dental surgery: A review. Med J Babylon 2021;18:59-65.

PRP is broadly employed nowadays to speed up postoperative healing process and is completely safe. Since the used blood is taken from the patient him/herself, contracting a disease is not a matter and relatively most patients were satisfied and comfort after their procedures.[7] In addition to that, as PRP collecting is performed with only 55 cc of blood in the doctor's clinic, the patient does not need to subject to the expense of the collecting procedure in a hospital or at the blood donor center. PRP is easy to manipulate and improves the ease of application of bone substitutes and bone grafting products by converting them to a gel-like material.[8] However, candidates indicated for treatment with PRP should undergo a pretreatment blood investigation to eliminate the risk of coagulopathies and platelet dysfunction. Anemic patients and those with thrombocytopenia may be improper candidates for treatment with PRP[9] and this may consider a limitation of this biological material.

PRP has been utilized in several dental and oral surgical operations. These include preservation of tooth socket after extraction, dry socket, treatment of infrabony periodontal pockets and closure of the oroantral fistula, as well as operations related to the insertion of osseointegrated dental implants. In these maneuvers, the adhesive property of PRP promotes the simplest manipulating of graft material, more predictable flap adaptation, adequate hemostasis and provides effecient seal compared with suturing alone.[10,11] Nowadays, the usage of PRP has also been suggested in the treatment of bisphosphonate-related osteonecrosis of the jaw (BRONJ) or avascular necrosis, which associated with other causes (e.g., radio-osteonecrosis), with the goal of improving soft-tissue healing and bone maturation.[12]

This study aimed to evaluate the effectiveness of PRP in oral surgical procedures and to evaluate the applications of PRP in oral and dental surgery.

Materials and Methods

Articles on the use of autologous PRP in dental and oral surgery have been collected from December 15, 2019 to June 10, 2020. An electronic PubMed, Google Scholar, Scopus database and manual search were used to collect articles and other reviews relevant to this study. The keywords or the terms used for searching the articles include PRP, oral surgery, dental surgery, dry socket, dental implant, tooth socket preservation, wound healing and bone defect. The inclusion criteria include articles used PRP in oral and dental surgical procedures (after surgical extraction of impacted lower wisdom teeth, treatment of periodontal pocket, preservation of tooth socket, mantainance of implant stability and bone density, prevention of dry socket, treatment of bony defect after cystic removal and ridge augmentation), original articles, studies using adult patients, and articles published in the English language. The exclusion criteria involve articles used other platelet's derivatives such as platelete-rich fibrin (PRF), the use of PRP in bisphosphonate-related necrosis of the jaws (BRONJ), studies using <6 patients and articles published before 2010.

The articles were analyzed according to the type of study, sample size, treatment modality, study outcome, time for follow-up and patients' age. The evaluation of the outcome of each study depends on the clinical and radiographical parameters used during the study. Since the main concern of this review is to estimate the effect of PRP in certain dental and oral surgical procedures, parameters consideration of accelerating bone regeneration and soft tissue healing, decreasing inflammatory response (pain, swelling and bleeding) were taken as to estimate the effectiveness of PRP.

Results

Twenty-seven original articles were chosen to carry out a systematic review on the possible use of PRP alone or in combination with other bone substitutes in dental and oral surgery. There are six articles on the usage of PRP after surgery of impacted lower wisdom teeth, five articles on the treatment of infrabony pocket and dental implant treatment, four on the ridge preservation, three on the prevention of dry socket and two articles on the treatment of bony defect after removal of cystic lesion and ridge augmentation. All studies are randomized clinical trials and the majority were split-mouth design, while the other are parallel studies. Since the number of articles regarding the clinical use of PRP was too low and there was high variation in the surgical procedures among studies, meta-analysis was not performed. The evaluation was determined according to the outcome differences between the PRP-containing system and non PRP-containing system. Details of each study are shown in Table 1.

