

# Effect of Platelet Rich Fibrin on Frequency of Alveolar Osteitis Following Mandibular Third Molar Surgery

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## ABSTRACT

**Background:** The objective is to evaluate the efficacy of platelet-rich fibrin on the frequency of alveolar osteitis following mandibular third molar surgery. **Methods:** This is a Randomized clinical trial conducted at the Oral and Maxillofacial Surgery Department of Liaquat University of Medical & Health Sciences, Jamshoro/Hyderabad, Pakistan from September 2018 to August 2019. A total of 136 patients for Mandibular third molar surgery were randomly allocated into two groups. Sixty-eight patients in group A were treated with platelet-rich fibrin and 68 were without platelet-rich fibrin (PRF). All this data was collected on preformed pro forma and variable recorded. **Results:** The average age of the patients was 36.93±11.24 years. Incidence of dry socket was significantly low in group A than group B [17.6% vs. 36.8%; p=0.0005]. At 4 days, the incidence of dry socket was also significantly low in group A than group B [5.9% vs. 26.5%; p=0.001]. **Conclusion:** In conclusion, PRF showed potential in lowering the incidence of AO after mandibular third molar surgery. Because PRF is autologous and contains no additives, it is highly biocompatible.

**Keywords:** Mandibular third molar, Platelet-rich fibrin, Alveolar Osteitis.

## INTRODUCTION

Surgical removal of the Mandibular third molar is one of the frequent procedures that is done by general dental practitioners and consultants.<sup>[1]</sup> Besides pain, swelling and functional impairment third molar extraction also leads to a well-known but highly undesirable complication that is dry socket also interpreted by terms alveolar osteitis, alveolitis sicca dolorosa, septic socket, necrotize socket.<sup>[2]</sup>

Development of dry socket is a noticeable phenomenon and is of common occurrence, its incidence varies from 5-30% of the surgically removed lower third molar cases.<sup>[3]</sup>

Dry socket is a condition that can be characterized as pain full bony ridge, increasing intensity of the discomfort within 1-3 days of the time followed by lower third molar extraction, subsequent failure or improper primary clot formation may or may not be presented along with bad breath or foul odor. This

condition results from an impaired primary clot maturation and disturbed wound healing process which otherwise would have initiated immediately after tooth removal by synthesis and contraction of blood clot normally.<sup>[4]</sup>

Normal socket repairing phenomenon is accomplished by angioblastic ingrowths from within the clot toward the alveolar oral surface site, progressive epithelial migration, fibrin delivery from the fibroblast, induction of regional mesenchymal entities to transform transitional osteoid into the woven bone by bone-forming and bone-resorbing cellular processes, eventually soft tissues and their microvasculature and hard bone generation is achieved.<sup>[5]</sup>

Although dry socket is a self-limiting condition that usually resolves after 5-10 days followed by third molar extraction but increased severity of pain and dysfunction has necessitated maxillofacial surgeons and devotee scholars to formulate remedies and or preventive approaches against the development of the dry socket subsequent to lower third molar extraction.<sup>[6]</sup>

Different predisposing factors have been known to contribute to the formation of dry socket those include limitations of surgical procedures, improper surgical techniques, skills of the surgeons, age, tobacco consumption, the sufficiency of wound

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irrigation, infection control, sex and female hormonal imbalance.<sup>[7]</sup>

Previously studies and clinical trials were conducted which were focused on dry socket symptoms relieving. Although some have emphasized on prevention of alveolar osteitis as well. Among preventive and symptom-oriented approaches incorporation of steroidal and non-steroidal anti-inflammatory drugs, systemic and local antibiotics, antimicrobial mouth rinses and topically applied gels, antifibrinolytic drugs and some clot-forming formulation have been pursued.<sup>[8,9]</sup>

A study conducted by Donald R Hodgin, in the year 2013 on 168 patients following extraction of the third molar with the placement of platelet-rich fibrin gel, with the extracted socket, incidence of alveolar osteitis was almost zero as compared to the control group who had 8% frequency of alveolar osteitis.<sup>[10]</sup>

The aim of this study was to evaluate the efficacy of adding Platelet-rich fibrin (PRF) gel in the tooth socket after surgical removal of the lower third molar. This study is aimed to provide help to maxillofacial surgeons to surgically remove the third molar tooth and to achieve faster wound healing reduced post-operative complications like infection, swelling, pain, bleeding and dry socket.

