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Evaluation of Role of Platelet Rich Fibrin [PRF] In Wound Healing of Surgically Extracted Third Molar Socket – A Clinical Study

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Abstract – The removal of impacted third molars is a common oral surgical procedure. Surgical extraction of third molars is often accompanied by pain, swelling, trismus, limited mouth opening and general oral dysfunction during the healing period[1].

The first phase of wound healing starts by formation of clot and initiation of inflammation, which than progresses to proliferative stage that consist of epithelialization, neoangiogenesis, granulation tissue formation and collagen formation and finally maturation and shrinkage. Growth factors are mitogenic, chemo tactic and angiogenic. They are very crucial to the healing process of wounds[2].

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INTRODUCTION

Major objective of biomaterial research and tissue engineering is to promote a material induced tissue reaction that leads to regeneration and an effective wound-healing process in the defective area. Thus, a biomaterial should serve as a temporary barrier to cover defects and promote tissue regeneration while being tissue compatible and most importantly, clinically applicable. In the field of tissue regeneration, vascularization plays a crucial role as it ensures a continuous supply of nutrients and the removal of waste products from the scaffold and the transplanted region[3].

Platelet rich plasma (PRP) is an autologous concentration of human platelets in a small volume of plasma. The activated platelets releases numerous growth factors mainly angiopoietin-2, epidermal growth factor, etc., all these factors largely contribute to the improvement of soft and hard-tissue healing[4].

Platelet-rich fibrin (PRF) is modification of Platelet-rich plasma (PRP), PRF was developed in France by Joseph Choukroun et. al. in 2001. There is various advantage of PRF over PRP. The method of preparation for PRF is easy and economically effective.

Many studies have been conducted in past to find out better modalities for management of surgical outcomes following surgical extraction of lower impacted third molar. There were various studies that showed PRP is has got better results in comparison to alloplastic materials.[4] We have not come across any study so far comparing of PRF & non -PRF on surgical outcome following surgical extraction of lower impacted third molar.

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Outcome measures:

Primary outcome measure:

To compare wound healing of surgically extracted third molar socket with and without use of PRF jelly.

To study effect of platelet rich fibrin [PRF] jelly:-

- On soft tissue healing after third molar extraction
- On hard tissue healing after third molar extraction

METHODOLOGY:

Study Participants:

Patients in need of extraction of third molar were selected irrespective of their caste, creed and sex from the Department of Oral and Maxillofacial Surgery, Santosh Medical and Dental College and Hospital, Ghaziabad.In this study, 30 impacted third molars were selected. All patients underwent bilateral removal of third molars and after removal one extraction site was filled by PRF jelly **(Group A)** and other extraction site was not filled with PRF jelly **(Group B).**

Sample Size: 30

Surgical Technique (Figure 1-3 &10-12)

1. Aseptic technique was followed in removal of third molar.
2. Extraction was performed under Local Anesthesia.
3. Standard ward's incision was given to raise muco periosteal flap, the ostectomy was done using bur technique.
4. Copious saline irrigation was done.
5. Odontectomy was done, whenever required and tooth is removed.
6. After removal of impacted third molar.PRF jelly was placed in one extraction site (Group A) and other extraction site was kept empty without PRF jelly(Group B), closure of wound was done with silk sutures for both groups.

METHOD – TO PREPARE PRF / PREPARATION OF PRF

A 24 gauge butterfly needle was used with 9ml blood collection tube. Whole blood was drawn in tube without anticoagulant and was immediately centrifuged for 15 minutes at 2400 rpm.(fig. B) Circulating blood thrombin turns into fibrin and PRF jelly was obtained. After placement of PRF jelly, closure of socket was done by silk sutures

INCLUSION CRITERIA:

Healthy individuals within the age of 30 to 50 yrs.

EXCLUSION CRITERIA:

- Medically compromised HCW /operator
- H/o cough, cold, fever, anosmia, breathlessness etc. In the past 3 months

Criteria of Evaluation

- Evaluation for soft tissue healing analysis was done on the 7th, 15 th and 30th postoperative days, clinical evaluation of soft tissue healing was done using index of LANDRY et al.(fig. 4-6 & 13-15)and radiographic evaluation for hard tissue healing was done using magnetic lasso tool.

