Original Article National Journal of Medical and Dental Research, April-June 2016: Volume-4, Issue-3, Page 168-172

PLATELET RICH PLASMA, A USEFUL TOOL TO AVOID POST OPERATIVE COMPLICATIONS AFTER IMPACTED MANDIBULAR THIRD MOLAR SURGERY

Sachin Pathak[A], Chandra Vijay Singh[B], Tanushree[C], Saurabh Mishra[D], Shalini Sharma[E]

[A] - *Associate professor, Department Of Dental Sciences, SRMSIMS, Bareilly*

[B] - *Reader, Department of Endodontics and Conservative Dentistry, Institute of Dental Sciences, Bareilly*

[C] - *Assistant professor, Department of Dental Science, SRMSIMS, Bareilly*

[D] - *Government Dental Surgeon, Moradabad*

[E] - *Director, Sri Sai Dental Clinic, Bareilly*

Oral and Maxillofacial Surgery

Corresponding Address

Dr Sachin Pathak
712 janakpuri izzatnager bareilly (U.P.) Pin 243122
drsachinpathak@gmail.com
Mobile: 09458702337

Abstract:

Introduction: Impacted mandibular third molar removal is the most common surgical procedure performed in maxillofacial surgical practice and commonly it is associated with some unwanted post operative complications. Reduction of these complication incidences is primary goal of any operator for uplifting his surgical skill as well as patient comfort perspective. Platelet rich plasma now days used as a beneficial tool to facilitate wound healing because of having multiple growth factors and easily extracted from patients blood. The purpose of this study is to find if platelet rich plasma is beneficial to reduce the incidence of post operative pain, dry socket, wound infections, and promotes healing of the wound created after extraction .

Material and methods: A total no. of 20 patients having almost same bilateral impacted mandibular third molars randomly selected from the population. Both the impacted third molars were removed at the same appointment and patient was looked for desired variables on regular recall visits

Conclusion: In this study we found that platelet rich plasma is an effective tool for promoting wound healing, avoid occurrence of dry socket, and reducing post operative pain while it does not had a significant effect to prevent post operative wound infections.

Keywords: Platelet rich plasma, dry socket, third molar

Introduction:

Platelet rich plasma is a concentrate of platelet suspended in plasma.[1] It is defined as high concentrate of autologous platelet in small volume of autologous plasma.[2,3] Now a day it is considered as a good tool in regenerative medicine. It is also used in various other medical fields as like burn dressings and for hair follicle regeneration. Use of PRP is becoming popular in different medical fields because it is a very less time consuming and cost effective method to provide accelerated wound healing without altering the cell cycle so minimal or no risk of malignancy.

Use of PRP in oral and maxillofacial surgery is also very vast and it is used as filling of post extraction socket to more complex surgery involving bone regeneration and sinus elevation. First article that quotes the use of PRP in oral surgery was published in 1977 by whiteman et al.[4] It stated that through activation of platelet in platelet gel, and the subsequent release of growth factor explains acceleration in surgical wound healing.

Platelet rich plasma has been also used with success in the most commonly performed surgical procedure in oral and maxillofacial surgery i.e. removal of mandibular third

molar. Often extraction of mandibular third molar is associated with some unwanted complications like post operative pain, trismus, inferior alveolar nerve injury and dry socket. Many attempts has been made to predict and limit the post operative complications and improve post operative healing

Although there is limited work done with platelet rich plasma in the field of oral and maxillofacial surgery yet it is well known for its healing abilities.

The purpose of this study is to evaluate the effect of platelet rich plasma not only on wound healing but also on occurrence of other complications like post operative pain, dry socket, and other post operative wound infections.

Material and methods:

All 20 patients were randomly selected from the population needs to go for extraction of both right and left mandibular impacted third molars (N=40) with similar padderson difficulty index and approximately same depth and type of infection. Difficulty index of both the teeth needs to go for the extraction was noted at the time of diagnostic radiographs and screening.

All the patients involved in this study were between ages of 18-40 years with unmarkeble medical history and were non smokers and female patients not on oral contraceptives.

At the time of surgery patient is asymptomatic or made asymptomatic by standard antibiotic regimen. An informed consent is to be signed by the patient before surgery indicating that data collected from him can be used for further study and he willingly want to be a part of this study.