## MATERIALS AND METHODS

This is a Randomized clinical trial with a Non-probability consecutive sampling technique conducted at Oral and Maxillofacial Surgery Department of Liaquat University of Medical & Health Sciences, Jamshoro/Hyderabad, Pakistan from September 2018 to August 2019.

**Sample Size:** Sample size was calculated using power and sample size calculator with expected proportions of 3.2% and 8% for dry socket without the use of platelet-rich fibrin [10, 90] respectively and at 5% level of significance and 80% power to detect the difference, the maximum sample size required for each group is 68, i.e 136 collectively

### Inclusion criteria:

- The patient requiring mandibular third molar extraction
- Irrespective of gender
- Patient age between 18 – 60 years
- The patient medically fit and healthy patient

### Exclusion criteria:

- Limited mouth opening (opening below 35mm)
- Pericoronitis
- Uncontrolled diabetes. (measured by lab investigation, RBS, HA1c, OGTT)
- Uncontrolled periodontal disease. (poor oral hygiene, bad odor)
- Patients suffering from bleeding disorders if any origin labeled through history and clinical examination

- Patients having a previous history of malignancy of head and neck labeled through history and clinical examination

### Data collection procedure:

Patients were divided into 2 groups by slip picking method namely group A and B. GROUP A= with Platelet-rich fibrin and group B = without Platelet-rich fibrin. A detailed history was taken from the patient with name, age, gender, presenting complaint, Radiological assessment of the third molar tooth was done and recorded as seen on radiographs periapical view and OPG. Alveolar Osteitis was observed for 1st to 7<sup>th</sup> postoperative days. In both groups, patients were recalled on the 3<sup>rd</sup> and 7<sup>th</sup> day for routine intraoral clinical examination and a follow-up radiograph was recommended to revealed dry socket.

Prior to the surgery patient received a detailed explanation of the surgical procedure that was performed, possible complication and informed consent was obtained. The surgical protocol includes an assessment of the patient medical history, blood analyses and the systemic antibiotic prophylaxis will perform before treatment. The selection of patients was done by the port method and divided into two groups. Under local anesthesia full-thickness, mucoperiosteal flap either three-cornered or four-cornered was reflected than bone removal was done followed by tooth removal.

In Group A after extraction With the help of sterilizing water, platelet-rich fibrin (PRF) gel was subsequently introduced immediately into the bone cavity to fill up the empty space followed by flap repositioning with vicryl 3/0.

In Group B after extraction primary closure was done. The flap was repositioned and sutured with restorable threads 3/0 vicryl.

Post-operative instructions were given to the patient along with antibiotic, analgesic, anti-inflammatory coverage and 0.12% chlorhexidine mouth wash prescribed for 5 days. The sutures were removed after one week. The patient was recalled on 3<sup>rd</sup> and 7<sup>th</sup> day for routine intraoral clinical examination and a follow-up radiograph was recommended to revealed a dry socket.

Data were analyzed by statistical software package SPSS version 22.0.

## RESULTS

A total of 136 patients for Mandibular third molar surgery were randomly allocated into two groups. Sixty-eight patients in group A were treated with platelet-rich fibrin and 68 were without platelet-rich fibrin. The average age of the patients was 36.93±11.24 years [95%CI: 35.02 to 38.83]. There were 76(5.9%) male and 60(44.1%) females. Mean age and gender distribution with respect to groups are presented in [Table 1 & Figure 1] respectively.

Regarding winter's classification, mesioangular pattern 39 (28.7%) was most frequently seen, followed by distoangular 49 (36%) and horizontal 48 (35.3%). Winter's classification as per groups is also presented in [Figure 2]. The swelling was observed in 16.18% (22/68) cases in group A and 17.65% (245/68) in group B as shown in [Figure 3].