Armamentarium (Fig. A)

Choukroun centrifuge machine – It is an automatic single spin system machine, and there is no need of anti-coagulant, directly Jelly is received.

PRF collection kit including 24 gauge butterfly needle and 9ml collection tube

Complete PRF box set up.

Basic Surgical Kit for Extraction of Impacted Lower Third Molar

RESULTS:

This study was spilt mouth, a total of 15 patients (30 surgical removal of third molar) were performed. After removal PRF jelly was placed in one extraction site [Group A] and other extraction site was kept empty without PRF jelly [Group B].

Table 1 Represents the distribution of patients according to Pederson difficulty index. Out of 30 cases (15 Group A + 15Group B), 6 were having minimally difficult index, 22 were having moderately difficult index, 2 were having very difficult index.

Table 2 Represents clinical score wise evaluation for Soft Tissue Healing at 7th, 15th and 30thday for Group A and Group B .However healing score on 7thday(score 3), at 15th day(score 4) and on 30th day(score 5) was statistically more significant along with Group A (with PRF jelly) than Group B (without PRF jelly).

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Table 3 Represents mean value comparison of Soft Tissue Healing score at 7th day, 15th day and 30th day for Group A (With PRF jelly) and Group B (Without PRF jelly). The mean value of Soft Tissue Healing was more than 0.001(p-value). So, it shows statistically more significant mean value among Group A in comparison to Group B.

Table 4 summarizes the radiographic evidence from pre-operative OPG to post-operative OPG at 1st and 4th month. Measurement was made on OPG by magnetic lasso tool which show statistically more significant amount of bone formation among Group A than Group B. patient was taken 4 tablets.

Out of 30 cases (15 Group A + 15Group B),6 were having minimally difficult index, 22 were having moderately difficult index, 2 were having very difficult index.

The data of Soft Tissue Healing at 7th, 15thand 30th day was compared between Group A (With PRF jelly) and Group B (Without PRF jelly) using the Chi-square test. The healing score was statistically more among Group A (With PRF jelly) than Group B (Without PRF jelly). At 7thday, score 3 was significantly more among with Group A (with PRF jelly). At 15thday, score 4 was significantly more among with Group A (with PRF jelly). At 30thday, score 5 was significantly more among with Group A (with PRF jelly).

The mean value of Soft Tissue Healing score at 7th day, 15th day and 30th day was compared between Group A (Without PRF jelly) and Group B (Without PRF jelly) using the Unpaired t-test. The mean value of Soft Tissue Healing score was statistically more significant among Group A in comparison to Group B.

The mean Hard Tissue Healing [Bone Area] at 1st month and 4th month was compared between Group A (With PRF jelly) and Group B (Without PRF jelly) using the Unpaired t-test. The mean Hard Tissue Healing [Bone Area] at 1st month and 4th month was statistically more significant among Group A in comparison to Group B.

DISCUSSION:

In third molar surgeries postoperative sequelae, such as pain, swelling, trismus and delayed healing is very common. Patient usually returns back to clinics for the management of these sequelae. These symptoms can affect the quality of life of patients during initial days of the postsurgical process[6].

Surgical trauma in oral cavity tissue causes injury to the surrounding structures. The greater and extensive tissue injury leads to an increased amount of tissue response .The classic sign of inflammation, which includes Dolor, calor, rubor and tumor, commonly occur after extensive oral surgical procedures[6].

This study was spilt mouth, a total of 30 surgical removal of third molar were performed. After removal PRF jelly was placed in one extraction site [Group A] and other extraction site was kept empty without PRF jelly [Group B]. The closure of wound was done with silk sutures for both Groups. Removal of sutures was done after 7 days for both Groups. Pederson Difficulty Index is a method to score the difficulty of a lower third molar surgery. This difficulty score gives us an estimated amount of trauma and time taken during the surgery. More the difficulty in the surgery, more will be the trauma to the soft and hard tissue of that region. Out of 30 cases, 6 were having minimally difficult index, 22 were having moderately difficult index, 2 were having very difficult index.

