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RESEARCH ARTICLE

Efficacy of Platelet Rich Plasma in Postoperative Healing Amongst Patients undergoing FESS – A Randomised Control Trial in a Tertiary Care Centre

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Abstract: ***Background***: Chronic rhinosinusitis (CRS) is a common inflammatory condition often requiring surgical intervention in refractory cases. Functional Endoscopic Sinus Surgery (FESS) is the standard surgical treatment, but postoperative complications such as synechiae, crusting, and delayed mucosal healing remain challenges. Platelet-rich plasma (PRP), rich in growth factors and cytokines, has shown regenerative potential across various medical disciplines. This study evaluates the effect of PRP on postoperative healing in CRS patients undergoing FESS. ***Methods:*** In this prospective, controlled study, 58 adult patients with bilateral CRS refractory to medical therapy underwent FESS. Each patient's nasal cavities were randomly assigned as test (PRP-treated) and control sides. PRP, prepared using a two-step centrifugation technique, was injected submucosally at surgical sites on the test side. Postoperative outcomes were assessed using the Meltzer polyp score and SNOT-22 questionnaire at 1st, 4th, and 8th weeks. ***Results:*** The PRP-treated side demonstrated earlier and greater improvement in endoscopic scores and symptom relief, particularly during the first postoperative week. PRP application was associated with reduced crusting, synechiae formation, and inflammation. By the 8th week, outcomes were comparable between test and control sides. Two cases of recurrence were noted; however, symptomatic improvement persisted due to enhanced sinus ventilation. ***Conclusion:*** Submucosal PRP application during FESS appears to enhance early-phase mucosal healing and reduce postoperative complications. Its favorable safety profile and regenerative potential make it a promising adjunct in endonasal surgeries. Further research is warranted to explore long-term benefits and optimal usage protocols.

Keywords : Chronic sinusitis, FESS, Platelet rich plasma.

INTRODUCTION

The European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) defines chronic rhinosinusitis (CRS) as a clinical diagnosis established by the presence of characteristic symptoms alongside objective evidence of mucosal inflammation. According to EPOS criteria, CRS is diagnosed when patients exhibit nasal obstruction/congestion or discharge, accompanied by at least one additional symptom such as facial pain/pressure or olfactory dysfunction (hyposmia/anosmia), persisting for more than 12 weeks and confirmed by endoscopic or radiological findings [1]. CRS may present with nasal polyps (CRSwNP) or without (CRSsNP).

The cornerstone of CRS management is medical therapy, with surgical intervention reserved for patients refractory to medical treatment. FESS is regarded as the preferred surgical approach, with complication rates reported to range from 0.3% to 22.4% (median 7.0%) in experienced hands [2]. Common intraoperative and early postoperative complications include bleeding, crusting, and the formation of synechiae or adhesions.
This study investigates the potential role of autologous platelet-rich plasma (PRP) in improving postoperative outcomes in CRS patients undergoing FESS. Specifically, we evaluated its impact on reducing bleeding, crust formation, and synechiae. The term "platelet-rich plasma" was first introduced by Kingsley in 1954 [3]. Since then, PRP has gained significant traction across various medical specialties. Its therapeutic efficacy is attributed to the high concentration of platelets and the subsequent release of growth factors, cytokines, and adhesion proteins, which collectively promote hemostasis, tissue regeneration, and angiogenesis at the site of application [4].

MATERIAL AND METHODS

In each participant, one nasal cavity was randomly designated as the test side and the contralateral side served as the control. Approximately 10 mL of the patient's venous blood was collected into a container containing acid-citrate-dextrose as an anticoagulant. The sample was processed by a two-step centrifugation method—first at 1500 rpm, followed by 2000 rpm for 10 minutes each—to isolate 3–4 mL of platelet-rich plasma (PRP) as the supernatant, yielding a platelet concentration approximately fivefold higher than the baseline. Intraoperatively, the test side received intramucosal PRP injection at the surgical site,

specifically over the raw mucosal areas resulting from debridement or removal of diseased tissue. PRP was administered after achieving hemostasis and immediately before nasal packing with Ivalon. Both the test and control sides were evaluated preoperatively and postoperatively at 1st, 4th , and 8th weeks using diagnostic nasal endoscopy.

Endoscopic findings were graded using the Meltzer polyp scoring system [5] for both test and control sides at each follow-up. Additionally, overall symptomatic improvement was assessed using the SNOT-22 questionnaire, administered preoperatively and postoperatively. Postoperative Meltzer and SNOT-22 scores were compared between the test and control sides for outcome analysis.