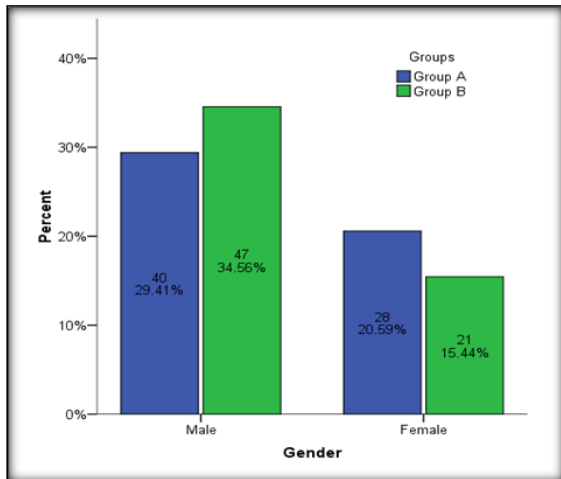


Figure 1: Gender status according to groups

Table 1: Descriptive statistics of age by groups

Descriptive Statistics	Group A n=68	Group B n=68
Mean	36.68	37.18
Std. Deviation	10.81	11.72
95% Confidence Interval for Mean	Lower Bound	34.06
	Upper Bound	39.29
Minimum	20	18
Maximum	58	58

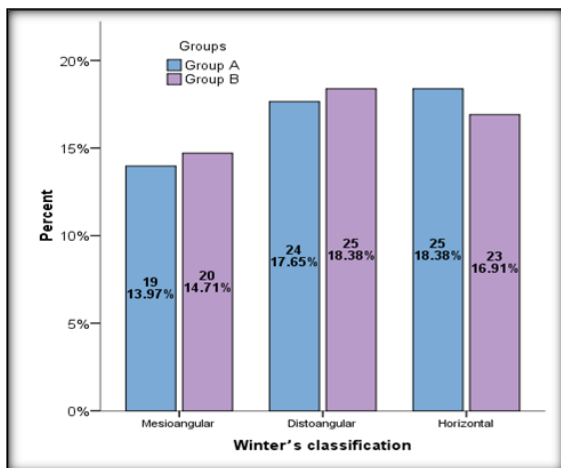


Figure 2: Winter's classification according to groups n= 136

A comparison of the efficacy of platelet-rich fibrin on the frequency of alveolar osteitis following mandibular third molar surgery at 3rd day is shown in [Table 2]. Incidence of alveolar osteitis was significantly low in group A than group B [17.6% vs. 36.8%; p=0.0005]. On 7<sup>th</sup> day, the incidence of alveolar osteitis was also significantly low in group A than group B [5.9% vs. 26.5%; p=0.001] as shown in [Table 3].

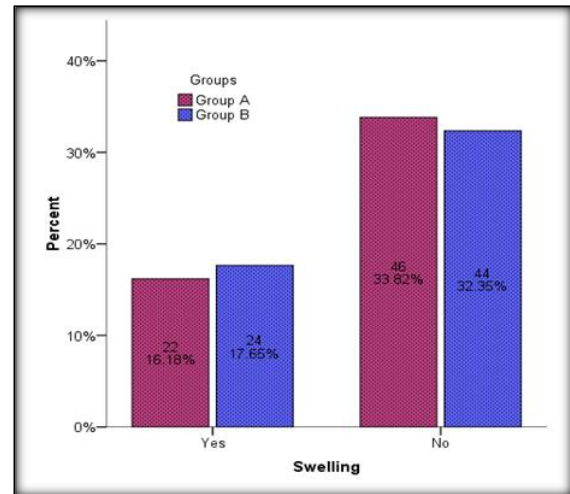


Figure 3: Swelling according to groups n= 136

Table 2: Comparison of Efficacy of Platelet-Rich Fibrin on Frequency of Alveolar Osteitis Following Mandibular Third Molar Surgery at 3rd Day

Incidence of dry socket	Group A n=68	Group B n=68	Total	P-Value
Yes	12(17.6%)	38(55.9%)	50(36.8%)	0.0005
No	56(82.4%)	30(44.1%)	86(63.2%)	

Chi-square=21.38

Table 3: Comparison of efficacy of platelet-rich fibrin on the frequency of alveolar osteitis following mandibular third molar surgery at 7th day

Incidence of dry socket	Group A n=68	Group B n=68	Total	P-Value
Yes	4(5.9%)	18(26.5%)	22	0.001
No	64(94.1%)	50(73.5%)	114	