In this study, statistical test applied on soft tissue healing was chi-square test and unpaired t-test. In chi-square test, data of Soft Tissue Healing at 7th, 15th and 30th day was compared between Group A (With PRF jelly) and Group B (Without PRF jelly)using healing index of Landry. At 7th day (score 3), at 15th day (score 4), and at 30th day (score 5) was statistical more significant among Group A (with PRF jelly) than Group B (without PRF jelly).

In unpaired t-test , mean soft tissue healing score at 7th, 15th and 30th day was compared between Group A (PRF jelly) and Group B (without PRF jelly). The mean score is statistical more significant and p-value <0.001* for Group A (with PRF jelly) than Group B (without-PRF jelly). Statistical test applied on hard tissue healing was unpaired t-test. The mean grey value of hard tissue healing [Bone area] was compared between Group A (with PRF jelly) and Group B (Without PRF jelly) at 1st month and 4th month taking pre-operative radiograph as guide. The mean hard tissue healing [Bone area] at1st month and 4th month is statistical more significant among Group A (with PRF jelly) than comparison to Group B (without PRF jelly). Many studies have been conducted in past to find out better modalities for management of surgical outcomes following surgical extraction of lower impacted third molar. The result of this study showed PRP is better graft material than synthetic graft in term of soft tissue & bone healing. A study was conducted by S. Girish Rao et. al.[7], they performed bilateral mandibular third molar extractions. In one socket they put PRF randomly and others socket remained empty without PRF. After that evaluation regeneration of bone was measured using serial Radiographs (RVG) post-operatively at 1st post op day, 1st week, 1st month, 3rd month and 6th month in coral draw software. They concluded that difference in mean value for both sockets was not statistically significant (P>0.05).

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A study was conducted by Yuvika Raj Kumar et. al.[8], they performed bilateral mandibular lower third molar extractions. In one socket they put PRF randomly and other socket remained empty without PRF, closure of wound was done with silk sutures for both sockets. They concluded that pain score, healing of soft tissue was statistically significantly more among PRF side but hard tissue healing did not differ significantly for both PRF side and non–PRF side.

CONCLUSION:

The most commonly performed surgical procedure in most oral and maxillofacial surgery practices is the removal of impacted third molars. Extensive training, skill, and experience allow this procedure to be performed in Atraumatic fashion with local anesthesia. Postoperative pain, delayed healing and edema are common phenomena particularly frequent after surgical removal of impacted third mandibular molars. They are consequences of direct trauma to bone, muscular attachments, blood and lymph vessels. This condition represents fluid accumulation in the interstitial area due to transudation from injured blood vessels and fibrin obstruction of lymph drainage. Sequentially, there is a release of mediators from mast cells, the vasculature and other cells. Use of PRF improve bone healing, therefore this procedure is effective in managing post-operative sequelae.

The advantages of PRF over other platelet derivates are that no biochemical handling of blood is required, the process is easy and economically effective, most efficient cell migration and proliferation.

In our study, Group A(with PRF jelly) has shown statistical significant improvement in the Soft tissue healing than Group B (without PRF jelly).Mean hard tissue healing [Bone area] at 1stand 4thmonth is statistical more significant among Group A (with PRF jelly) than comparison to Group B (without PRF jelly).

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TABLES AND GRAPHS:

Table 1 and Graph I: Pederson's Difficulty Index wise Distribution of Population study.

