

## Clinical Comparison of Extraction Socket Following the Use of Autologous Platelet-Rich Fibrin Matrix (PRFM) Employing Demineralized Freeze Dried Bone Material and Membrane

Anil Kumar Yadav<sup>1</sup>, Birendra Kumar Yadav<sup>2</sup>, Vikas Kumar Gupta<sup>3</sup>, Rajesh Pandey<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Dentistry, Maharishi Vashishtha Autonomous State Medical College, Basti

<sup>2</sup>Associate Professor, Department of Medicine, Maharishi Vashishtha Autonomous State Medical College, Basti

<sup>3</sup>Associate Professor, Department of Biochemistry, Maharishi Vashishtha Autonomous State Medical College, Basti

<sup>4</sup>Assistant Professor, Department of ENT, Maharishi Vashishtha Autonomous State Medical College, Basti

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Corresponding author: Dr Rajesh Pandey

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### Abstract

**Background:** Platelet rich fibrin (PRF) is a fibrin matrix in which platelet cytokines, growth factors, and cells are trapped and may be released after a certain time and that can serve as a restorable membrane.

**Objectives:** To evaluate healing of the facial bone defect with both these among two groups using DFDB and the outcome.

**Methods:** The present study was undertaken in the Department of Oral & Maxillofacial Surgery, Career Dental College & Hospital, Lucknow to compare. A total of 40 patients with maxillofacial defects fulfilling the inclusion criteria were enrolled in the study. Out of these, 20 cases were treated with use of DFDB and other 20 were treated with use of DFDB with PRF. Analysis of data was done by using SPSS software ver. 22 Chi-square test was used.

**Results:** Difference in age of both the groups was not found to be statistically significant. In the present study, a total of 14 females and 26 males were enrolled. Group A constituted of 8 (40.0%) females and 12 (60.0%) males while Group B constituted of 6 (30.0%) females and 14 (70.0%) males. majority (n=36; 90.0%) of patients did not complain of post-operative pain. Difference in proportion of patients suffering different grades of pain was not found to be statistically significant (p=0.368). There was no post-operative infection. Difference in proportion of patients in both the groups with different evidence of calcification was not found to be statistically significant (p=0.136) but was significant at 6 weeks.

**Conclusions:** DFDB is a predictable homologous graft material which is less expensive than synthetic material and easily available.

**Keywords:** Platelet rich fibrin (PRF), Facial Bone Defect, Calcification, Bone Bridging, DFDB, Autograft.

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## Background

Oral and maxillofacial bone defect of variable size result from trauma, neoplasm or infectious process. These defects do not fill with bone completely and/or spontaneously [1]. The resultant healed defect tends to be filled with fibrous scar, or stay as unfilled defect. A graft transferred to the recipient bed adapts in several ways, leading ultimately to incorporation of the graft into the skeletal system of the host [2]. Incorporation refers to the process of envelopment and interdigitation of the graft with new bone deposited by the recipient [3].

Platelet rich fibrin (PRF) is a fibrin matrix in which platelet cytokines, growth factors, and cells are trapped and may be released after a certain time and that can serve as a restorable membrane [4]. Have Platelet rich fibrin (PRF) is an enhanced concentrate of platelets derived from centrifuged blood. Platelet rich fibrin affects cellular activities at genetic and cellular levels. In this present study we have tried to evaluate the neoangiogenic potentials of the cytokine and growth factors PRF on the non vascularised allogeneous graft, as DFDB [5].

## Materials and Methods

The present study comprised of an adequate number of patients attending the O.P.D of Career Post Graduate Institute of Dental Sciences & Hospital Dental College, Ram Manohar Lohia Awadh University, Faizabad.

### Inclusion criteria

1. Healthy individuals in the age group of 19-60 years
2. Platelet count more than  $1,50,000/\text{mm}^3$

### Exclusion criteria

1. Subjects with any underlying systemic disease or compromised immunity
2. Pregnant and lactating women

The case selection was being done irrespective of sex, caste, religion and socioeconomic status. A pre-operative assessment of the patients comprised of a detailed medical and dental history, clinical and radiographic evaluation and hematological investigations to establish the clinical condition of patients. After pre-operative evaluation and obtaining the written informed consent, all patients included in the study were be categorized randomly into two groups:

