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A comparative evaluation of bone regeneration for healing of socket withtooth autograft and tooth autograft with PRF after surgical extraction ofmandibular third molar.

[1]Dr.Vinayak Kamble, [2]Dr.Reshma Hammanavar, [3]Dr.Sharanbasappa Japatti, [4]Dr.Harshada Rakh, [5]Dr.Kiran Holikatti,

Post graduate student, Department of Oral and Maxillofacial Surgery, A.C.P.M. Dental College,Dhule, Maharashtra.
Professor, Department of Oral and Maxillofacial Surgery, A.C.P.M. Dental College, Dhule,Maharashtra.
Professor and Head, Department of Oral and Maxillofacial Surgery, A.C.P.M. DentalCollege, Dhule, Maharashtra.
Post graduate student, Department of Oral and Maxillofacial Surgery, A.C.P.M. Dental College,Dhule, Maharashtra.
Professor, Department of Oral Pathology and Microbiology, A.C.P.M. Dental College, Dhule,Maharashtra.

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ABSTRACT

AIM: To evaluate and compare the efficacy of tooth autogenous graft and tooth autogenous graft with PRF on bone regeneration after surgical removal of mandibular third molar tooth.

MATERIAL AND METHOD: An in vivo randomized clinical trial was carried in Department of oral and maxillofacial surgery on 28 patients having bilaterally symmetrically impacted mandibular third molar teeth.The patients were equally distributed for healing of socket with tooth autograft and tooth autograft with PRF after surgical extraction of mandibular third molar.Patient was evaluated and noted preoperatively for:paraesthesia,wound dehiscence.Swelling was also preoperatively evaluated by using silk suture thread and ruler scale.Probing depth was evaluated using William's Graduated probe.Alveolar bone height and bone density was measured on IOPA radiographs.All this preoperative record were maintained for respective patients of both the groups.Patients were evaluated post operatively at 1st day,3 months and 6 months for all the above mentioned parameters.

CONCLUSION: In conclusion the present study clearly indicates a definitive improvement in periodontal health (distal to 2nd molar) after the third molar surgery, in cases treated with tooth graft and graft with PRF. Similarly, the improvement in bone regeneration was more in group A that is tooth graft with PRF than only with group B that is tooth graft.

KEYWORDS: Disimpaction, Tooth autogenous graft, Platelet rich fibrin, Bone regeneration.

I. INTRODUCTION:

Extraction of teeth is one of the most routinely performed procedures in dentistry and this may initiate significant changes in the dimension of the alveolar ridge. The management of impacted mandibular 3rd molars contributing to uneventful and enhanced wound healing, ascertaining quality of life after 3rd molar surgery remains a clinical challenge (1). The surgical removal of mandibular third molar is generally followed by immediate postoperative sequelae like pain, swelling, trismus and dehiscence and delayed sequelae are seen mostly on the distal surface of second molar owing to distal bone loss which includes prolong sensitivity due to root exposure or increasedprobing depth (2).

There are many bone graft materials used for various purposes like bone regeneration, bone augmentation, sinus lift procedures. Autogenous bone graft is considered as gold standard, since it is nonpathogenic and non-immunogenic in nature (3). Cementum and dentin in the teeth contain a large quantity of bone growth factors, including type I collagen and bone morphogenetic proteins (BMPs). Hence, it is thought that the teeth could be used to develop bone graft material that have a healing ability similar to autogenous bone and can be used for bone regeneration procedures (4). Dentin has the potential to be used as bone substitute because of its mineral content which is higher than any other material derived from bone and also it is similar to autogenous bone in two aspect that is 1) osteocompactibility and 2) osteoconductivity. (2) therefore it can be used as a bone graft material for new bone regeneration. In many studies it has been concluded that platelet rich fibrin(PRF) has a great

healing potential for bony and soft tissue which can be used with all kind of graft with no inflammatory effects(7) and therefore used during alveolar bone grafting in extraction socket and in implant cases.The objective of the present study is to compare the bone regeneration, infection rate, paraesthesia, swelling, probing depth and crestal height between the tooth autograft and tooth autograft with PRF after surgical extraction of mandibular third molar.

II. MATERIAL AND METHOD:

An in vivo randomized clinical trial was carried in Department of oral and maxillofacial surgery on 28 patients having bilaterally symmetrically impacted mandibular third molar teeth.The patients were equally distributed for healing of socket with tooth autograft and tooth autograft with PRF after surgical extraction of mandibular third molar.Patient was evaluated and noted preoperatively for:paraesthesia,wound dehiscence.Swelling was also preoperatively evaluated by using silk suture thread and ruler scale.Probing depth was evaluated using William's Graduated probe. Alveolar bone height and bone density was measured on IOPA radiographs.All this preoperative record were maintained for respective patients of both the groups.Patients were evaluated post operatively at 1st day,3 months and 6 months for all the above mentioned parameters.
Inclusion criteria:

1. Bilaterally symmetrically impacted mandibular third molar teeth.
2. Patient without any decayed or carious or periapical infection to the impacted mandibular third molar teeth. 3.Patient willing to participate in the study.

Exclusion criteria:
1. Patients with unilateral impacted mandibular third molar.
2. Patients with pericoronitis in relation to impacted mandibular third molar. 3.Patient with systemic disease or any immunocompromised state.

