



Effect of Leucocyte and Platelet Rich Fibrin (L-PRF) in Postoperative Sequelae of Impacted Mandibular Third Molar Surgery - A Split Mouth Randomized Controlled Trial

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ABSTRACT

Objectives: The surgical removal of impacted mandibular third molars is one of the most common procedures in oral surgery, and also one of the most feared inciting procedures among patients due to the postoperative sequelae. Leukocyte and platelet rich fibrin (L-PRF) is an autologous biomaterial enmeshed with platelets, leukocytes and cytokines. The aim of this study is to assess the effect of placing platelet rich fibrin on post-operative healing and complications after impacted mandibular third molar removal.

Materials and Methods: This study is a split mouth randomized controlled trial. 25 patients with the same type of mandibular third molar impaction bilaterally were chosen for the study. Venous blood obtained from the patient and centrifuged at 2800 rpm for 12 minutes to obtain L-PRF. In the Case group the Socket was filled with L-PRF; and in the Control group the Socket was filled with standard blood clot. Post-operative swelling and pain score (VAS) assessed on the 1st, 3rd and 7th post-operative days. Soft tissue healing index assessed on the 7th postoperative day. Post-operative complications, if any were noted. Statistical test - Mann-Whitney U test and Wilcoxon signed rank test were performed using SPSS version 20.0.

Results: L-PRF treated sites showed improved Healing Index ($p < 0.05$) and reduced pain VAS scores ($p < 0.05$) when compared to the control site. The post-operative swelling showed statistically significant reduction in the case group for the 1st and 3rd days ($p < 0.05$). Only one L-PRF site and five control sites were affected with alveolar osteitis.

Conclusion: Within the limitations of this study, L-PRF exhibits the potential of improving the soft tissue healing and reducing the post-operative pain, swelling and incidence of alveolar osteitis following mandibular third molar removal.

Keywords: *Mandible, third molar, L-PRF, post-operative, pain, swelling, trismus, oral surgery, impacted teeth, innovative technique*

INTRODUCTION

The surgical removal of impacted teeth is one of the most commonly performed procedures in the field of oral and maxillofacial surgery. The first most common tooth to be impacted is the mandibular third molar. The etiology of such impacted mandibular third molars is governed by a mixture of local and systemic factors. There are numerous factors that govern the removal of such impacted mandibular third molars. Of these, the most commonly cited factors include pericoronitis, caries, cysts, Periapical infections, damage to the adjacent tooth, prophylactic removal, for orthodontic or prosthetic treatment, or tooth in the line of fracture (1,2). The removal of these third molars is also one of the most feared inciting procedures for the patients because of the postoperative sequelae such as pain, swelling, reduced mouth opening, difficulty in mastication and deglutition.

According to Daugela et al., (3), the main surgical objective in impacted mandibular third molar surgery is to remove the tooth with minimal sequelae and a complication-free procedure, reducing postoperative morbidity and patient discomfort to the lowest possible level. For this purpose, various approaches and techniques were suggested, including corticosteroids and nonsteroidal anti-inflammatory drugs (NSAIDs), cryotherapy, compression, soft laser, piezo surgery, and, eventually, platelet concentrates. Among the platelet concentrates, platelet rich fibrin (PRF) is a second-generation platelet concentrate. It is prepared as a natural concentrate without the addition of any anticoagulants in physiologic thrombin concentration.

Equilateral junctions (connected trimolecular) allow the establishment of a fine and flexible fibrin network able to support cytokines enmeshment and cellular migration. This 3-dimensional organization gives great elasticity to the fibrin matrix which is observed in a flexible, elastic and very strong PRF membrane. Existing literature evidence reveal the efficiency of PRF over PRP in reducing postoperative pain and swelling after minor surgical procedures. However, there exists lacunae in the evidences about the effectiveness of Leukocyte and platelet rich fibrin (L-PRF) in reducing the postoperative sequelae after mandibular third molar surgery.