1. **Group A (Control group):** Bone Defect receiving only Demineralised Freeze Dried Bone Graft
2. **Group B (Experimental group):** Bone Defect receiving Demineralised Freeze Dried Bone Graft along with PRF

Pre-operatively intraoral periapical X - rays was be taken for each patient. Occlusal and O.P.G views were be taken as and when required. Oral prophylaxis of all patients to improve their oral hygiene and reduce chances of post-operative infection was carried out. Decalcified freeze dried, irradiated bone allograft material DFDBA ( $500 - 1000\mu\text{m}$  particle size) was procured from - TATA MEMORIAL HOSPITAL TISSUE BANK, Mumbai,

Method for Preparation of PRF: 10 ml of whole venous blood was collected in one of the sterile vacutainer tubes without anticoagulant. The other test tube was filled with 10ml of saline & used for balancing.

### Statistical Analysis

Analysis of data was done by using SPSS software ver. 22. Data were statistically described in terms of mean ( $\pm$ SD), frequencies (number of cases) and percentages when appropriate. Comparison of quantitative variables between the study groups was done using Student t test for independent samples if

normally distributed. For comparing categorical data, Chi square test was performed. A probability value (p value) less than 0.05 was considered statistically significant.

## Results

A total of 40 patients with maxillofacial defects fulfilling the inclusion criteria were enrolled in the study. Out of these, 20 cases were treated with use of DFDB and other 20 were treated with use of DFDB with PRF.

**Table 1: Age and Gender wise comparison between both groups**

Age Group (years)	Total	Group A (n=20)		Group B (n=20)		Statistical Significance	
		No.	%	No.	%	$\chi^2$	p
Upto 20	16	6	30.00	10	50.00	3.833	0.147
21-30	12	4	20.00	8	40.00		
31-40	6	4	20.00	2	10.00		
>40	6	6	30.00	0	0.00		

As per table 1 though proportion of patients with lower age (Upto 30) was higher in Group B as compared to Group A and proportion of patients with higher age was found to be higher in Group A as compared to Group B. Difference in age of both the groups was not found to be statistically significant. In the present study, a total of 14 females and 26 males were enrolled. Group A constituted of 8 (40.0%) females and 12 (60.0%) males while Group B constituted of 6 (30.0%) females and 14 (70.0%) males.

**Table 2: Post-Operative pain in both groups**

Post-Operative Pain	Total	Group A (n=20)		Group B (n=20)		Statistical Significance	
		No.	%	No.	%	$\chi^2$	p
No	36	18	90.00	18	90.00	2.000	0.368
Mild	2	0	0.00	2	10.00		
Moderate	2	2	10.00	0	0.00		

As per table 2 in the present study, majority (n=36; 90.0%) of patients did not complain of post-operative pain. No pain was observed by majority of patients of both the groups (90.0%) each while 2 (10.0%) patient of Group B suffered with mild pain and 2 (10.0%) of Group A suffered with moderate pain. Difference in proportion of patients suffering different grades of pain was not found to be statistically significant (p=0.368). There was no post-operative infection.

**Table 3: Between Group Comparison of Evidence of Calcification at 3 weeks, 6 weeks & 12 weeks**

Evidence of Calcification	Total	Group A (n=20)		Group B (n=20)		Statistical Significance	
		No.	%	No.	%	$\chi^2$	p
Slight	36	20	100.00	16	80.00	2.222	0.136
Moderate	4	0	0.00	4	20.00		
At 6 weeks	40	20	100	20	100	3.78	0.01*
At 12 weeks	40	20	100	20	100	1.22	0.45

At follow up at 3, 6 and 12 weeks, slight evidence of calcification was observed in majority (n=36; 90.0%) of patients while in rest of the patients (10.0%) moderate degree of evidence of calcification was observed. Slight evidence of calcification was observed in all the patients of Group A (100.0%) while it was found in only 8 (80.0%) patients of Group B, in rest of

the 2 (20.0%) cases of Group B moderate evidence of calcification was observed. Difference in proportion of patients in both the groups with different evidence of calcification was not found to be statistically significant ( $p=0.136$ ) but was significant at 6 weeks.

