Clinical and Experimental Health Sciences

Efficacy of Platelet-Rich Fibrin on Outcome of 3rd Molar Extraction Mayo Hospital Lahore

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Abstract
There are many reasons for which extraction of teeth is performed, like caries making tooth non-restorable, periodontal disease, trauma, root fracture, acute infection impaction/orthodontic reasons. Impacted 3rd molar extraction is common surgical procedure performed by oral & maxillofacial surgeons. **Objective:** To compare the outcome of 3rd molar impaction surgery with and without platelet rich fibrin. **Study design:** Randomized controlled trial. **Setting:** Department of Oral & Maxillofacial Surgery, Mayo Hospital, Lahore. **Duration of study: 0**6 months from 30th Dec 2022 to 30th Jun2023. **Subjects and methods:** 116 patients fulfilling the inclusion criteria were selected in this study. The patients were randomly divided in two groups, in group A, patients were undergone surgery with L-PRF. In group B, patients were undergone surgery without L-PRF. Data was recorded on structured proforma according to visual analogue scale and alveolar osteitis respectively. **Results:** In this present study, from 116 patients, it was observed that the minimum age was 17 years and maximum age was 35 years. The minimum pain score was 0 and maximum was 2 with mean and standard deviation was 0.74 ± 0.712. There were 67 (57.8%) male patients and 49 (42.2%) were female patients. Alveolar Osteitis was developed in 15 (12.9%) patients while it was not developed in 101 (87.1%) patients. Significant association was found regarding Alveolar Osteitis in both groups with p-value = 0.013. **Conclusions:** Within the limitations of the present study, with PRF application after third molar impaction surgery is a good biologic material that reduces postoperative pain and alveolar osteitis as compared to without platelet rich fibrin. Keywords: Platelet-Rich Fibrin, Molar Extraction, Alveolar Osteitis

Introduction

Since the first description by Choukroun in 2000, platelet-rich fibrin(PRF) has become an important surgical adjuvant in oral surgical procedures. Infact, only after the publication of five important articles in 2006, this biomaterial gained highlight in the field of dental research.[1,2] To date, more than 500 scientific articles have been published on this subject.Some of the possible recommendations to use this biomaterial in oral surgical procedures are third molar surgery, alveolar ridge preservation after tooth extractions, sinus lift procedure, repair of alveolar cleft, dental implants, surgical treatment of medication-related osteonecrosis of the jaw and treatment of oroantra lcommunications.[3,4]

PRF is a second generation of platelet concentrate produced without biochemical blood manipulation, and basically constituted for three key parameters: first, the presence of platelets and its activated growth factors that are substantial embedding into the fibrin matrix during the natural polymerization process; second, the presence of leucocytes and its cytokines that contribute for anti-infectious action and for immune regulation of the healing process; third, the density and complex organization of the fibrin matrix architecture produced by a natural polymerization, .[5,6]

The strong fibrin architecture distinguishes it from other kinds of platelets concentrates, like platelet-rich plasma(PRP). This fibrin matrix seems responsible for the slow release of growth factors during proliferation stage of wound healing, over a period of 7-14 days, and it is composed of thin fibers with micropores that can serves as scaffold for cell migration and differentiation. PRF is an important reservoir of numerous growth factors to promote angiogenesis, such as transforming growth factor(TGF-3) and vascular endothelial growth factor (VEGF). There are still large amounts of platelet-derived growth factors(PDGFs) in platelet a-granules, which act as an essential regulator for collagen production and mesenchymal cell migration and proliferation.[7,8,9]

Extraction of mandibular third molars is one of the most frequently performed dental surgical procedures. While various surgical techniques and materials have been designed to accelerate the healing process after extraction, to date extractions specific to mandibular third molars remain those associated with the highest rate of potential complications. Specifically, alveolar osteitis(AO,drysocket) has been a well-known side effect following removal of mandibular third molars (especially those impacted) with well-known clinical manifestations including a partial or total disintegrated blood clot within the healing socket, resulting in prolonged inflammation, exposed bone, delayed healing ,and gradually increasing severity of pain.[10,11]