The results of these studies on the use of PRP in dental and oral surgery are described as followings:

After surgical removal of mandibular wisdom teeth

These studies include five randomized clinical trials (split mouth) and one was parallel design. The number of patients employed in these studies ranged between 6 and 150 patients. Both male and female genders were involved in these studies with age ranged from 18 to 70 years. All studies used PRP as a gel form except the study of Rutkowski *et al*.[31] where PRP was used as a buffy PRP (gelfoam and PRP) coat. In most of these studies, patients were followed up from 1 day to 7 days apart from the study of Joy and Kaul *et al*.[29,32] where patients were followed up to 1, 2, 3, and 6 months postoperatively. The outcome of these studies showed that PRP reduced probing depth distal to lower second molar, prevent wound dehiscence, and facilitate soft- and hard-tissue healing. However, the study of Rutkowski *et al*. and Gandevivala *et al*.[31,33] revealed that PRP had insignificant effect on pain, swelling, bleeding, and numbness.

Treatment of infrabony periodontal pocket

These articles include four randomized clinical trials (split mouth) and one parallel trial. Both male and female genders were involved in the study with age ranged from 25 to 48 years and the number of patients ranged from 10 to 45. In these

Table 1: Characteristics of randomized clinical trials on the use of platelet-rich plasma in dental and oral surgery

n	References	Type of study	Sample size	Mean age/ ranged	Treatment	Follow-up	Outcome
1	Nisar *et al*., 2020[13]	RCT-split mouth)	30	18-30	Use of collagen plug and PRP for ridge reservation	3 and 6 months	PRP + collagen plug preserved ridge height but not the width
2	Orabee *et al*., 2013[14]	RCT (split mouth)	12	Non	PRP and calcium sulfate for ridge preservation	3, 6, and 9 months	Preserved bone height and bone density
3	Isaia *et al*., 2018[15]	RCT (split mouth)	10	Mean age (±SD) of 49.3±15 years	Alveolar sockets filled with ABB and PRP gel and subsequently covered with PRP clot membrane for ridge preservation	10 days-4 months	ABB-PRP was useful in ridge preservation, demonstrating a significant increase of bone regenerative index and structural bone density
4	Soni *et al*., 2018[16]	RCT (parallel)	60 extraction site, (30) for DFDBG and PRF and (30) for DFDBG and PRP	18-60 (29.2)	DFDBG and PRF, DFDBG and PRP (ridge preservation)	7th day and 1 month for soft-tissue healing. Radiographic assessment for bone healing was done at 7th day, 1st month and 3rd month and 6th month postoperativel year	DFDBG and PRP showed less bone height, width and density when compared to DFDBG and PRF in maxillary and mandibular anterior and posterior region
5	Jalaluddin *et al*., 2017[17]	RCT (parallel)	20	25-45 (35)	Infrabony pocket treated with either PRP or OFD	6 months	No significant difference between PRP or OFD alone
6	Döri *et al*., 2017[18]	RCT (split mouth)	24	32-56	EMD + NBM + PRP versus EMD + NBM (infra-bony pocket)	12 months- 5 years	PRP + NBM + EMD did not improve CAL
7	Pradeep *et al*., 2012[19]	RCCT (split-mouth)	45	36.8 years	PRP versus OFD (infrabony defect)	9 months	PRP + OFD improve CAL and probing depth
8	Ozdemir and Okte, 2012[20]	RCT (split mouth)	14	48.96±6.6 years	B-TCP + PRP versus B-TCP (infra-bony pocket)	6 months	No significant difference between PRP + B-TCP and B-TCP alone
9	Hassan *et al*., 2012[21]	RCT split-mouth	12	41.4±2.61 years	PRP + torus mandibularis chips versus torus mandibularis chips (infra-bony pocket)	6 months	PRP + torus mandibularis had significant effect on probing depth and CAL
10	Gopinath *et al*., 2017[22]	RCT-split mouth design	10	25-40 years	Effect of PRP on implant stability	18 months	PRP moisten implants improved osseointegration and secondary implant stability
11	ArRejaie *et al*., 2016[23]	RCT split-mouth	16	32 years	Bovine derived xenograft w/ wo PRP in defects of immediate implants in the maxillary anterior or premolar region	6-12 months	PRP with BDX had significant effect on bone density compared to BDX alone
12	Georgakopoulos *et al*., 2014[24]	RCT (split mouth)	30	25-6	Implant placement w/wo PR	8 months	ROC analysis of panoramic radiographs (AUC): PRP has a positive effect
13	Kundu and Rathee, 2014[25]	RCT (split mouth)	30	18-5	One-stage implants coated w/wo PRP and loaded within 2 weeks	3 months	PRP improve primary implant stability
14	Ergun *et al*., 2013[26]	RCT split-mouth	32	44.2±12.5	Implant stability quotient was evaluated for implant stability	In the 1st 7 days then up to 36 months	No significant effect of PRP on implant stability in the maxilla
15	Eskan *et al*., 2014[27]	RCT (spilt mouth)	32	19-7	Ridge augmentation with cancellous allograft w/wo PRP + S	4 months	Ridge width 5 mm apical to crest (mm)
16	Torres *et al*., 2010[28]	RCT (split-mouth)	30	48-76	Ridge augmentation ABB + Ti-mesh w/wo PRP, followed by implant placement after 6 months	30 months	PRP prevent Ti mesh exposure but has no effect on ridge augmentation
17	Joy, 2014[29]	RCT (split-mouth)	12 patients, 7 males and 5 females with bilaterally impacted mandibular third molars	25-35	Surgical removal impacted mandibular third molars	Day 1, day 2, day 3, day 7, 1st month, and 2nd month postoperativel year	Platelet-rich plasma is a surgical additive that can be used to improve bone and soft-tissue healing