**Table 4: Intragroups Change in Total Bridging Gap by normal bone**

		Group A				Group B			
		No.	Mean ranks	Sum of Ranks	Statistical significance	No.	Mean ranks	Sum of Ranks	Statistical significance
3 weeks to 6 weeks	-ve ranks	0	0	0	Z=-3.162; p=0.002	0	0	0	Z=-3.162; p=0.002
	+ve ranks	0	5.5	55		10	5.5	55	
	Ties	10				0			
	Total	10				10			
3 weeks to 12 weeks	-ve ranks	0	0	0	Z=-3.162; p=0.002	0	0	0	Z=-2.972; p=0.003
	+ve ranks	10	5.5	55		10	5.5	55	
	Ties	0				0			
	Total	10				10			
6 weeks to 12 weeks	-ve ranks	0	0	0	Z=0.000; p=1.000	0	0	0	Z=-2.828; p=0.005
	+ve ranks	10	0	0		8	4.5	36	
	Ties	0				2			
	Total	10				10			

As per table 4 In Group A, change in total in total bridging gap by normal bone between 3 weeks to 6 weeks was found to be statistically significant, no further change in total in total bridging gap by normal bone was found between 6 weeks and 12 weeks, hence change between 3 weeks to 12 weeks was also similar to that change observed between 3 weeks to 6 weeks.

In Group B, a statistically significant change in total in total bridging gap by normal bone was observed between 3 weeks to 6 weeks ( $p=0.002$ ).

Change in total in total bridging gap by normal bone between 3 weeks to 12 weeks was also found to be statistically significant and change between 6 weeks and 12 weeks was also found to be statistically significant.

## Discussion

In the present study, majority of patients did not complain of post-operative pain. No pain was observed by majority of patients of both the groups each while patient of Group B suffered with mild pain and 1 of Group A suffered with moderate pain. Difference in proportion of patients suffering different grades of pain was not found to be statistically significant. Since effective pain control was strived for both intraoperative and postoperative this finding is consistent with our precaution.

In the present study, majority of patients did not complain of post-operative Swelling. No swelling was observed by majority of patients of both the groups though no swelling was found in higher proportion of Group A as compared to Group B, rest of the patients in both the

groups suffered mild post-operative swelling. Difference in proportion of patients suffering different grades of swelling was not found to be statistically significant [6]. First, the fibrin clot plays an important mechanical role, with the PRF membrane maintaining and protecting the grafted biomaterials and PRF fragments serving as biological connectors between bone particles. Second, the integration of this fibrin network into the regenerative site facilitates cellular migration, particularly for endothelial cells necessary for the neoangiogenesis, vascularization and survival of the graft. Third, the platelet cytokines (PDGF, TGF- $\beta$ , IGF-1) are gradually released as the fibrin matrix is resorbed, thus creating a perpetual process of healing [7,8]. Lastly, the presence of leukocytes and cytokines in the fibrin network can play a significant role in the self-regulation of inflammatory and infectious phenomena within the grafted material [8].

No post-operative infection was found. The above can be attributed to the strict aseptic technique followed intra operative and post-operative antibiotic coverage.

At follow up at 3 weeks, slight evidence of calcification was observed in majority of patients while in rest of the patients moderate degree of evidence of calcification was observed. Slight evidence of calcification was observed in all the patients of Group A while it was found in only 8 patients of Group B, in rest of the 2 cases of Group B moderate evidence of calcification was observed. Difference in proportion of patients in both the groups with different evidence of calcification was not found to be statistically significant. Marked calcification is not expected.

Rank of total bridging of gap by normal bone in Group B was found to be significantly higher than that of Group A and this difference was found to be statistically significant in agreement studies showed although clinical results

from the comparison of PRP alone versus PRP and restorable membrane can be considered similar, from a histological point of view, the association of PRP to Bio-Gide membrane showed earlier signs of bone maturation but not a higher grade of bone regeneration [9,10].

In Group A, change in total in total bridging gap by normal bone between 3 weeks to 6 weeks was found to be statistically significant, no further change in total in total bridging gap by normal bone was found between 6 weeks and 12 weeks, hence change between 3 weeks to 12 weeks was also similar to that change observed between 3 weeks to 6 weeks [11,12].

### Conclusions

DFDB is a predictable homologous graft material which is less expensive than synthetic material and easily available. Incorporation of PRF in DFDB results in earlier calcification and bone formation when compared with DFDB alone. Also, bone bridging is faster when PRF is incorporated in DFDB. Handling, placement and retention of graft is comparatively better when PRF is used along with DFDB.

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