

Comparative Assessment of Alveolar Osteitis Following Mandibular Third Molar Surgery With and Without Using Platelet Rich Fibrin

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Abstract

Objective: To compare the frequency of alveolar osteitis with and without application of PRF in the extracted socket after lower wisdom extraction.

Methodology: A randomized controlled trial conducted in the Department of Oral and Maxillofacial surgery, PIMS, Islamabad from 01 November 2017 to 30 July 2019 to compare the frequency of alveolar osteitis with and without use of Platelet-rich fibrin after mandibular third molar removal. Study participants were divided into two equal groups (125 participants in each group), Group A and Group B. In Group A participants, PRF was placed after surgical extraction of the tooth, and in Group B surgical extraction was done without using PRF and Group B was evaluated as control group. The Data was analyzed by using SPSS Version 22.0. Mean and standard deviation were used for quantitative variables like patient's age. Frequency and percentage were calculated for qualitative variables.

Results: The mean age of participants were 23.58 ± 3.21 with majority (96.4%) having age of 25 years, in which majority (65.2%) were female patients. Dry Socket reported in 18.0% patients.

Conclusion: Platelet rich Fibrin was found to be effective, reliable, cost effective and safe for the third molar surgeries when compared with Non – PRF

Key words Alveolar Osteitis, Platelet Rich Fibrin, and Third Molar.

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Introduction

Dry socket/ Alveolar Osteitis is a debilitating, highly painful postoperative issue after tooth removal. It was first described by Crawford in 1876 as, the frequent postoperative complication after wisdom tooth removal, around 2 to 4 days after surgery.¹ The incidence of dry socket is approximately 3% which ranges from 1% to 4% of all routine extractions, reaching up to 30% for mandibular third molars.² This results after the failure of blood clot formation and disturbed normal socket healing.³ It is also as a postoperative pain around and inside the extracted socket, which increases in its intensity at any point after the 2-4 days of tooth extraction with total or partial absence of blood clot at

the extracted alveolar socket, without or with halitosis.⁴

The one of most frequent procedure in the oral cavity is the removal of mandibular wisdom tooth. The impacted mandibular wisdom teeth are difficult to remove as they have dense fibrous and hard tissue cover, as a result there is increase in operating time, tissue manipulation and consequently more postoperative discomfort⁶ such as hemorrhage, swelling, pain, infection, and alveolar osteitis (dry socket).^{6,7} Such complications not only affect the quality of patient's life but also can cause the labor and financial loss.⁸

Alveolar Osteitis is a self-limiting postoperative problem and disassociated within 5 to 10 days, during these days it disturbs patient's normal routine. Secondly this

Authorship Contribution: ^{1,3,5}Substantial contributions to the conception or design of the work; or the acquisition, manuscript writing, literature review, ⁶data analysis, ^{2,4}drafting the work or revising it critically for important intellectual content, Supervision

might need up to 4 dental checkup until unless resolved completely.⁹

There are various factors which have been reported for the development of dry socket including, age and gender of patient, preoperative infection, smoking habits, use of oral contraceptives, menstrual cycle in women, difficulty and duration of surgery, experience of surgeon, amount of surgical trauma, amount of socket irrigation.¹⁰ In spite of these etiological factors, cause of dry socket still is not fully understood. There are two theories, which define the possible etiology of dry socket development. In the 1973 Birn reported that the increase in the fibrinolytic activity develops the dry socket⁵, which leads the disturbance blood clot formation in the tooth extracted area. On the other hand, activity of oral flora was reported as another possible cause for the lysis of the blood clot, which ultimately develops the dry socket/ Alveolar Osteitis.