Contd....

Table 1: Contd....

n	References	Type of study	Sample size	Mean age/ ranged	Treatment	Follow-up	Outcome
18	Dutta *et al*., 2016[30]	RCT (parallel)	40	17-36	Surgical removal impacted mandibular third molars PRP, PRF, and HA	3rd, 7th, and 14th day of postoperative periods. Up to 4-month follow-up	Pain and swelling less with PRP and PRF, but bone generation is better with HA
19	Rutkowski *et al*., 20109[31]	RCT (spilt mouth)	6	18-40 bilateral impaction	Puffy PRP (gelfoam-PRP) coat to evaluate treatment outcome after impacted mandibular third molar surgery	After 3 days and 25 weeks	Improve bone formation and decreased healing time. But no effect on pain, bleeding, and numbness
20	Kaul *et al*., 2018[32]	RCT (split-mouth)	25	18-70 years	Surgical removal impacted mandibular third molars	1st-7th days and then evaluated on 3rd and 6 months	PRP decreased wound dehiscence and probing depth. Improve soft- and hard-tissue healing
21	Gandevivala *et al*., 2017[33]	RCT (split-mouth)	25	16-60	Surgical removal impacted mandibular third molars	Up to 2 months	PRP decreased pain and swelling insignificantly and decreased healing period, pocket depth
22	Singha *et al*., 2019[34]	RCT (parallel)	30	18-30	PRP and PRF after surgical removal of impacted lower third molars	1, 3-7 days	Autologous PRP can be used as an adjunct to promote wound healing in mandibular-impacted third molar extraction socket
23	Prataap *et al*., 2017[35]	A case-control study (split-mouth)	75	40 years	PRP in the gel form to prevent dry socket	3-5 days	PRP significantly improved soft-tissue healing, reduced pain, and decreased the incidence of AO
24	Alissa *et al*., 2010[36]	RCT (split-mouth)	23	18 and older	PRP gel (dry socket)	3 months	Reducing the incidence of dry socket and improving soft-tissue healing but not bone
25	Pathak *et al*., 2016[37]	RCT (split mouth)	20	18-40	Gelfoam socked with PRP to prevent dry socket	15 days	PRP prevents the occurrence of dry socket and promotes wound healing
26	Supriya *et al*., 2018[38]	RCT (split mouth)	12	35-45	PRP gel to treat bony defect after removal of benign lesion like cyst	1, 3, and 6 months	PRP in the gel form enhanced bone regeneration
27	Ramanathan and Cariappa, 2014[39]	RCT (split mouth)	11	29-34	Removal of cysts and benign tumors of the jaws	6 months	PRP not significantly enhanced bone regeneration