PEDERSON DIFFICULTY INDEX	Group A (With PRF jelly)	Group B (Without PRF jelly)	Total
Minimally difficult	5	1	6
	33.3%	6.7%	20.0%
Moderately difficult	9	13	22
	60.0%	86.7%	73.3%
Very difficult	1	1	2
	6.7%	6.7%	6.7%
Total	15	15	30

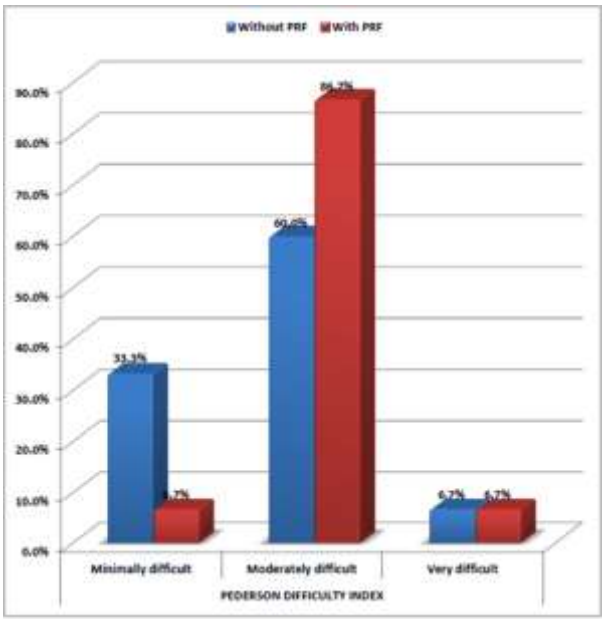

Table 2: Comparing score wise difference between soft tissue at 7th, 15thand 30thday for Group A (with PRF jelly) and Group B (without PRF jelly) by applying chi-square test.

SOFT TISSUE HEALING (By Healing index of LANDRY)	SCORE	Group A (With PRF jelly)	Group B (Without PRF jelly)	Total	Chi-square value	p-value
7th day	2	5	14	19	11.627	0.001*
		33.3%	93.3%	63.3%		
	3	10	1	11		
		66.7%	6.7%	36.7%		
15th day	2	0	4	4	13.030	0.001*
		.0%	26.7%	13.3%		
	3	5	10	15		
		33.3%	66.7%	50.0%		
	4	10	1	11		
		66.7%	6.7%	36.7%		
30th day	3	1	8	9	14.778	0.001*
		6.7%	53.3%	30.0%		
	4	5	7	12		
		33.3%	46.7%	40.0%		
	5	9	0	9		
		60.0%	.0%	30.0%		

Graph II: Bar diagram showing score wise comparison between Group A (with PRF jelly) and Group B (without PRF jelly) for soft tissue healing.

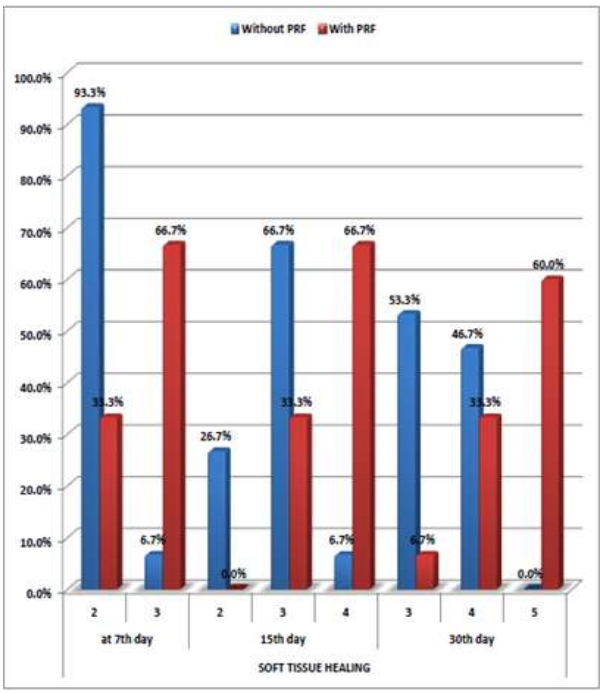

Table 3: Comparing the difference between soft tissue healing at 7th, 15th and 30th day for Group A (with PRF jelly) and Group B (without PRF jelly) by applying Unpaired-t test.

	Group A (With PRF jelly)		Group B (Without PRF jelly)				
Soft Tissue Healing	Mean	SD	Mean	SD	Mean difference	t-test value	p-value
7th day	2.67	0.49	2.07	0.26	-0.60	-4.209	< 0.001*
15th day	3.67	0.49	2.80	0.56	-0.87	-4.516	< 0.001*
30th day	4.53	0.64	3.47	0.52	-1.06	-5.024	< 0.001*

Graph III :Bar diagram representing Group A (with PRF jelly) and Group B (without PRF jelly) effect on soft tissue healing.