Reports from the literature suggests that while the incidence of AO has been reported relatively low in routine dental extractions, this rate has been reported much higher (3.9–29.6%) when focused specifically on mandibular third molars.[12,13]

Therefore, precautions and effective strategies should be employed to minimize patient discomfort and improve clinical outcomes with many predisposing factors, including pre-existing

systemic diseases, operative technique, smoking, oral contraceptives, anticoagulant medication, and poor oral hygiene and/or pre-existing local infection, being identified as risk factors increasing the rate of occurrence.[14,15]

One strategy that has gained popularity in recent years has been the use of platelet concentrates. While platelet rich plasma(PRP) was first utilized in regenerative medicine and dentistry owing to its supra-physiological doses of platelets and accompanying growth factors, more recently, its incorporation of anticoagulants has since been shown to interfere with the angiogenic and regenerative responses mediated by platelets. For these reasons, asecond generation platelet concentrate termed platelet rich fibrin (PRF) has been more favourably utilized with anticoagulant removal. A number of randomized clinical studies in various avenues of dentistry have further demonstrated its ability to either promote hard or soft tissues.[16]

Methods

STUDY DESIGN: Randomized controlled trial

SETTING: Department of Oral & Maxillofacial Surgery, Mayo Hospital, Lahore.

DURATION:6 months from 30th Dec 2022 to 30th Jun 2022.

SAMPLE SIZE: Sample size of 116 cases, 58ineachgroupiscalculatedwith80%powerofstudy, 95% confidence level, pain score of 0 with PRF and 0.52 ±1.41 without PRF.

SAMPLING TECHNIQUE: Non-probability, consecutive sampling

SAMPLESELECTION

Inclusion Selection: Patients of age between 17-35 years, both genders, with impacted mandibular 3rd molar undergoing 3rd molar impaction surgery (as per operational definitions)

Exclusion criteria:

- Presenceofperi-coronitis,peri-apicallesionwithrespecttoimpacted3rdmolar,oppositetraumaticoccluding/impingingupper3rdmolar
- Smoker sandalcoholics,systemicdisordersi.e.hypertension(BP ≥140/90mmHg),anddiabetes(BSR>200mg/dl),takingchemotherapy,radiotherapyorimmunosuppressivetherapyformalignancy,osteoporosisorHIVpositive patients.

DATACOLLECTIONPROCEDURE: Aftertakingapprovalfromhospitalethicalcommittee116 patientsfulfillingtheinclusioncriteriawillbeselectedinthestudyfromdepartmentoforalandmaxillofacialsurgery.Theywillberecruitedinthestudyafterwritteninformedconsent.Thepatient'sdemographicslikename,agegender,andlateralsidewillbenoted.Thenpatientswillberandomlydividedintwogroupsbyusinglotterymethod.IngroupA,patientswillundergosurgerywithL-PRF.IngroupB,patientswillundergosurgerywithoutL-PRF.Beforesurgicalextraction,two10mlbloodsamplesharvestedandcentrifugedat3000rpmappliancefor 10minutes.Theproductofcentrifugeprocesswillbetakentoatray/bowlinordertoseparateserumfromfibrinduringoneminute.IANB,Lingualnerveblockandlongbuccalnerveblockwillbegivenwith1-2%lignocainewithepinephrine.Mandibular3rdmolarwillbeextractedbystandardrules.Thewoundwillbeclosedafterbloodclotformationingroup Bwithvicyl3/0andingroupAafterplacementofL-PRFimmediatelywithvicryl3/0.Patientswillberecalleddonday1,3and7.Datawillberecordedonstructuredproformaaccordingtovisualanaloguescaleandalveolarosteitisrespectively(asperoperationaldefinition).Allthisinformationwillberecordedthroughproforma(attached).