Preparation of PRP:

In this study PRP was prepared as the guidelines of American association of blood bank technical manual.[5]

10ml whole blood is being drawn in a tube with anticoagulant. The solution centrifuged at 160 G for 10 min at 22 degree C. RBC settled down to leave clear plasma and Buffy coat. This plasma and buffy coat pipette out and re centrifuged at 400 g for 10 minutes. This separated upper platelet poor layer and lower PRP, reduce PPP to one fourth of its volume and remaining solution is PRP.[6]

Both the impacted third molars were removed at the same appointment. Standard surgical process with bone guttering by cutting bur and tooth sectioning was followed for extracting the tooth. Case side was closed by 3'0 silk suture and on the controlled side gelfoam socked with autologous PRP was placed and sutured with 3'0 silk sutures.

Every patient was prescribed with same standard antibiotic regime for 5 days.

Suture cutting done on 7th day

		T test for equality of means			
		t	**Significance (2-tailed)**	**Mean Difference**	**Std. error difference**
Soft tissue healing	Equal variances assumed	2.307	.027	1.750	.759
	Equal variances not assumed	2.307	.027	1.750	.759
Pain	Equal variances assumed	2.455	.019	.850	.346
	Equal variances not assumed	2.455	.019	.850	.346
Post operative infections	Equal variances assumed	1.435	.159	.150	.105
	Equal variances not assumed	1.435	.162	.150	.105
Dry socket	Equal variances assumed	2.147	.038	.250	.116
	Equal variances not assumed	2.147	.041	.250	.116

Post operative pain was recorded 6hr. post op. on VAS scale. Patient follow up was done on 3rd day to check for alveolar osteitis 5th day, 7th day, 10th day, 15th day for note down soft tissue healing time and other post op infections

Results:

Out of total 40 extractions (N=40), 20 cases selected randomly to receive PRP after extraction and other side did not receive any PRP and variables were noted. The collected data was analyzed by using SPSS 21 software. Level of significance was calculated by using independent sample t test to see if there was a relationship between use of PRP and different variables (soft tissue healing, pain 6 hour post operatively, occurrence of dry socket and post op infections at the operated site). Soft tissue healing (level of significance =.027), pain 6 hours post operatively (level of significance =.019) and occurrence of dry socket (level of significance =.038, .041) found to be significantly related with application of PRP but somehow in our study we did not found any significant relationship between post op infections and platlet rich plasma application (level of significance = .169 & .162)

Discussion:

Platelets besides taking part in simple homeostasis perform several functions. Platelets contain important growth factors when got secreted, results in increase collagen production, increase in cell mitosis recruiting other cells to the site of injury increase in vascular in growth and induction of cell in growth, all of these are the crucial steps in wound healing. So increasing the number of platelets at the site of injury result into indirectly increasing the concentration of growth factors at the site thus providing rapid and better bone healing, Whitman et al[4] suggested PRP as fibrin glue for faster soft tissue healing.

When to call a concentrated platelet solution as PRP is a matter of confusion till date, several criteria were suggested to define a concentrated platelet solution as platelet rich plasma. Marx et al[2,3] establish a clinical benchmark as a definition of PRP and that is well accepted too. According to Marx the concentration of platelet is to be 4 to 5 times higher in PRP than in normal number of platelets in blood.

In this study we found a direct significant relationship between times of healing of soft tissue is considerable lower in groups treated with PRP than the group which does not receive PRP. Injury activate clotting mechanism resulting into adherence of platelets ultimately forming fibrin mesh and subsequently release growth factors and cytokines. Platelets are the bags full of at least 15 types of growth factors including platelet derived growth factor(PDRF) with its isoforms, transforming growth factor beta (TGF BETA) and its isoforms, platelet factor4(PF4), interlukins 1(IL-1), platelet derived angiogenesis factor(PDAF),vascular endothelial growth factor (VGEF),epidermal growth factor(EGF) platelet derived endothelial growth factor(PDEGF), epithelial cell growth factor(ECGF), insulin like growth factor(IGF),osteocalcin(Oc), osteonectin(On), fibrinogen (Fg), fibrinonectin(Fn),and thrombospontin-1(TSP-1).[7]

Release of these all growth factor at the site of injury is an obvious cascade in wound healing mechanism and these factors when released facilitate healing of soft and hard tissues at the injury site. Platelet rich plasma having four to five times more concentration of platelets when applied to the injured site makes the normal growth factors to be several times higher in quantity. And as EGF, ECGF, PDEGF have definitive role in epithelial cell migration and acceleration of healing cascade at the injury.