Chi-square=10.62

## DISCUSSION

Alveolar osteitis (AO) is the most common complication after permanent tooth extraction.<sup>[11]</sup> The frequency of AO after mandibular third molar surgery varies from 5% to 30%.<sup>[12]</sup> AO is a self-limited condition and generally resolves after 5-10 days, but it causes severe pain, foul taste, halitosis, and regional lymphadenitis and negatively affects a patients' quality of life.<sup>[13]</sup> Periodontal problems occur mainly on the distal surface of the second molar and manifest as continued sensitivity owing to root exposure or increased probing depth.<sup>[14]</sup> Many attempts, including pharmacological agents, platelet-rich plasma (PRP), or platelet-rich fibrin (PRF) administration, cryotherapy, ultrasound, and laser, have been made to reduce the frequency and severity of complications and improve postoperative healing.<sup>[15]</sup> PRF is a second-generation platelet concentration, produced by a simplified technique lacking biochemical handling, is associated with the ease of manipulation, and exhibits a more controlled release of growth factors compared with that of PRP.<sup>[14,15]</sup> Moreover, PRF

exhibits a cicatricial capacity that creates a physiological architecture to improve the healing process.<sup>[16]</sup> To evaluate the efficacy of platelet-rich fibrin on the frequency of alveolar osteitis following mandibular third molar surgery, A total of 136 patients of both gender age between 18-60 years came for Mandibular third molar surgery were included in this study. These patients were randomly allocated into two groups. Sixty-eight patients in group A were treated with platelet-rich fibrin and 68 were without platelet-rich fibrin. In our study out of 136 patients, there were 55.9% males and 44.1% females. In a similar study by Tegginamani and Prasad, 58 % of the patients were males and 42% females thus indicating the male predominance,<sup>[17]</sup> which is consistent with the results reported in the present study. The male predominance (55% males and 44% of females) was also seen in another study done by Monica.<sup>[18]</sup> Similarly, a study in the U.S.A reported that the majority of the patients were males (57%) whereas 74% of females and 26% of males have been reported in the study done by Khorasani and Samiezadeh.<sup>[19,20]</sup> This gender difference can be due to certain geographical, environmental and social factors.

The application of PRF in the extraction sockets of impacted mandibular third molars decreased the frequency of AO significantly. In accordance with the present results, Hoaglin and Lines reported that applying PRF significantly decreases the frequency of AO after mandibular third molar surgery.<sup>[10]</sup> Haraji et al.<sup>[21]</sup> studied PRGF application in preventing dry socket in bilateral impactions of 40 patients divided into two groups, and showed good healing with PRGF and a significant decrease in the incidence of dry socket. In accordance to these studies the comparison of the efficacy of platelet-rich fibrin on the frequency of alveolar osteitis following mandibular third molar surgery at 3<sup>rd</sup> day in our study, we found an incidence of dry socket was significantly low in group A (PRF treated group) than group B [17.6% vs. 36.8%;  $p=0.0005$ ]. At 7 days, the incidence of dry socket was also significantly low in group A than group B [5.9% vs. 26.5%;  $p=0.001$ ]. The frequency of AO is age-dependent, with most studies marking the peak age of 20 to 40 years old.<sup>[6,9]</sup> Hence, in the present study, stratification analysis was performed and observed that the incidence of dry socket was not statistically significant between the group for below and equal to 40 years of age [Table 4] while it was significant between groups for above 40 years of age patients. The lower frequency of AO after the PRF application could be related to the hemostasis and cicatricial properties of PRF, in addition to its sealing ability.<sup>[22]</sup> Birn reported higher fibrinolytic activity in sockets with AO, which affects the integrity of the clot and inhibits clot formation and maturation. PRF produces a 3-dimensional

architecture that provides a reservoir of platelets, leukocytes, and various cytokines. In addition, PRF provides a natural fibrin matrix that supports clot formation and covers the clot to prevent mechanical dislodgement.<sup>[23,24]</sup>

## CONCLUSION

In conclusion, within the limitations of the study, PRF showed potential in lowering the incidence of AO after mandibular third molar surgery. Because PRF is autologous and contains no additives, it is highly biocompatible. In addition to its availability, the cost is reasonable and the production technique is simple. However, further investigation with larger numbers of patients and more strict inclusion criteria regarding the difficulty level of surgery is needed.

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