RCT: Randomized clinical trial, PRP: Platelet-rich plasma, SD: Standard deviation, ABB: Anorganic bovine bone, DFDBG: Demineralized freeze-dried bone graft, PRF: Platelete-rich fibrin, OFD: Open flap debridement, EMD: Enamel matrix derivatives, NBM: Natural bone mineral, CAL: Clinical attachment level, PR: Platlate rich, AUC: Area under the curve, ROC: Receiver operating characteristic, B-TCP: Beta-tracalcium phosphate, AO: Alveolar ostietis, HA: Hydroxyapatite, RCCT: Randomized controlled clinical trials, BDX: Bovine derived xenograft

studies, PRP was used in combination with bone graft/and or open flap debridement (OFD) to treat infrabony pocket and patients were followed up from 6 months to 5 years. The outcome of the studies of Pradeep *et al*. and Hassan *et al*.[19,21] showed that PRP with chips of torus mandibularis and PRP/OFD improved clinical attachment level (CAL) and probing depth. However, other studies[17,18,20] indicated that PRP alone or with other bone graft or OFD had an insignificant effect on CAL and pocket depth.

Treatment of dental implants

These articles include five randomized clinical trials (split-mouth design). Both male and female genders were involved in the studies with age ranged from 18 to 44 years and the number of patients ranged from 16 to 32. In these studies, PRP was used as a gel form and patients were followed up from 1 week to 36 months. All studies revealed that PRP improved osseointegration, bone density and stability of dental implants. However, the study of Ergun *et al*.[26] stated that PRP has no impact on implant stability in the maxilla after long-term follow-up.

Preservation of alveolar ridge

These articles include four randomized clinical trials. Three of these studies were split-mouth design and one parallel trial.[16] Both male and female genders were involved in these studies with age ranged from 18 to 60 years and sample size ranged from 10 to 30 patients. In these studies, PRP was used in combination with other bone grafts such as collagen plug, calcium sulfate, demineralized freeze-dried bone (DFDB), and inorganic bovine bone (ABB) and patients were followed up to 9 months. The outcome of these studies demonstrated that PRP with other bone substitutes improved bone density and bone height but not the width of alveolar ridge.

Prevention of dry socket

There are three articles on the utilization of PRP in the prevention of dry sockets that were found during searching. Three of these articles were randomized clinical trials (split-mouth design) and one was parallel.[36] In these studies, males and females were involved with age ranged from 18 to 40 years and the sample size ranged from 20 to 75 patients. PRP was used alone in the gel form and patients were followed up from 3 days to 3 months postoperatively. These studies stated that PRP prevented the occurrence of dry socket after extraction of permanent teeth and promote healing of soft tissue. However, these studies agreed that PRP had no impact on bone healing.

Treatment of bony defect

There are two articles on the usage of PRP in the treatment of bony defect in the maxillofacial region that were found during searching. Both of these studies were designed as split-mouth trials. Male and female were involved in the studies with the sample size ranged from 11 to 12 patients. PRP was used in the gel form to treat bony defect after removal of cystic lesion or benign tumors like cyst in the maxillofacial region. The patients in these studies were followed up to 6 months postoperatively. The results of Supriya *et al*.[38] revealed that PRP enhanced bone regeneration in a bony defect; whereas the study of Ramanathan and Cariappa[39] indicated that PRP had an insignificant impact on bone healing after 6 months.

Ridge augmentation

There are two articles on the usage of PRP for ridge augmentation. Both of these studies were split-mouth design. Male and female were used in these studies with age ranged from 19 to 76 years and the sample size was within 30 patients. PRP was used in the gel form and the patients were followed up from 4 to 30 months. The findings of these studies showed that PRP increased width of the ridge after 4 and 30-month follow-up.

Discussion

There is a considerable debate on the effect of PRP in wound recovery and despite a large body of literature discussing this effect, the outcomes are conflicting and need further evaluation. This systematic review includes 27 articles aimed to evaluate the benefit of PRP in certain dental applications.