In the study of 60 patients DUTTA SR et al[8] in 2015 found that the site receiving PRP had significantly improved soft tissue healing. Although in small sample size of 10 patients Vivek GK and Sripati Rao in 2009[9] also proposed the same results.

Pain is a factor that is of prime consent for the patient before and after the procedure. In this study patients reported significantly less pain on the side that receives PRP than the control site. The possible explanation of this may be as suggested by Xie et al (2014)[10] in their study. Authors suggested that in spite of anti inflammatory molecules PRP also contains some pro inflammatory cytokines such as IL-1alpha, IL-1 beta, TNF alpha, IL-6,IL-8, IL-17 and IL-18 but the concentration of these are very much less than their inflammatory counterparts.[11] IL-1 beta is the only pro inflammatory cytokine that show slight increase in concentration after application of PRP where as anti inflammatory molecule such as IL-4 and IL-10 showed 4 to 5 times of raised concentration.[12] These sequel of events described that after application of PRP there is slight increase in inflammatory activity that is soon suppress by

marked anti inflammation.

Kuffler DP (2013)[13] in his study found that not only by anti inflammatory effect PRP also reduce neurogenic pain by wound repair and axonal regeneration. The research papers of Andia l (2013)[14], Namazi H (2016)[15] and Hegab AF(2015)[16] also establish PRP as an effective tool for pain reduction in different pathological conditions.

Alveolar osteitis is a common complication after extraction of impacted third molar its incidence is between 0.5% to 68.1% following removal of permanent teeth, it is characterized by severe painful condition that begins within 3-5 post operative days and usually refractory to NSAID and narcotic analgesics.[17,18] Clinical presentation of AO is demonstrated as partial or total disintegration of intra alveolar sanguine clot resulting in a denuded bony crypt with surrounding debris.[19,20] A definitive etiology of AO is not very clear common acceptance is fibrinolysis of clot as a result of bacterial invasion.

Rutkowsky et al (2007)[21]with a large sample size of 904 extractions did a landmark study to establish a significant relationship between use of PRP and incidence of alveolar osteitis. In his published paper in 2007 also proposed that Presence of various growth factors in platelet rich plasma resulting into cell mitosis and differentiation reflected as faster healing of both hard and soft tissues. PRP also promote clot formation and there are some white blood cells left in PRP while preparation of solution, inhibit bacterial growth. Mancuso JD et al in 2003 in his published article confirms use of PRP in the sockets of lower third molars to decrease in incidence of AO.[22]. Afshin haraji et al(2012)[23]and Alissa rami(2010)[24], in their studies also confirmed the same.

In this study incidence of wound infection were found to be 17.5% and it does not have a statistically significant relationship with placement of PRP.

Cristina Borona Dorado et al[25] in their paper quoted that there is low risk of infection and immunological reaction with PRP use as platelets play important role in host defense mechanism due to release of a signaling peptide that attract macrophage. This theory appears convincing but in our study any statistical significant relationship could not be established between wound infection and use of PRP. Aseptic procedure environment, proper use of antibiotics and detailed explanation of instructions might be a cause to cut down the occurrence rate of wound infection.

References:

1. Pushker d Gawande, Rajshekhar Halli Efficacy of platelet rich plasma in bone regeneration after surgical removal of impacted bilateral third molar. Pilot study. J Maxillofacial oral Surgery 2009.8(4),301-307.

2. Marx RE.,Platelet rich plasma,evidence to support Its use. O Oral and Maxillofacial Surgery. 200462,489-96.

3. Marx RE.,Platelet rich plasma(PRP),what is PRP and what is not PRP?.Implant Dent,2010,225-8.

4. Whitman DH, Berry RL, Green DM, Platelet gelan autologous alternative of fibrin gluewith application in oral and maxillofacial surgery. Journal of Oral and maxillofacial Surgery 1997,55,1294-9.

5. American association of blood banks technical manual committee method 6.11, Preparation of platelet from whole blood In,Vengelen Tyler V, editor AABB technical manual, 13th edition. Bethedsha (MD), American association of blood banks 1999,p. 725.

6. Arshdeep M.SendhilKumaran,Platelet rich plasmain dermatology-Boon or Bane?, Indian Journal of Dermatology, Venereology, and Leprology, Jan-Feb2014,Vol80,Issue 1, 5-14.

