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Original Research Article

Impact of Platelet-Rich Fibrin on Postoperative Infection in Mandibular Fractures: A Comparative Clinical Study

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Abstract: ***Background:*** Postoperative infection is a significant concern in mandibular fractures treated by open reduction and internal fixation (ORIF). Platelet-Rich Fibrin (PRF) has emerged as a biomaterial that supports wound healing and reduces inflammation. This study aimed to evaluate the efficacy of PRF in reducing postoperative infections in simple mandibular fractures under short antibiotic regimens. ***Methods***: A prospective comparative clinical study was conducted on 31 patients (32 fracture sites) with simple mandibular fractures requiring ORIF. Patients were randomly divided into PRF (n=16) and non-PRF (n=16) groups. Both groups received identical preoperative and perioperative antibiotic coverage. Postoperative infection signs were assessed clinically on the 3rd, 7th, and 14th days. ***Results***: The PRF group demonstrated better early pain reduction and healing outcomes. Although clinical signs of infection such as erythema, wound dehiscence, and fever were less common in the PRF group, the difference between groups was not statistically significant. ***Conclusion***: PRF shows potential to enhance postoperative healing and reduce minor complications in mandibular fracture management. However, its benefit in preventing infection was not statistically conclusive.

Keywords: Platelet-Rich Fibrin, Mandibular Fracture, Infection, Healing, Open Reduction Internal Fixation.

INTRODUCTION

Mandibular fractures are among the most common maxillofacial injuries and often require open reduction and internal fixation (ORIF) for proper stabilization. Despite strict asepsis, postoperative infection remains a concern, with reported rates ranging from 0% to 25%. Various strategies have been explored to enhance healing and reduce infection, including antibiotic prophylaxis and the use of biological adjuvants like Platelet-Rich Fibrin (PRF).

PRF, a second-generation platelet concentrate, is known for its ability to release growth factors such as VEGF, PDGF, and TGF-β over a sustained period. These bioactive molecules play a role in angiogenesis, inflammation modulation, and tissue regeneration. The application of PRF in oral and maxillofacial surgery has shown promising results in soft and hard tissue healing, yet its effectiveness in preventing infection in mandibular fractures remains under-explored.

This study aims to evaluate the influence of PRF on postoperative infection rates in simple mandibular fractures managed with short-term antibiotic regimens.

MATERIALS AND METHODS

This prospective, randomized comparative study included 31 patients (32 fracture sites) undergoing ORIF for simple mandibular fractures at a tertiary care center in Karnataka, India. Patients were randomly assigned into two groups: the case group received PRF at the fracture site during fixation, while the control group did not.

Inclusion criteria were patients aged 12 and above, with ASA I or II status, requiring ORIF for non-comminuted, non-infected mandibular fractures. Exclusion criteria included pregnancy, penicillin allergy, and ongoing antibiotic therapy.

All surgeries were performed under general anesthesia with identical perioperative antibiotic coverage as shown in Fig 1. PRF was prepared intraoperatively via centrifugation at 3,000 rpm for 10 minutes and applied only in the case group as shown in Fig 2 and 2a. Postoperative assessment for infection signs was carried out on the 3rd, 7th, and 14th days as shown in Fig 3a, 3b and 3c.

Parameters assessed included pain (via VAS), erythema, wound dehiscence, swelling, fever, and purulent discharge based on CDC criteria.