DATAANALYSIS: Allthecollectedinformationwillbeenteredinto SPSS Version 26. Quantitativevariableslikeage,durationofprocedure,andpainwillbepresentedasmean+/-SD.Qualitativevariableslikegender,lateralside,andAlveolarOsteitiswillbepresentedasfrequencyandpercentages.Bothgroupswillbecompared for Alveolar Osteitis by usingchi-squaretest and pain score by t-test.P-value≤0.05willbetakenas-significant.Datawillbestratifiedforage, gender,lateralside,anddurationofprocedure.Post-stratification,bothgroupswillbecomparedforoutcomebyusingchi-squaretest and t-test respectively

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value≤0.05willbetakenassignificant.

Results

Descriptive statistics was shown in table 1. Percentage of gender was shown in graph 1.Tables2and3showthedescriptivestatisticsoflateral side and Alveolar Osteitisrespectively.Significant association was found regarding Alveolar Osteitis in both groups with p-value = 0.013 (Table 4).The Alveolar Osteitis in both group (Group A (with L-PRF), Group B (without L-PRF) was noted concerning age (below 25 years and above 25 years), it was found that there was a significant association for < 25 years old, but it was not significantly associated with ≥ 25 years old with p-value= 0.024 (Table 5). The Alveolar Osteitis in both group (Group A (with L-PRF), Group B (without L-PRF) was noted concerning gender, it was found that there was no significant association for male, but it was significantly associated with female patients having p-value= 0.033 (Table 6).The Alveolar Osteitis in both group (Group A (with L-PRF), Group B (without L-PRF) was noted concerning duration of procedure (below 25 min and above 25 min), it was found that there was no significant association between them (Table 7). By using independent sample t-test, comparison of mean pain score in both groups (Group A (with L-PRF), Group B (without L-PRF) was applied, it was found that there was a significant difference between them having p-value as 0.001 (Table 8). By using independent sample t-test and stratification of age, it was found that there was significant difference in both groups (Group A (with L-PRF), Group B (without L-PRF) regarding age and pain score (Table 9).Independent sample t-test was applied for both groups (Group A (with L-PRF), Group B (without L-PRF), there was significant difference between pain score and gender having p-value as 0.008 and 0.003 for male and female respectively (Table 10).It was found that there was significant difference in both groups (Group A (with L-PRF), Group B (without L-PRF) regarding pain score and duration of procedure (Table 11).

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Table 1. Descriptive Statistics

(n = 116)

	Minimum	Maximum	Mean	Std. Deviation
	17	35	25.99	4.898
ion of procedure	10	40	21.22	6.768
core	0	2	0.74	0.712

Graph 1. Pie chart of Gender

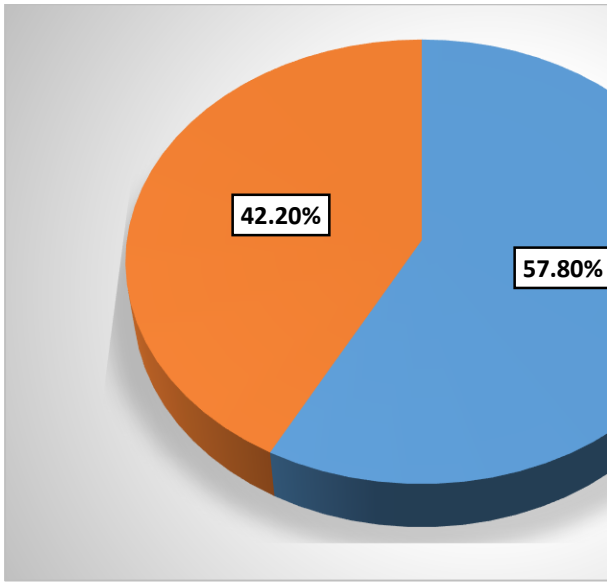

Table 2. Distribution of lateral side

Lateral side	Frequency	Percent
Left	45	38.8
Right	71	61.2
Total	116	100.0

Table 3. Distribution of Alveolar Osteitis

Alveolar Osteitis	Frequency	Percent
Developed	15	12.9
Not developed	101	87.1
Total	116	100.0

Table 4. Stratification of Alveolar Osteitis with respect to both groups

(n = 116)

p	Alveolar Osteitis		Total	P-value
	Developed	Not developed		
p A (with L-PRF)	3	55	58	0.013
p B (without L-PRF)	12	46	58	
	15	101	116	

Chi-square test was applied.