RESULT

Surgical intervention varied based on disease extent: 12 patients underwent middle meatal antrostomy (MMA) alone, 26 underwent MMA with anterior ethmoidectomy, 11 underwent MMA with both anterior and posterior ethmoidectomy, and the remaining 9 underwent full-house FESS, which included MMA, anterior and posterior ethmoidectomy, and clearance of frontal and sphenoid recesses (Table 1).

Endoscopic assessment of polyp burden was performed using the Meltzer scoring index for both test and control sides. The mean preoperative score was 3.32 for both sides. At the 1st postoperative week, the mean score reduced to 0.344 on the control side and 0.2 on the test side. By the 4th and 8th weeks, both sides demonstrated further improvement with a mean score of 0.17 (Table 2). Similarly 1st postoperative week showed crust completely obscuring the surgical site on control sides in 53 patients whereas test sides showed partial obstruction of raw area in 23 patients with remaining patients having negligible or no crust formation at all. 5 patients had synechiae formation on control sides whereas only 2 presented with synechiae formation on test sides during the 4th week followup.

Symptomatic outcomes were evaluated using the SNOT-22 questionnaire. The mean scores were 81.22 preoperatively, 74.74 at the 1st week, 50.31 at the 4th week, and 43.96 at the 8th postoperative week, indicating progressive symptomatic improvement over time.

Recurrence was noted in two patients who underwent MMA with anterior ethmoidectomy. One recurrence occurred at the 4th postoperative week and the other at the 8th week.

DISCUSSION

The evolution of endoscopic instrumentation in rhinology can be traced back to 1806, when Sir Philip Bozzini developed a rudimentary light conductor to visualize internal cavities in animals. Over the subsequent decades, various prototypes were introduced, with progressive enhancements in illumination sources—from sunlight and limelight (oxyhydrogen combustion) to electrically heated platinum wires cooled in water. A significant milestone occurred in 1879 with the invention of the cystoscope by Nitze and Leiter, which laid the foundation for modern endoscopy. Eventually, the development of the rigid Hopkins rod-lens endoscope revolutionized nasal endoscopic surgery.

The widespread acceptance of endoscopic sinus surgery was further driven by the pioneering anatomical studies of Professor Walter Messerklinger and the clinical contributions of his student, Professor Heinz Stammberger, along with Dr. David Kennedy in the United States. These advancements established functional endoscopic sinus surgery (FESS) as the standard of care for chronic rhinosinusitis (CRS) [6].

In parallel, the therapeutic potential of platelet-rich plasma (PRP) has garnered significant attention since Kingsley first coined the term in 1954 [3]. Ehrenfest et al. [7] later introduced a widely adopted classification system based on platelet, leukocyte, and fibrin content, dividing PRP into four categories: pure PRP (P-PRP), leukocyte-rich PRP (LR-PRP), pure platelet-rich fibrin (P-PRF), and leukocyte-rich PRF (L-PRF).

Wound healing in the nasal mucosa is a complex, highly regulated process comprising phases of coagulation (5–10 minutes), inflammation (24–48 hours), tissue formation (approximately 4 days), and remodeling (up to 6 months). PRP has demonstrated antibacterial and anti-inflammatory properties with minimal risk of allergic reactions, making it an attractive option for enhancing postoperative healing [8].

In the present study, PRP was utilized as an adjunct to FESS to promote mucosal healing. PRP preparations are known to stimulate a supraphysiological release of bioactive molecules—including PDGF, TGF-β, VEGF, EGF, bFGF, and IGF-1—that modulate tissue regeneration, angiogenesis, cell proliferation, and chemotaxis [9–11]. Based on its multifaceted biological properties, platelet-rich plasma (PRP) was selected in this study to enhance postoperative healing. The rationale for its use was grounded in the following mechanisms:

(i) **Antimicrobial and Immunomodulatory Effects**: Platelets are known to release antimicrobial peptides and reactive oxygen species that bind to pathogens, thereby facilitating antibody-mediated immune responses. These antimicrobial properties have been demonstrated in PRP preparations, which exhibit bacteriostatic effects and help prevent postoperative infections at the site of application [12]. Additionally,

PRP is rich in growth factors, cytokines, and chemokines, which create a biologically favorable microenvironment conducive to angiogenesis, cellular proliferation, and differentiation. This accelerates mucosal epithelialization, thereby aiding the restoration of mucociliary function in the nasal and paranasal sinuses.