Our team has extensive knowledge and research experience that has translated into high quality publications (4-13). Thus, the aim of this study is to evaluate the effectiveness of L-PRF in preventing and controlling the postoperative healing and complications following mandibular third molar surgery.

MATERIALS AND METHODS

The study was conducted at Saveetha Dental College and Hospitals, Chennai, Tamil Nadu, India. The study was approved by the Scientific Review Board and the Institutional Ethics Committee clearance was obtained. The study design is a Randomized controlled split mouth trial.

25 Patients with bilateral mandibular third molar impactions of the same type were included in the study. Inclusion criteria was healthy patients in the age group of 18-45 years with bilateral mandibular third molar impactions. It was ensured that the right and left molars had the same difficulty index according to the WHARFE

assessment. Exclusion criteria included patients with systemic disorders including diabetes, hypertension, and different mandibular third molar difficulty index bilaterally. The study was conducted for a period of 5 months, during which 25 patients who satisfied the above criteria were selected. Randomization was done and patients were allotted in the two groups accordingly. Allocation concealment for each patient was done for the right and left side with one side being the control and other side being the case groups. The procedures were carried out under conscious sedation by a single standard operator.

Lignocaine with 1:80,000 adrenaline was infiltrated in the surgical sites. Ward's or modified ward's incision was placed and mucoperiosteal flap elevated. Bone guttered and the tooth was removed. The control site was closed only with 3-0 polyglactin sutures. Venous blood of the patient was drawn and centrifuged at 2800 rpm for 12 minutes to obtain L-PRF. This was placed in the case group site and closure was done using 3-0 polyglactin sutures.

Postoperative pain and swelling were assessed on the 1st, 3rd and 7th postoperative days. Soft tissue healing index was assessed on the 7th postoperative day. Pain was assessed using a VAS score. Swelling was assessed by the following two measurements (3)

In the vertical dimension, measurement from the lateral canthus of the eye to the pogonion of the mandible was taken.

In the horizontal dimension, the distance from the lower border of the tragus to the mouth commissure on both operated sides was measured.

The mean value of these two measurements was recorded. The assessment of all the indices was carried out by a blinded examiner. The variables were coded and the data was imported to SPSS. Using SPSS Version 20.0, categorical variables were expressed in terms of frequency, percentage and bar graphs were plotted. The statistical significance was tested using Mann-Whitney U test and Kruskal Wallis test and the results were obtained.

RESULTS

The postoperative pain assessed on 1st, 3rd and 7th postoperative days revealed that the difference between L PRF side and control side was significant for the 1st and 7th postoperative days with less mean pain on the L PRF side (Table 1). The postoperative swelling assessed on 1st, 3rd and 7th postoperative days revealed that the difference between L PRF side and control side was significant for the 1st and 3rd postoperative day with reduction in mean swelling on the L PRF side (Table 2).

TABLE 1: Post-operative pain assessment in VAS score

Day	1	3	7
L PRF side	4.10 ± 2.60	2.93 ± 1.05	0.43 ± 0.31
Control Side	5.96 ± 0.35	5.86 ± 0.98	2.86 ± 0.84
p value	0.005	0.070	0.040

TABLE 2: Post-operative swelling assessment

Day	1	3	7
L PRF side	83.05 ± 7.62	84.93 ± 8.57	80.35 ± 4.56
Control Side	89.95 ± 9.87	89.06 ± 7.58	81.15 ± 4.84
p value	0.040	0.030	0.090

DISCUSSION

Pain, edema, and trismus are main and the most commonly observed postoperative complications that may occur in patients who have undergone oral surgery procedures especially third molar surgery. The factors that determine the difficulty of the surgical procedure of avulsion of the third molar are depth and space available for removal of the impacted mandibular third molar, the angulation of the tooth, root spacing, size of the bone septum, presence or absence of a dilated tooth follicle, periodontal space, bone density, and the relation to the inferior alveolar nerve. Other factors that influence the occurrence of non-infectious complications after this procedure are the experience of the surgeon, the choice of the operating method, the time of the procedure, and soft tissue trauma (14). The regenerative potential of platelets has been harnessed and used in the field of oral and maxillofacial surgery. This is because of the growth factors released by platelets, such as, platelet derived growth factor (PDGF), Insulin like growth factor (IGF) and transforming growth factor beta (TGF beta) (3). The classification of platelet rich forms is as follows:

Platelet-rich plasma (PRP):

Pure platelet-rich plasma (P-PRP);

Leukocyte- and platelet-rich plasma (L-PRP).

Platelet-rich fibrin (PRF):

Pure platelet-rich fibrin (P-PRF);

Leukocyte- and platelet-rich fibrin (L-PRF)

Injectable PRF (I-PRF).

The benefit of L-PRF over L-PRP is that it is more homogenous and fibrous than L-PRP that is gelatinous. The organized arrangement of the L-PRF enables it to be packed easily in narrow spaces, such as extraction sockets. The results of the recent research point out that the beneficial antimicrobial effect of L-PRF and the release of growth factors and matrix proteins lasts for over 7 days (1). As the recent literature evidence reveals the superiority of L-PRF over other platelet preparations, we decided to evaluate the effectiveness of L-PRF in controlling the postoperative sequelae of third molar surgery.

In a study by Caymaz and Uyanik, Gabka and Matsamura's tape method of assessing facial swelling was adopted. However, no difference in

the postoperative swelling was observed between L-PRF and A-PRF (15). Contradictory to this, in the study by Makki et al., it was observed that the A-PRF group responded better than the L-PRF group in terms of postoperative pain score and number of painkillers (16). This can be attributed to the disadvantages of PRF that they're not useful for large wounds as the PRF quantity reduces if the autologous blood sample quantity is low (17,18).

In our study, the postoperative pain assessed on 1st, 3rd and 7th postoperative days revealed that the difference between L PRF side and control side was significant for the 1st and 7th postoperative days. The postoperative swelling assessed on 1st, 3rd and 7th postoperative days revealed that the difference between L PRF side and control side was significant only for the 1st postoperative day. The soft tissue healing index was also statistically significant for the 7th postoperative day ($p < 0.05$). All the above results indicate that the postoperative sequelae are better controlled when L-PRF is placed into the surgical site after removal of mandibular third molars.

PRF is a reservoir of platelet, cytokines, leukocytes and immune cells that release large amounts of cytokines and growth factors, aiding not only the process of healing, vascularization and cicatrization, but also in the stabilization of clot. This explains the role of platelet rich fibrin in reducing the incidence of alveolar osteitis after mandibular third molar surgery. In the meta-analysis by Xiang et al., (19), it was found that most studies revealed that application of PRF to extraction sockets significantly reduced pain on the postoperative third day and swelling on the postoperative first day. Soft tissue healing and cicatrization indices showed significant difference from baseline values only on the 7th day in most of the studies (20).

In the meta-analysis by Rahman et al., though statistically significant difference was obtained in the pain and swelling scores, no difference was observed in the soft tissue healing. Platelets contain biologically active proteins, binding of these proteins within a developing fibrin mesh or to the extracellular matrix can create chemotactic gradients favoring recruitment of stem cells, stimulating cell migration, differentiation, and

promoting repair (21,22). Thus, use of autologous platelet concentrates has been a promising application in the field of regeneration, particularly in oral and maxillofacial surgical procedures. The dual functions (tissue sealants and drug delivery systems to carry biomolecules and chemotactic growth factors) have helped the practitioners to treat the complicated oral conditions and tissue regeneration.

CONCLUSION

Within the limitations of this study, L-PRF exhibits the potential of improving the soft tissue healing and reducing the post-operative pain, swelling and incidence of alveolar osteitis following mandibular third molar removal.

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CONFLICTS OF INTEREST

The authors declare no potential conflict of interest.

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