Fig. 1: ORIF of right mandibular parasymphysis fracture

Fig. 2: Centrifuge machine

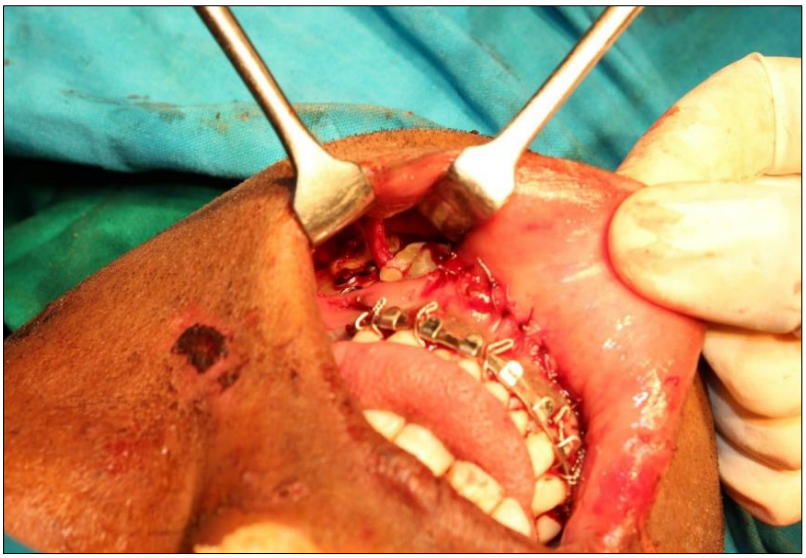

Fig. 2a: Prepared PRF membrane placed in the fractured site

Fig. 3a: Post-op follow up on 3rd day shows no signs of erythema and infection

Fig. 3b: Post-op follow up on 7th day shows no signs of erythema and infection

Fig. 3c: Post-op follow up on 14th day shows no signs of erythema and infection

RESULTS

The study included 16 fracture sites each in the PRF and non-PRF groups. The mean age was 32.56 years (PRF) and 29.94 years (non-PRF), with a male predominance. Pain scores were lower in the PRF group on day 3 and 7. On day 14, both groups showed similar healing. Minor complications like erythema and wound dehiscence were more frequent in the control group. Although the PRF group exhibited better early healing trends, the difference in infection-related outcomes between the two groups was not statistically significant ($p > 0.05$).

DISCUSSION

The current study was conducted to evaluate the clinical efficacy of Platelet-Rich Fibrin (PRF) in reducing postoperative infections and enhancing healing in patients with simple mandibular fractures treated by open reduction and internal fixation (ORIF). While both groups received short-term antibiotic coverage, the use of PRF appeared to improve early healing outcomes and reduce minor complications.

Postoperative infection in mandibular fractures is a multifactorial issue influenced by surgical technique, microbial load, patient habits (such as tobacco and alcohol use), systemic health, and local healing environment. Infection rates reported in the literature vary widely, from 0% to 25% [1, 2]. Several studies have suggested that short-term antibiotics are as effective as extended regimens, thus reducing the risk of antibiotic resistance and adverse effects [3, 4]. Our findings are consistent with these observations.

PRF acts as a biologically active scaffold containing leukocytes, cytokines, and growth factors such as VEGF, TGF-β, and PDGF. It facilitates angiogenesis, modulates inflammation, and promotes epithelialization and connective tissue remodeling [5-7]. Clinical studies have shown its utility in periodontal surgeries, sinus lifts, and implantology [8-10]. In our study, PRF placement demonstrated improved soft tissue healing and reduced discomfort, although it did not result in statistically significant differences in infection rates. This could be due to the limited sample size or the effectiveness of baseline aseptic protocols.

Several comparative trials have evaluated the efficacy of PRF in various surgical contexts. In a randomized study by Singh *et al*., the PRF group showed significantly faster soft tissue healing after third molar extractions [11]. Similar results were echoed by Simonpieri *et al*., in sinus augmentation procedures [12]. However, other studies such as by He *et al*., noted no statistical advantage of PRF in socket preservation, which may be related to anatomical and procedural variability [13].

PRF's effect in fracture healing is likely through modulation of the inflammatory phase and early stabilization of the clot environment. It has also been postulated to reduce the incidence of alveolar osteitis in dental extractions [14]. In the context of mandibular fractures, PRF may act by accelerating mucosal healing and reducing wound dehiscence, thereby minimizing opportunities for bacterial ingress.

Despite the limitations of our study, including a small sample size and single-center design, the findings suggest that PRF is a promising adjunct in ORIF of mandibular fractures. Future research with larger randomized trials, multicenter validation, and long-term outcomes is needed to establish definitive conclusions.

Moreover, incorporation of quantitative radiographic healing scores and biochemical markers may further elucidate PRF's role in bone regeneration and infection prevention.

CONCLUSION

Platelet-Rich Fibrin appears to offer clinical advantages in postoperative healing of simple mandibular fractures. Although not statistically significant, the reduction in minor complications and better patient comfort in the early postoperative phase suggests PRF may be a useful adjunct. Larger multi-center studies are needed to validate these findings.

List of Abbreviations

ORIF - Open Reduction and Internal Fixation
PRF - Platelet Rich Fibrin
VEGF - Vascular Endothelial Growth Factor
PDGF - Platelet Derived Growth Factor
TGF-β - Transforming Growth Factor Beta
ASA - American Society of Anesthesiologists
VAS - Visual Analog Scale

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