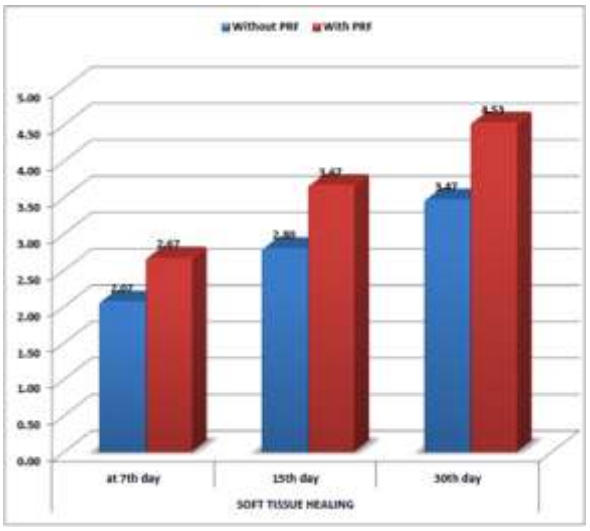

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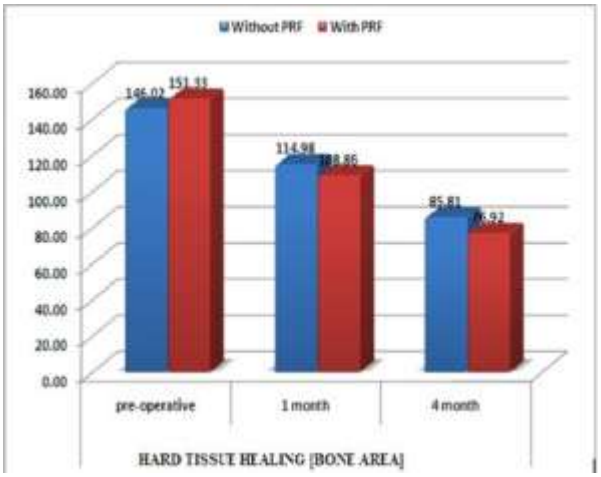
Table 4: Comparing the difference between pre-operative bone area and post–operative bone area formation by applying Unpaired-t test.

	Group A (With PRF jelly)		Group B (Without PRF jelly)				
Hard Tissue Healing [Bone Area]	Mean	SD	Mean	SD	Mean difference	t-test value	p-value
Pre-operative	151.33	12.42	146.02	10.59	-5.30	-1.259	0.218
1st month	108.86	9.90	114.98	11.10	6.13	1.595	0.122
4th month	76.92	7.77	85.81	7.03	8.89	3.287	0.003*

Graph IV: Bar diagram representing for pre-operative and post-operative bone area formation.



REPRESENTATIVE CASES:

Group A: (with PRF jelly), 25/F, Site: 38

Fig. 1: Intraoral photograph showing impacted 38

Fig. 2: Placement of PRF Jelly

Fig. 3: Sutures placement

Fig 4:7th day Healing of soft tissues

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Fig 5:15th day Healing of soft tissues

Fig 6:30th day healing of soft tissues

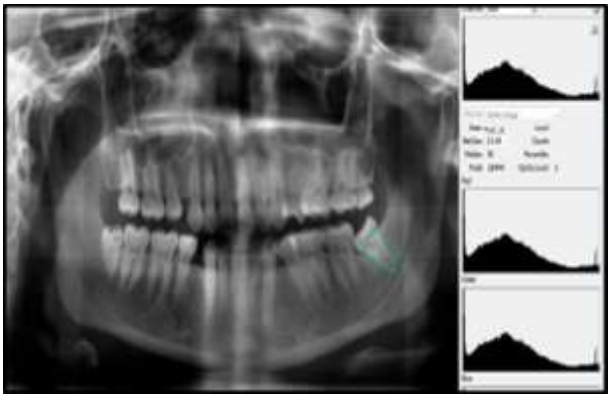

Fig:7: Pre-operative OPG with Hard Tissue marking(Magnetic Lasso tool)