Table 5. Stratification of Alveolar Osteitis in both groups with regards to age (n = 116)

age	Group	Alveolar Osteitis		Total	p-value
		Developed	Not developed		
ears	Group A (with L-PRF)	2	22	24	0.220
	Group B (without L-PRF)	5	19	24	
ears	Group A (with L-PRF)	1	33	34	0.024
	Group B (without L-PRF)	7	27	34	
		15	101	116	

Table 6. Stratification of Alveolar Osteitis in both groups with regards to gender (n = 116)

nder	Group	Alveolar Osteitis		Total	p-value
		Developed	Not developed		
le	Group A (with L-PRF)	3	30	33	0.111
	Group B (without L-PRF)	8	26	34	
male	Group A (with L-PRF)	0	25	25	0.033
	Group B (without L-PRF)	4	20	24	
al		15	101	116	

Table 7. Stratification of Alveolar Osteitis in both groups with regards to duration of procedure (n = 116)

ration of ocedure	**Group**	**Alveolar Osteitis**		**Total**	**p-value**
		Yes	No		
5 min	Group A (with L-PRF)	2	42	44	0.141
	Group B (without L-PRF)	5	31	36	
5 min	Group A (with L-PRF)	1	13	14	0.083
	Group B (without L-PRF)	7	15	22	
al		15	101	116	

Table 8. Comparison of mean pain score in both groups

(n = 116)

Group	**n**	**Mean ± SD**	**P-Value**
Group A (with L-PRF)	58	0.48 ± 0.504	0.001
Group B (without L-PRF)	58	1.00 ± 0.795	

Independent T-test applied

Table 9. Comparison of mean pain score in both groups with respect to age

(N = 60)

ge	**Group**	**n**	**Mean ± SD**	**P-Value**
25 years	Group A (with L-PRF)	24	0.38 ± 0.495	0.009
	Group B (without L-PRF)	24	0.92 ± 0.830	
25 years	Group A (with L-PRF)	34	0.56 ± 0.504	0.002
	Group B (without L-PRF)	34	1.06 ± 0.776	

Independent T-test applied

Table 10. Comparison of mean pain score in both groups with respect to Gender

(N = 60)

der	Group	n	Mean ± SD	P-Value
e	Group A (with L-PRF)	33	0.52 ± 0.508	0.008
	Group B (without L-PRF)	34	0.94 ± 0.736	
ale	Group A (with L-PRF)	25	0.44 ± 0.507	0.003
	Group B (without L-PRF)	24	1.08±0.881	

Independent T-test applied

Table 11. Comparison of mean pain score in both groups with respect to duration of procedure (N = 60)

ation of cedure	**Group**	**n**	**Mean ± SD**	**P-Value**
min	Group A (with L-PRF)	44	0.48 ± 0.505	0.044
	Group B (without L-PRF)	36	0.78 ± 0.797	
min	Group A (with L-PRF)	14	0.50 ± 0.519	0.001
	Group B (without L-PRF)	22	1.36±0.658	