(ii) **Tissue and Bone Regeneration**: Beyond soft tissue healing, PRP has also been implicated in promoting tissue morphogenesis and bone remodeling [10,11]. These regenerative properties enhance both the structural and functional recovery of sinonasal tissues following surgical intervention.

(iii) **Reduction of Adhesion Formation**: Adhesions typically form when two raw, non-epithelialized surfaces come into contact postoperatively [13]. PRP promotes the development of a fibrin scaffold over these exposed surfaces, serving as a matrix for cell migration and epithelial proliferation. This process facilitates rapid epithelialization, thereby reducing the risk of adhesion formation. Furthermore, excessive collagen deposition is a key factor in synechiae and fibrosis; studies have shown that PRP can reduce hydroxyproline levels at the wound site, thereby limiting excessive collagen synthesis and fibrosis.
Notably, Yildirim et al. [14] reported that PRP decreases hydroxyproline levels, thereby reducing collagen deposition and minimizing synechiae and fibrosis risk.

In our cohort, a slight female predominance was observed, with a median age of 42 years, consistent with findings by Busaba et al. [15], who also noted gender-based differences in symptom profiles. However, in our study, nasal obstruction remained the predominant complaint across all patients, regardless of gender.

The Meltzer index scores showed notable early improvement on PRP-treated sides during the first postoperative week, while differences between test and control sides diminished by the 4th and 8th weeks. Similarly, PRP appeared to reduce postoperative crusting, adhesion, and synechiae formation more effectively in the early phase. Two cases of recurrence were observed—both in patients who underwent MMA with anterior ethmoidectomy alone. In one, unilateral recurrence initially affected the control side, followed by involvement of the test side at six weeks. In the other case, bilateral recurrence was present by the 8th postoperative week.

Symptomatic relief was reflected in the progressive reduction of SNOT-22 scores during follow-up. Interestingly, even participants who experienced recurrence reported lower postoperative SNOT-22 scores, likely attributable to improved sinus ventilation and drainage following MMA.
Our findings suggest that PRP primarily exerts its beneficial effects in the early postoperative phase, with observable advantages during the first few weeks. The recurrence noted on the PRP-treated side by the 6th postoperative week implies that the therapeutic window of PRP may be limited to this early period.

These results align with previous studies, such as that by Huang et al. [16], who demonstrated favorable wound healing outcomes using PRF in the repair of Schneiderian membrane perforations during maxillary sinus augmentation. Future research is warranted to better define the onset, duration, and long-term efficacy of various platelet-derived biologics on respiratory epithelium. Additionally, exploring the use of PRP in an outpatient setting during postoperative follow-up visits could offer a promising avenue for sustained healing and recurrence prevention.

CONCLUSIONS:

This study demonstrates that submucosal application of platelet-rich plasma (PRP) following endonasal surgery exerts favorable effects on nasal mucosal healing, including anti-inflammatory action, enhanced mucus clearance, and a reduction in postoperative synechiae formation. Given its established role in promoting tissue regeneration across various medical disciplines, PRP similarly appears to support early-phase healing of the nasal mucosa. The findings suggest that PRP is a safe and effective adjunct in sinonasal surgical procedures. These results provide a foundation for future experimental and clinical research to further explore the long-term efficacy and optimal application protocols of PRP in rhinological practice.

Tables

Table 1- Total procedures done on both test and control sides

Sl.No	Procedure done	Total numbers
1	MMA alone	12
2	MMA and anterior ethmoidectomy	26
3	MMA, anterior and posterior ethmoidectomy	11
4	MMA, anterior and posterior ethmoidectomy, frontal and sphenoid disease clearance	9

Table 2 - Pre and postoperative mean scores of Meltzer index and SNOT22 along with crust and synechiae results.

Sl.No		Preoperative		1st postop week		4th postop week		8th postop week	
		Control	Test	Control	Test	Control	Test	Control	Test
1	Meltzer Index mean	3.32	3.32	0.34	0.2	0.17	0.17	0.17	0.17
2	Crust	-	-	++	+	-	-	-	-
3	Adhesion & synechiae	-	-	-	-	5	2	-	-
4	SNOT22	81.22		74.74		50.31		49.36	