Fig:8: 1 month Post-operative OPG with Hard Tissue marking(Magnetic Lasso tool)

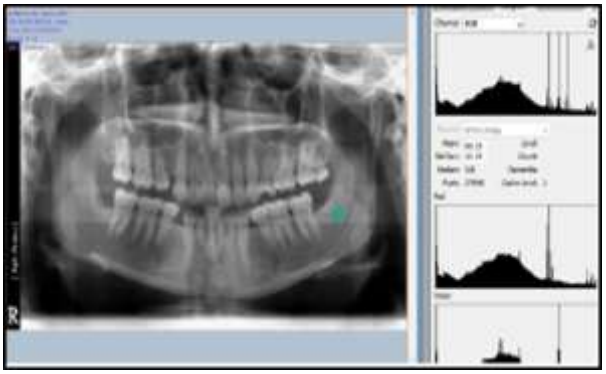

Fig:9 : 6 months Post-operative OPG with Hard Tissue marking(Magnetic Lasso tool)

Fig. 10: Intraoral photograph showing impacted 38

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Fig.11: Extraction socket without Placement of PRF Jelly

Fig.12: Sutures placement

Fig 13:7th day Healing of soft tissues

Fig 14:15th day Healing of soft tissues

Fig 15:30th day healing of soft tissues

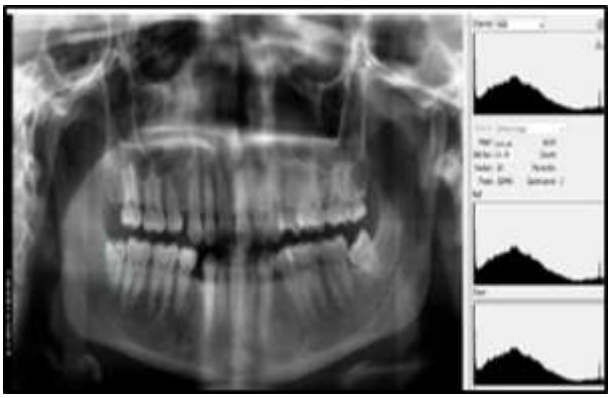

Fig:16: Pre-operative OPG with Hard Tissue marking(Magnetic Lasso tool)

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Fig:17: I month Post-operative OPG with Hard Tissue marking(Magnetic Lasso tool)

Fig:18 : 6 months Post-operative OPG with Hard Tissue marking(Magnetic Lasso tool)

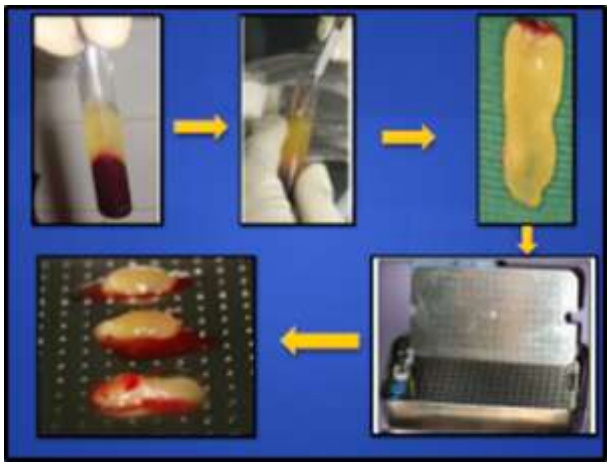

Fig. B- Showing the method of preparation of PRF

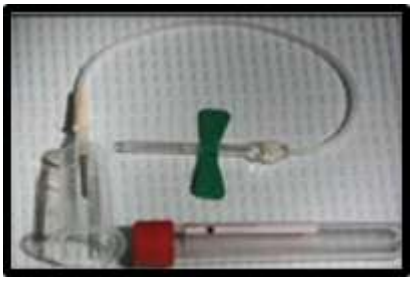

Fig. A- Armamentarium

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