7. Baeyens W,Glineur R, Evrard L., the use of platelet concentrate-platelet rich plasma(PRP) and platelet rich fibrin(PRF) in bone reconstruction prior to dental implant surgery.J Maxillofacial and Oral Surgery,2015,jun 14(2)-410-16.

8. Dutta S R, Singh P, Passi D, Patter P,mandibular third molar extraction woundhealind with and without platelet rich plasma, A comparative prospective study. J Maxillofacial and Oral Surgery,2015,sep,14(3)-808-15.

9. Vivek GK1, Sripathi Rao BH, Potential for osseous regeneration of platelet rich plasma: a comparitive

study in mandibular third molar sockets. J Maxillofac Oral Surg. 2009 Dec;8(4):308-11

10. Xuetao Xie, Changqing Zhang, Rocky S Tuan,Biology of platelet rich plasma and its clinical application in cartilage repair. Arthritis and research therapy 2014,16-204

11. Anida I,Sanchez M, Maffulli N, Joint pathology and platelet rich plasma therapies, Expert Opin Biol Ther 2012,(12) 7-22.

12. Bendinelli P, Matteucci E, Dogliotti G, Corsi MM, Benfi G, Maroni P, Desiderio MA, Molecular Basis Of Anti-inflammatory Action of Platelet Rich Plasma on Human Chondrocyts, Mechanism of NF kappa B inhibition via HGF. J Cell Physiology 2010,(225)757-766.

13. Kuffler DP, Platelet rich plasma and the elimination of neuropathic pain. Mol Neurobiology 2013 oct,48(2)315-32

14. Anida l, Maffulli N., Platelet rich plasma for managing pain and inflammation in osteoarthritis , Net Rev Rheumatol,2013, Dec 9 (12), 721-30.

15. Namazi H, Mehbudi A, investigating the effects of intra articular PRP injection on pain and function improvement in patients with distal radius fracture. Orthop Traumatol Surg Res 2016 feb,102 (1), 47-52.

16. Hegab AF, Ali HE, Elmasry M, Khallaf MG. platelet rich plasma injection as a effective treatment for temporomandibular joint osteoarthritis. J oral maxillofacial surg. 2015 sep 73 (9)1706-13.

17. Larson PE, Alveolar osteitis after surgical removal of impacted mandibular third molars, identification of the patient at risk. Oral Surg Oral Med Oral Pathol 1992,73,393-97.

18. Torres- Lagares D, Serrea Figallo MA, Romero Rutz MM, Infante Cossio P, Garcia Calderon M, Gutierrez Perez JL. Update on dry socket A review of the literature. Med Oral Pathol Oral Cir Bucal 2005,10,77-85

19. Houston JP, McCollum J, Pietz D, Schneck D. Alveolar osteitis: a review of its etiology, prevention, and treatment modalities. Gen Dent. 2002;50:457–463.

20. Blum IR. Contemporary views on dry socket (alveolar osteitis): a clinical appraisal of standardization, aetiopathogenesis and management: a critical review. Int J Oral Maxillofac Surg. 2002; 31:390–317.

21. James L. Rutkowski,; James W. Fennell, ; John C. Kern,; Dana E. Madison; David A. Johnson, Inhibition of alveolar osteitis in mandibular tooth extraction site using platelet rich plasma, Journal of oralimplantology 2007 vol 33(3) pg. 116-121.

22. Mancuso JD, Bennion JW, Hull MJ, Winterholler BW. Platelet-rich plasma: A preliminary report in routine impacted mandibular third molar surgery and the prevention of alveolar osteitis. J Oral Maxillofac Surg. 2003;61 Suppl:40.

23. Afshin Haraji, Eshagh Lassemi, Mohammad Hosein Kalantar Motamedi, Maryam Alavi, Saman Adibnejad, Effect of plasma rich growth factor in alveolar osteitis. Natl J maxillofacial Surg, 2012 Jan-Jun,3(1), 38-41

24. Alissa Rami, Esposito Mraco, Horner, Keith, Oliver, Richard, The influence of platelet rich plasma on the healing of exctraction sockets, an explorative randomized clinical trial, Eur J Oral Implant 2010,3,(2), 121-34

25. Cristina barona dorado, Iria Gonzalez reguerio, Maria martin ares, Oscar arias lrimia, jose M.martinez Gonzalez, efficacy of platelet rich plasma applied to post extraction retained third molar alveoli, A systemic review.