Independent T-test applied

Discussion

Significant association was found regarding Alveolar Osteitis in both groups with p-value = 0.013 (Table 4).The Alveolar Osteitis in both group (Group A (with L-PRF), Group B (without L-PRF) was noted concerning age (below 25 years and above 25 years), it was found that there was a significant association for < 25 years old, but it was not significantly associated with ≥ 25 years old with p-value= 0.024 (Table 5). The Alveolar Osteitis in both group (Group A (with L-PRF), Group B (without L-PRF) was noted concerning gender, it was found that there was no significant association for male, but it was significantly associated with female patients having p-value= 0.033 (Table 6). The Alveolar Osteitis in both group (Group A (with L-PRF), Group B (without L-PRF) was noted concerning duration of procedure (below 25 min and above 25 min), it was found that there was no significant association between them (Table 7). By using independent sample t-test, comparison of mean pain score in both groups (Group A (with L-PRF), Group B (without L-PRF) was applied, it was found that there was a significant difference between them having p-value as 0.001 (Table 8). By using independent sample t-test and stratification of age, it was found that there was significant difference in both groups (Group A (with L-PRF), Group B (without L-PRF) regarding age and pain score (Table 9).Independent sample t-test was applied for both groups (Group A (with L-PRF), Group B (without L-PRF), there was significant difference between pain score and gender having p-value as 0.008 and 0.003 for male and female respectively (Table 10).It was found that there was significant difference in both groups (Group A (with L-PRF), Group B (without L-PRF) regarding pain score and duration of procedure (Table 11).

Platelet-rich fibrin is characterized by the slow polymerization during itspreparation that generate a fibrin network very similar to the natural one that enhances cell migration and proliferation. Being a reservoir of platelets,leukocytes, cytokines and immune cells, PRF is reported to allows slow releaseof cytokines; TGF, PDGF, VEGF, and EGF which play a critical role onangiogenesis and tissue healing and cicatrization. PRF also reported toenhance angiogenesis, support immunity, and to enhance the coverage of injuredtissues through its positive effect on epithelial cells and fibroblasts. Although, PRF preparation is simple, inexpensive process, and require noadditives, rapid blood handling is an important factor in success of itspreparation. Failure in quick handling of the blood sample results in a diffusepolymerized fibrin within the glass tube and only a small blood clot withoutconsistency will be obtained. In previous study, considering the socket complications, PRF significantly reduced theincidence of alveolar osteitis (AO) compared with the control group (P= 0.037). However, therewere no significant differences between the two groups regarding the incidence of infected or inflamed sockets (P= 1.00 and 0.312 respectively).

Complications following third molar surgery are not uncommon. Pain anddelayed healing are perhaps the most frequently encountered complications. AOis a painful and relatively common complication that necessitates

interventionfor treatment. The incidence of AO following removal of ILTMs varies from 7to 32.6%. In accordance with the previous studies, an incidence of AO was found in Group A (with L-PRF) was 5% (3/58) and in Group B (without L-PRF) was found in 20 (12/58) in the present study. The positive role of PRF in the prevention of AO was alsoreported by Hoaglin and lines and Eshgbpour et al. [17]

Relief of postoperative pain is an essential criterion in the overall successof tooth extraction. In addition, most of the potential postoperativecomplications are in fact manifested as pain. In the present study, the degree ofpain was measured using the VAS forpain relief. This study revealed that L-PRF significantly reduced postoperativepain following surgical removal of impacted thirdmolars. This is in agreement with otherstudies[18]. Hoaglin and Lines investigatedthe number of alveolar infection including AO with/without PRF. It was found that placement of PRF within the extraction sitewas associated with a 1.0 % rate of AO versus 9.5 % in the controlsite (nearly a 10 fold reduction). There was asignificant reduction in pain associated with AO at 3 and 7 dayspost-PRF placement, a marked decrease in the degree of inflammation at 3 days and better wound healing by the 2nd week. [19] Similarly, Yüce and colleagues found that PRF application in alreadyexisting AO cases demonstrated rapidly and continually reducedpain intensity at each respective time when compared to the control [20] [17]

Conclusion

Within the limitations of the present study, with PRFapplication after third molar impaction surgery is a good biologic material thatreduces postoperative painand alveolar osteitis as compared to without platelet rich fibrin.

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