After tooth extraction, socket healing occurs through secondary intention¹³. A period of four to six months is required for the normal tissue to heal at a point where it is radiologically incomparable to the surrounding bone. There are various methods to increase socket healing and decreases the postoperative complications after wisdom molar surgery.¹⁴

As the healing of extracted sockets are the coordinated sequences involving various physiologic, biochemical mechanisms, cellular and molecular responses, growth factors, cytokines, hormones and other proteins, which intend to maintain the tissue integrity and restore the functional efficacy after injury¹¹. In order to decrease the inflammatory response and post-operative problems after surgical extraction of wisdom tooth, a well-planned surgical technique and scrupulous post-operative care is important. Different methods have been proposed by investigators such as systemic antibiotic prescription, local antibiotics, non-steroidal anti-inflammatory drugs, chlorhexidine gel, chlorhexidine mouth wash, clot supporting agent and anti-fibrinolytic agents application.¹²

Lately the application of platelet concentrates in oral surgery have been proposed for enhancement of epithelial tissues and osseous tissues regeneration.¹⁶ Platelet rich fibrin (PRF) is an immune and platelet concentrate, which was developed in France by Choukroun in the very start of 21st century.¹⁷ PRF is a 2nd generation platelet concentrate that contains different

types of cytokines and immune cells which enhance the hard and soft tissue healing.³ In addition, due to the structural nature and strength of PRF, it has been used as a cover membrane for the extraction socket to enhance healing. The application of PRF decrease chances of dry socket after the third molar surgery.¹⁸ The PRF is a meshwork that is safe, effective and biocompatible as it is centrifuged from patient's own blood.¹⁹ This autologous biomaterial has many clinical applications. The theory which implements the use of this biomaterial is by slow release of cytokines and growth factors that are released from the leukocytes and blood platelets. Another importance regarding use of this blood product is its fibrin matrix nature, which develops through polymerization.

In literature, we could not find any study previously conducted in Pakistan by using Platelet Rich Fibrin (PRF) following removal of impacted lower wisdom tooth. Therefore, this randomized controlled trial was carried out to compare the two treatment modalities (with and without use of PRF) after mandibular third molar surgery thereby emphasizing the selection of best approach to decrease postoperative complication and contribute in developing better management of patients.

Material and Methods

A randomized controlled trail conducted in the Department of Oral and Maxillofacial surgery, PIMS, Islamabad from 01 November 2017 to 30 July 2019 to compare the frequency of alveolar osteitis with and without use of Platelet-rich fibrin after mandibular third molar removal. The sample size was calculated using WHO sample size calculator at the significant level of 5% using 0.09 population proportions with PRF and 0.205 population proportions without PRF use, the sample size turned to be 250 through non-probability consecutive sampling technique. This study was conducted and submitted for publication after taking approval from ethical review board of Shaheed Zulfqar Ali Bhutto Medical University Islamabad, ERB No. F. 1-1/2015/ERB/SZABMU/572.

Either gender having age range from 18 to 35 years with impacted mandibular wisdom tooth were included. Pregnant or females taking oral contraceptives since last 12 weeks, immuno-compromised patients, periapical lesions associated with impacted tooth and patients requiring extraction under general anesthesia were excluded from the study.

Patients were recruited from outpatient Department of Oral and Maxillofacial Surgery, Pakistan Institute of Medical Sciences, Islamabad. After detailed history, clinical examination, Laboratory investigations and radiographic imaging (OPG, Periapical view). A structured Performa was used to record demographic details such as name, age, gender. After explaining details of procedure, fully informed consents were signed by the patients. Surgery was done under Local Anesthesia. Study participants were divided into two equal groups (125 participants in each group), Group A and Group B. In Group A participants, PRF was placed after surgical extraction of the tooth, and in Group B surgical extraction was done without using PRF and Group B was evaluated as control group. Prior to surgery, from Group A patients, PRF was prepared after withdrawing 5ml of blood from vein in antecubital fossa using 23 Gauge sterile syringe, it was transferred to a vial without anticoagulant and immediate centrifugation was carried out at the rate of 3000 RPM for 10 minutes and platelet rich fibrin was obtained from the middle layer of centrifuged concentrate. The investigator performed the surgical procedure during which an adequate reflection and elevation of buccalmucoperiosteal flap (after modified wards incision) under local anesthesia (2% Lidocaine Hydrochloride with 1:100,000 Adrenaline). Bone guttering to facilitate delivery of tooth was done with meticulous irrigation of the surgical site with normal saline (0.9%). PRF was placed inside the same socket from where tooth has been extracted in the same seating. Flap was repositioned and sutured with Vicryl 3/0. In Group B, same surgical procedure was carried out without placement of PRF (Platelet Rich Fibrin) in extracted socket. The variables outcome for