Six articles on the usage of PRP after removal of lower wisdom teeth were chosen. These articles evaluated the effect of PRP on pain, swelling, bleeding, probing depth distal to lower second molar, wound dehiscence and bone regeneration and soft-tissue healing. Some of these studies found that PRP reduced pain and swelling postoperatively,[35] wound dehiscence and probing depth distal to lower second molar[32] and improved bone regeneration and soft-tissue healing.[29,34] However, other studies stated that PRP may improve bone regeneration and soft-tissue healing but had a negligible effect on pain, swelling and bleeding.[31,33] These differences among the studies may be attributed to the type of PRP used or the methods used to measure pain, swelling and bleeding or to the sample size. The type and level of impaction of mandibular wisdom teeth were not mentioned in these articles which may be another source of diffrence among these studies.

Franchini *et al*., 2019[40] stated that periodontal tissue involves hard-tissue (bone) element and soft-tissue element. This systematic review revealed that there is a controversial effect of PRP on the CAL and pocket depth after treatment of periodontal pocket. Three of the studies[17,18,20] showed that PRP alone or in combination with other bone grafts had no effect on CAL or pocket depth. However, others[19,21] reported that PRP containing grafts had significant effect on probing depth and (CAL). These differences among the studies may be attributed to the difference in the (criteria of patient's selection. the measurement of the periodontal pocket and PRP containing system and non-PRP containing system). In addition to that, most of these studies evaluated the effect of PRP up to 9 months, apart from the study of Döri *et al*.,[18] where patients were followed up to 5-years. In the latter study, PRP was used in conjunction with natural bone mineral and enamel matrix derivatives and the results showed that PRP did not improve (CAL).

Five articles in this systematic review discussed the impact of PRP on dental implant stability and bone density. One study included PRP with other bone graft[23] to treat bony defect associated with implant placement; while other studies coated the implant surface with PRP before implant insertion.[22,24,26] Most of these studies indicated that PRP alone or in conjuction with other bone graft improved implant stability and bone density. However, the study of Ergun *et al*.[26] showed that there was no appreciable impact of PRP on implant stability. The study of Ergun *et al*.[26] studied the impact of PRP on primary implant stability in the posterior region of the maxilla, whereas other studies discussed this effect in different regions of the upper and lower jaws. This may explain the differences between the study of Ergun *et al*. and other studies. The posterior region of the maxilla contains soft bone and lack of cortical bone and the alveolar ridge tends to resorb with age.[41] These factors render the achievement of implant stability in the posterior maxilla is problematic and difficult.

Four articles investigating the outcome of PRP alone or in conjunction with other bone grafts to preserve ridge height, width, and bone density. Two of these articles demonstrating that the height and width of alveolar ridge were preserved when alveolar socket covered with PRP with calcium sulfate or ABB.[14,15] However, PRP with collagen plug was failed to preserve ridge height and bone density.[13] In addition to that, a comparative study between PRP and PRF with DFDB graft proved that PRP with DFDBG revealed less effect on width, height and bone density of the upper and lower alveolar ridge.[16] These differences among these studies may be due to the sample size, criteria of patients selection and type of PRP-containing system. Notably, the effect of sample size was

very clear in the studies of Orabee *et al*. and Isaia *et al*.[14,15] where the sample size was ranged from 10 to 12 patients which may be not indicative of the impact of PRP on alveolar ridge preservation. This is in comparison with other studies[13,16] where 30 patients were recruited to demonstrate similar effect.

Three studies demonstrating the effect of PRP on prevention of dry socket. All these studies[35-37] indicated that PRP reduced the incidence of dry socket and promoted soft-tissue healing. In two of these studies,[35,37] patients were followed up to 15 days and these studies stated that healing of soft tissue occurred within this time period; whereas the study of Alissa *et al*.[36] demonstrated that PRP was able to prevent dry socket but not bone regeneration despite the fact that the patients were followed up to 3 months. However, these studies did not mention whether PRP was used alone or in combination with other bone substitutes.