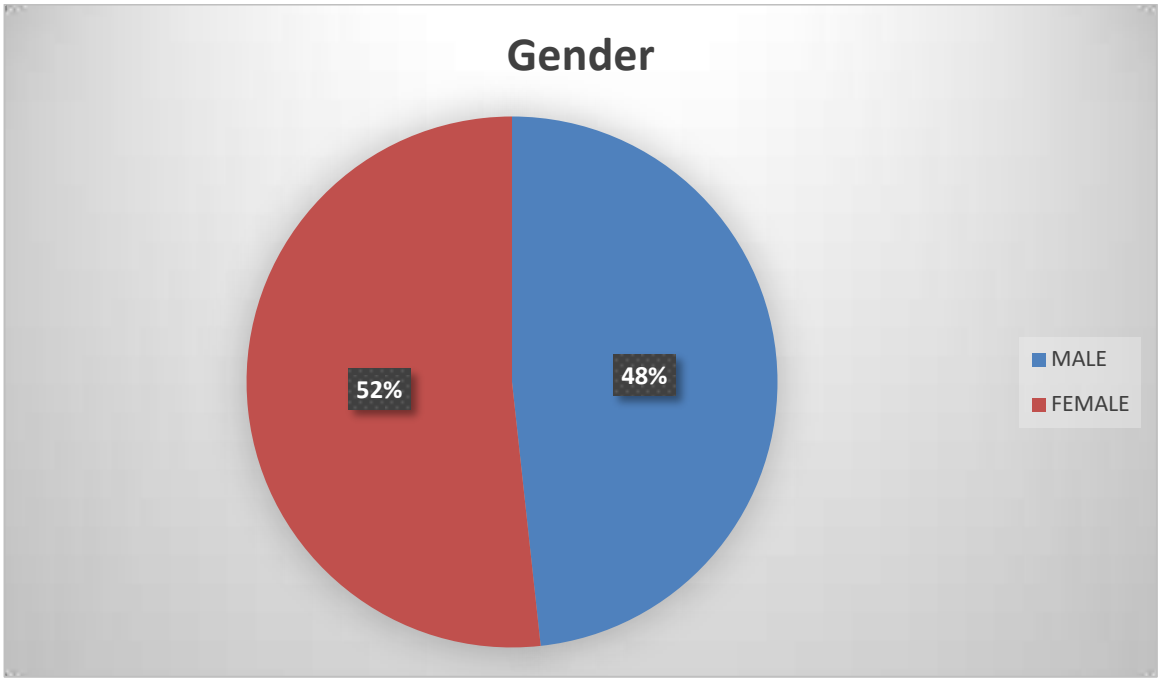

Figure 1 Gender distribution

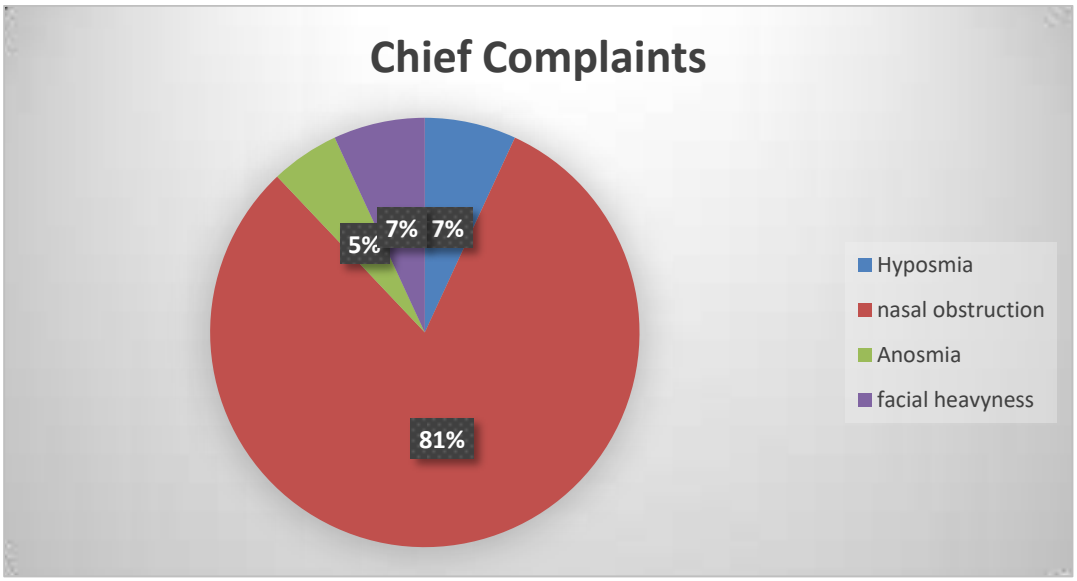

Figure 2 Chief complaints

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