both treatment modalities in term of Alveolar osteitis (pain, halitosis, foul taste, lysis of blood clot in socket) in postoperative period were recorded at day 3 on follow up visit.

The Data was analyzed by using SPSS Version 22.0. Mean and standard deviation were used for quantitative variables like patient's age. Frequency and percentage were calculated for qualitative variables like patient's gender, type of impaction and alveolar osteitis clinically by absence of pain, foul taste, halitosis and lysis of blood clot in extraction socket. Chi square test was used to test the proportion of alveolar osteitis, effect modifiers like age, gender and type of impaction were controlled by stratification. Post stratification chi square test was applied. P value of less than or equal to 0.05 was considered as significant.

Results

In this study the mean age of participants were 23.58 ± 3.21 with majority (96.4%) having age of 25 years, in which 87 (34.8%) were male patients while 163 (65.2 %) were female patients. The type of impaction reported in this study are, Mesio-angular impaction 51.2%, Horizontal impaction 24.8%, Vertical impaction 15.2% and disto-angular impaction 8.8% respectively. Dry Socket was reported in 45 patients (18.0%), in which 27% were from group A and 73%) patients were from group B. Participants of this study were from rural as well as from urban areas as shown in table I.

Dry Socket was stratified with regards to gender, residential status, and type of impaction as shown in Table II.

Variable		Group A		Group B		Total
		N	%	N	%	
Gender	Male	46	52.9%	41	47.13%	87(34.8%)
	Female	79	48.5%	84	51.53	163(65.2%)
	Total					250(100%)
Age group	Up to 25 years age	121	50.2%	120	49.8%	241(96.4%)
	>25 years age	4	44.4%	5	55.6%	9(3.6)
	Total					250(100%)
Type of impaction	Mesioangular	65	50.8%	63	49.2%	128(51.2%)
	Horizontal	28	45.2%	34	54.8%	62(24.8%)
	Vertical	20	52.6%	18	47.4%	38(15.2%)
	Distoangular	12	54.6%	10	45.4%	22(8.8%)
	Total					250(100%)
Residential status	Rural	32	45.1%	39	54.9%	71(28.4%)
	Urban	93	52.0%	86	48.0%	179(100%)
	Total					250(100%)
Dry Socket	Yes	12	26.7%	33	73.3%	45(18.0%)
	No	113	55.1%	92	44.9%	205(82.0%)
	Total					250(100%)

Table II: Stratification of variables with dry socket.

Variable		Dry Socket	Group		P-value
			Group A	Group B	
Gender	Male 87(34.8%)	Yes (N=09)	0	09	0.001
		No(N=78)	46	32	
	Female 163(65.2%)	Yes(N=36)	12	24	0.058
		No (N=127)	67	60	
Type of impaction	Mesioangular 128(51.2 %)	Yes (N=13)	4	9	0.019
		No (N=115)	61	54	
	Horizontal 62(24.8 %)	Yes (N=10)	3	7	
		No (N=52)	25	27	
	Vertical 38(15.2%)	Yes (N=11)	3	8	
		No (N=27)	17	10	
Distoangular 22(8.8%)	Yes (N=11)	2	9		
	No (N=11)	10	9		
Residenti	Rural area 71(28.4%)	Yes (N=19)	04	15	0.017
		No (N=52)	28	24	
	Urban area 179(71.6%)	Yes (N=26)	08	18	0.032
		No (N=153)	85	68	