Two studies evaluated the effect of PRP on the treatment of bony defect after surgical removal of cystic lesion or benign tumor of the jaws. In these studies,[38,39] PRP was used in the gel form to manage bony defect. The findings of these studies were controversial as the study of Supriya *et al*.[38] stated that PRP enhanced bone regeneration after 6-month follow-up, whereas the study of Ramanathan and Cariappa[39] showed that PRP had an insignificant effect on bone formation. These differences among the studies may be due to the differences in the size of the bony defect or the PRP-containing system or patient's age recruited in the studies. It has been stated that healing of bony defect depends on many factors such as anatomical site, patient's age, nature of the bony defect whether mono- or bicortical defect, hormonal secretion, periosteal integrity and blood supply.[38] Many studies indicated that spontaneous healing of bony defect after removal of cystic lesion or benign tumors may take 2 years.[42-44] However, other studies showed that this period was reduced to 6 months after using PRP gel.[45-47] It is worth to mention that two articles may be not enough to justify whether PRP enhanced bone formation after cystic removal or not.

Two studies evaluated the effect of PRP on the ridge augmentation.[27,28] In these studies, PRP was used with cancellous allograft[27] and ABB and titanium mesh.[28] The formal study showed that there was an increase in bone width apical to the crest of the ridge, while the latter revealed that PRP had no effect on ridge augmentation. It is difficult to justify whether PRP has an influence on ridge augmentation or not based on two studies. In addition to that, the PRP-containing system was different in both these studies. Therefore, the judgment on the effect of PRP on ridge augmentation needs further studies to reach the final conclusion.

Conclusion

PRP improved soft-tissue healing and bone regeneration after surgical extraction of lower wisdom tooth but had no effect on inflammatory response (pain, swelling and bleeding). PRP decreased the depth of periodontal pocket but not improved CAL. Implant stability and ridge height were maintained using PRP. PRP reduced the incidence of dry sockets in susceptible patients and there is no justification for the effect of PRP on bone regeneration in a bony defect after cystic removal or ridge augmentation. Further studies should be conducted to support the usage of PRP in dental and oral surgical procedures.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Singer AJ, Clark RA. Cutaneous wound healing. N Engl J Med 1999;341:738-46.
2. Nurden AT. Platelets, inflammation and tissue regeneration. Thromb Haemost 2011;105 Suppl 1:S13-33.
3. Liu T, Jin Y. Development of tissue engineering dermal materials without cells. Guo Ji Sheng Wu Xue Zha Zhi 2006;29:170-73.
4. Oudelaar BW, Peerbooms JC, Huis In 't Veld R, Vochteloo AJH. Concentrations of blood components in commercial platelet-rich plasma separation systems: A review of the literature. Am J Sports Med 2019;47:479-87.
5. Mohammadi R, Mehrtash M, Mehrtash M, Hassani N, Hassanpour A. Effect of platelet rich plasma combined with chitosan biodegradable film on full-thickness wound healing in rat model. Bull Emerg Trauma 2016;4:29-37.
6. Marx RE. Platelet-rich plasma: Evidence to support its use. J Oral Maxillofac Surg 2004;62:489-96.
7. Everts PA, Knape JT, Weibrich G, Schönberger JP, Hoffmann J, Overdevest EP, *et al*. Platelet-rich plasma and platelet gel: A review. J Extra Corpor Technol 2006;38:174-87.
8. Coviello V, Peluso F, Dehkhargani SZ, Verdugo F, Raffaelli L, Manicone PF, *et al*. Platelet-rich plasma improves wound healing in multiple myeloma bisphosphonate-associated osteonecrosis of the jaw patients. J Biol Regul Homeost Agents 2012;26:151-5.
9. Mishra A, Pavelko T. Treatment of chronic elbow tendinosis with buffered platelet-rich plasma. Am J Sports Med 2006;34:1774-8.
10. Park KY, Kim IS, Yeo IK, Kim BJ, Kim MN. Treatment of refractory venous stasis ulcers with autologous platelet-rich plasma and light-emitting diodes: A pilot study. J Dermatol Treat 2013;24:332-5.
11. Nikolidakis D, van den Dolder J, Wolke JG, Jansen JA. Effect of platelet-rich plasma on the early bone formation around Ca-P-coated and non-coated oral implants in cortical bone. Clin Oral Implants Res 2008;19:207-13.
12. Carlson NE, Roach RB Jr. Platelet-rich plasma: Clinical applications in dentistry. J Am Dent Assoc 2002;133:1383-6.
13. Nisar N, Nilesh k, Parkar MI, Punde *P* Extraction socket preservation using collagen plug combined with platelet rich plasma (PRP): A comparative clinico-radiographic study. J Dent Res Dent Clin Dent Prospects 2020;14:133-40.
14. Orabee A, Hindy A, Elsharkawy R, Omar M. Evaluation of calcium sulfate and platelet-rich plasma as an osteoinductive biomaterial for jaw bone regeneration and ridge preservation after extraction. Egy J Oral Maxillofac Surg 2013;4:78-81.
15. Isaia L, Isaia B, Traini T, Isaia F. The effects of the combined use of platelet-rich plasma and xenograft on alveolar socket healing. Biomed J Sci Tech Res 2018;3:1-9.
16. Soni HC, Raghuveer HP, Kumar DR, Shobha ES, Prashanth NT, Rangan R, *et al*. Evaluation of bone healing and ridge preservation in mandibular and platelet rich fibrin-A clinical and radiological study. Int J Curr Res 2018;10:68639-46.
17. Jalaluddin MD, Singh DK, Jayanti I, Kulkarni P, Faizuddin M , Tarannum F. Use of platelet rich plasma in the management of periodontal intra-osseous defects: A clinical study. J Int Soc Prev Community Dent 2017;7:105-15.
18. Döri F, Arweiler N, Húszár T, Gera I, Miron RJ, Sculean A. Five-year