Discussion

In the oral and maxillofacial surgeon's clinical practice, surgical extraction of wisdom tooth is the most common procedure performed by the clinician. After surgery, different postoperative complications can occur such as swelling, trismus and pain that directly affect patient's normal routine. Such side effects are influenced by an inflammatory response that affects the area of procedure leading to vasodilatation and release of pro-inflammatory mediators. In order to decrease such robust inflammatory responses after surgery, many drugs have been prescribed, among them corticosteroids are most prescribed group of drugs because of their strong anti-inflammatory action and relative safety. These drugs have an ability to reduce vascular dilation, fluid transudation, and reduce cell updates with inhibition of the production of several inflammatory mediators through a reduction of chemotaxis of inflammatory cells.

A study conducted by Rashid et al²³ also reported 59% female gender predominance in patients presenting with impacted third molar tooth and Shad et al²⁵ reported 53% females gender preponderance which is similar to that of our study results. Ehsan et al²⁴ reported 68 % male gender predominance which is different from our study results.

Mean age of participants in this randomized control trial was 23.58 ± 3.21 years with majority (96.4%) of participants having age 25 years. Shad et al²⁵ has reported 25.58 ± 5.11 years mean age which is close to our study results. Ehsan et al²⁴ reported 27.92 ± 5.93

year mean age and Rashid et al²³ has reported 29.33 ± 8.96 years mean age of their patients which is in compliance with our study results. As age increases, bone density increases which leads to extra surgical efforts and long surgical procedure time thus increasing complication rate.

Of these 250 study cases, 71 (28%) belonged to rural areas and 179 (72%) belonged to urban areas. As patients belonging to urban areas, have high literacy rates and easy access to advanced healthcare facilities. One more reason to this is that patients in rural areas have less approach and affordability of junk food and fancy food items (chocolates, candies) in comparison to patients presenting from urban areas who are fond of junk food and chocolates, thus people in rural areas have habit of chewing slightly hard food items that increase chances of proper eruption of mandibular third molars. Mesioangular impaction was noted in 128(51%), horizontal impaction was noted in 62 (25%), vertical impaction was reported in 38(15%) patients while the distoangular impaction was found in 22(9%) patients. Alveolar Osteitis was noted in 45 (18.0%), Alveolar Osteitis in Group A was noted to 12 (27%) while in group B it was 33 (73%) with P value of 0.001 in male gender which is significant. In a study that was conducted in Iran by Eshghpour et al¹⁸, Percentage of Alveolar osteitis in PRF group is 9% and in Non-PRF group is 20.5%, which is significant with P-value 0.042. These findings are close to our study results. Hoaglin et al reported the use of PRF in one hundred patients after wisdom tooth removal as less chances of the dry socket development post operatively.²² Platelet rich Fibrin (PRF) was found to be effective, reliable and safe for the third molar surgeries when compared with Non – PRF as alveolar Osteitis frequency was significantly lower in PRF group than that non – PRF. Evidence based studies are important tools to find out essential parameters for implementation of PRF application in the present circumstances. In this regard, there is insufficient data as much as we need regarding the platelet rich fibrin use in the future to avoid the complication of dry socket after wisdom/ lower third molar surgeries.

Conclusion

Platelet rich Fibrin (PRF) was found to be effective, reliable, cost effective and safe for the third molar surgeries when compared with Non – PRF as Alveolar

Osteitis frequency was significantly lower in PRF group than that non – PRF. All surgeons treating such patients can consider employing PRF after mandibular third molar surgery to avoid complications and achieve good clinical outcomes. This may lead to better quality of life in immediate postoperative days and will also reduce extra healthcare costs and multiple follow up visits for patient.

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