results evaluating the effects of platelet-rich plasma on the healing of intrabony defects treated with enamel matrix derivative and natural bone mineral. J Periodontol 2013;84:1546-55.
19. Pradeep AR, Rao NS, Agarwal E, Bajaj P, Kumari M, Naik SB. Comparative evaluation of autologous platelet-rich fibrin and platelet-rich plasma in the treatment of 3-wall intrabony defects in chronic periodontitis: A randomized controlled clinical trial. J Periodontol 2012;83:1499-507.
20. Ozdemir B, Okte E. Treatment of intrabony defects with beta-tricalciumphosphate alone and in combination with platelet-rich plasma. J Biomed Mater Res B 2012;100B: 976-83.
21. Hassan KS, Alagl AS, Abdel-Hady A. Torus mandibularis bone chips combined with platelet rich plasma gel for treatment of intrabony osseous defects: Clinical and radiographic evaluation. Int J Oral Maxillofac Surg 2012;41:1519-26.
22. Gopinath A, Ravikanth A, Kadiyala K, Thota K, Manne P, Babu M. Effect of platelet rich plasma on stability of dental implants: A prospective comparative clinical study. J Dr NTR Univ Health Sci 2017;6:107-13.
23. ArRejaie A, Al-Harbi F, Alagl AS, Hassan KS. Platelet-rich plasma gel combined with bovine-derived xenograft for the treatment of dehiscence around immediately placed conventionally loaded dental implants in humans: Cone beam computed tomography and three-dimensional image evaluation. Int J Oral Maxillofac Implants 2016;31:431-8.
24. Georgakopoulos I, Tsantis S, Georgakopoulos P, Korfiatis P, Fanti E, Martelli M, *et al*. The impact of platelet rich plasma (PRP) in osseointegration of oral implants in dental panoramic radiography: Texture based evaluation. Clin Cases Miner Bone Metab 2014;11:59-66.
25. Kundu R, Rathee M. Effect of platelet-rich-plasma (PRP) and implant surface topography on implant stability and bone. J Clin Diag Res 2014;8:ZC26-30.
26. Ergun G, Egilmez F, Cekic-Nagas I, Karaca IR. Effect of platelet-rich plasma on the outcome of early loaded dental implants: A 3-year follow-up study. J Oral Implantol 2013;39:256-63.
27. Eskan MA, Greenwell H, Hill M, Morton D, Vidal R, Shumway B, *et al*. Platelet-rich plasma-assisted guided bone regeneration for ridge augmentation: A randomized, controlled clinical trial. J Periodontol 2014;85:661-8.
28. Torres J, Tamimi F, Alkhraisat MH, Manchón A, Linares R, Prados-Frutos JC, *et al*. Platelet-rich plasma may prevent titanium-mesh exposure in alveolar ridge augmentation with anorganic bovine bone. J Clin Periodontol 2010;37:943-51.
29. Joy D. Efficacy of PRP in Third Molar Impaction. Master thesis. Rajas Dental College, Kavalkinaru; 2013.
30. Dutta SR, Passi D, Singh P, Sharma S, Singh M, Srivastava D. A randomized comparative prospective study of platelet-rich plasma, platelet-rich fibrin, and hydroxyapatite as a graft material for mandibular third molar extraction socket healing. Natl J Maxillofac Surg 2016;7:45-51.
31. Rutkowski MJ, Sughrue ME, Kane AJ, Ahn BJ, Fang S, Parsa AT. The complement cascade as a mediator of tissue growth and regeneration. Inflamm Res 2010;59:897-905.
32. Kaul RP, Godhi SS, Singh A. Autologous platelet rich plasma after third molar surgery: A comparative study. J Maxillofac Oral Surg 2012;11:200-5.
33. Gandevivala A, Sangle A, Shah D, Tejnani A, Sayyed A., Khutwad G. Autologous platelet-rich plasma after third molar surgery. Ann Maxillofac Surg 2017;7:245-9.
34. Singha S, Dhirawani R, Asrani S, Agrawal A, Taank J. Evaluation of treatment outcome after impacted mandibular third molar surgery with and without autologous platelet concentrates. SRM J Res Dent Sci 2019;10:P-72-77.
35. Prataap N, Sunil PM, Sudeep CB, Ninan VS, Tom A, Arjun MR. Platelet-rich plasma and incidence of alveolar osteitis in high-risk patients undergoing extractions of mandibular molars: A case-control study. J Pharm Bioallied Sci 2017;9 Suppl 1:S173-9.
36. Alissa R, Esposito M, Horner K, Oliver R. The influence of platelet-rich plasma on the healing of extraction sockets: An explorative randomised clinical trial. Eur J Oral Implantol 2010;3:121-34.
37. Pathak S, Singh C, Mishra S, Sharma S. Platelet rich plasma, a useful tool to avoid postoperative complications after impacted mandibular third molar surgery. Nat J Med Dent Res 2016;4:168-72.
38. Supriya GP, Kotrashetty SM, Umarani M. Evaluation of efficacy of platelet rich plasma in healing of maxillofacial bony defects: A comparative *in-vivo* study. Acta Sci Dent Sci 2018;2:26-31.
39. Ramanathan A, Cariappa KM. Effect of platelet-rich plasma on bone regeneration after Removal of cysts and benign tumours of the jaws. Oral Maxillofac Surg 2018;18:445-52.
40. Franchini M, Cruciani M, Mengoli C, Masiello F, Marano G, D'Aloja E, *et al*. The use of platelet-rich plasma in oral surgery: A systematic review and meta-analysis. Blood Transfus 2019;17:357-67.
41. Furst G, Gruber R, Tangl S, Zechner W, Haas R, Mailath G, *et al*. Sinus grafting with autogenous platelet-rich plasma and bovine hydroxyapatite. A histomorphometric study in minipigs. Clin Oral Implants Res 2003;14:500-8.
42. Motta JJ, Chiapasco M, Rossi A, Crescentini M. Spontaneous bone regeneration after enucleation of large mandibular cysts: A radiographic computed analysis of 27 consecutive cases. J Oral Maxillofac Surg 2000;58:942-9.
43. Hanan MS, Ghada AK. Assesment of bone healing in large bone defects after enucleation of jaw cysts without using any graft material using direct digital radiography and CT scan (clinical study). Cairo Dent J 2009;25:35-42.
44. Hern N, Milijavec M. Spontenous bone healing of large bone defect in mandible. Int J Oral Maxillofac Surg 2008;37:1111-6.
45. Betea RR. Limitation of autografts and allograft: A new synthetic solution. Orthopedics 2002;25:561-70.
46. Cieslik-Bielecka A, Bielecki T, Gazdzik TS, Cieslik T, Szczepanski T. Improved treatment of mandibular odontogenic cysts with platelet-rich gel. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008;105:423-9.
47. Vivek GK, Sripathi Rao BH. Potential for osseous regeneration of platelet rich plasma: A comparitive study in mandibular third molar sockets. J Maxillofac Oral Surg 2009;8:308-11.