Procedure
Under proper aseptic conditions the patient's face was scrubbed, prepared and draped, followed by intra oral irrigationwith betadine and saline.

a. Anaesthesia: Inferior alveolar nerve, lingual nerve and long buccal nerve block were given using 2% lignocaine with 1: 2, 00,000 adrenaline to achieve satisfactory anaesthesia.
b. Incision and Muco-periosteal flap reflection: Standard ward incision was used in all cases. Full thickness muco-periosteal flap was raised to expose sufficient bone on lateral and distal aspect of impacted molar.
c. Removal of surrounding bone: Guttering of bone on buccal and distal of impacted third molar was done with round carbide bur. The depth of guttering was, up to cemento-enamel junction of the impacted third molar tooth. Wherever necessary the sectioning of the tooth was done. During this procedure constant copious irrigation with saline was used to prevent thermal necrosis of bone and to remove bone debris.
d. Extraction:Tooth was luxated with the help of coupland elevator and then extracted with molar forceps employing minimum force. Wherever sectioning was indicated, the tooth was sectioned and removed.
e. Wound Toileting: Curettage was carried out to remove any loose bony fragments, tooth fragments and granulation tissue. Surrounding bone was smoothened using bone file. The wound was irrigated with saline and checked for any small detached fragments of bone or tooth pieces.
f. Graft placement: In Group A, extraction socket was filled with tooth autogenous graft with PRF In Group B, extraction socket was filled with only tooth autogenous graft.
g. Wound Closure: The margins of flap refreshed and wound closed using 3-0 black braided silk interrupted suture.Pressure pack was given.

For the postoperative clinical evaluation, the patients were recalled on 1st, 3rd month, 6th month to assess the, swelling, wound dehiscence, infection and healing of wound, bone regeneration. The radiographs were taken on 3rd and 6th months to assess the alveolar bone height and the bone density.

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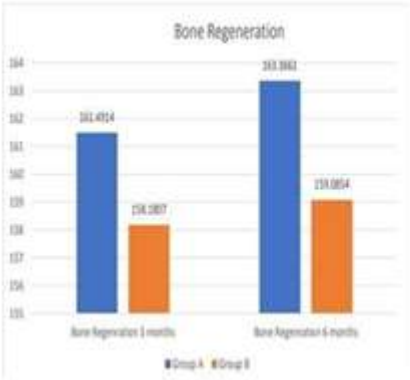

Figure 1

Figure 2

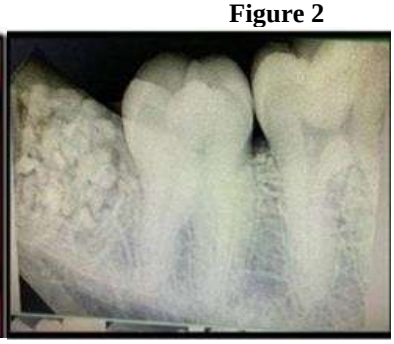

Figure 3Figure 4

Figure 5

FIGURE LEGENDS WITH CAPTIONS-

Figure 1-Graphic representation of bone regeneration Figure 2-Graphic representation of crestal bone heightFigure 3-Tooth autogenous graft placement

Figure 4-Post operative radiograph of tooth graft without PRF Figure 5-Post operative radiograph of tooth graft with PRF

RESULTS

Group A

t value		Mean	Std. Deviation	Std. Error Mean		p value
-9.777		Group A Bone Regeneration 3 months	161.4914	1.16425	.22002	<0.000*
		Group A Bone Regeneration 6 months	163.3661	.59844	.11310	

Group B

	Mean	Std. Deviation	Std. Error Mean	t value	p value
Group B Bone Regeneration 3 months	158.1807	.59646	.11272	-10.688	
Group B Bone Regeneration 6 months	159.0854	.72135	.13632		

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In group A, Paired t test showed statistically highly significant difference in 3 months and 6 months follow up in Bone regeneration between 3 and 6 months respectively. (p<0.001)

In group B, Paired t test showed statistically highly significant difference in 3 months and 6 months follow up in Bone regeneration between 3 and 6 months respectively. (p<0.001)

ANOVA		
Probing Depth		
	F	P value
Between Groups	7.525	.001*

ANOVA		
Crestal Height		
	F	P value
Between Groups	125.208	<0.001*

In group A, ANOVA showed statistically significant difference in the Probing depth between 1st day,3months and 6months. (p=0.001)

In group A, ANOVA showed statistically high significant difference in the crestal bone between 1st day, 3 months and6 months follow-up. (p<0.001)

ANOVA			
Crestal Height	Between Groups	79.773	<0.001*
	Within Groups		
	Total		

ANOVA			
		F	P value
Probing Depth	Between Groups	11.160	<0.001*
	Within Groups		

In group B, ANOVA showed statistically high significant difference in the crestal bone between 1st day, 3 months and 6 months follow-up. (p<0.001)

In group B, ANOVA showed statistically high significant difference in the Probing depth between 1st day,3monthsand 6 months. (p<0.001)

III. DISCUSSION:

Third molar extraction is one of the most frequent procedures in oral surgery. The reported reasons for third molar removal include the risk of impaction associated with caries, pericoronitis, periodontal defects in the distal surface of second molars, odontogenic cysts and dental crowding. The extraction of the impacted mandibular third molar provokes periodontal damage, which leads to osseous defect at distal surface of adjacent second molar. It is generally believed that 2/3rd of the tooth socket fills in 28 days and is maximal at 100 days. Periodontal defect distal to lower second molar are complications of removal of third molar. There are various augmentation procedures to maintain ridge form for prosthetic reconstruction and periodontal health by using various types of autogenous, synthetic, natural bone grafts, PRP, PRF, and GTR. Tooth autograft or dentin autograft was used for bone regeneration in this study because it is the most acceptable bone graft with minimum complications like infection and wound dehiscence etc. as it has all the properties needed for bone regeneration. Along with tooth autograft the use of platelet rich plasma also contribute to the good wound healing and bone regeneration. This PRF is a second generation PRP where autogenous platelet and leukocyte are present in complex fibrin matrix to increase or accelerate the healing of soft and hard tissue. The present study, examined the effect of tooth autograft and tooth autograft with PRF on postoperative sequelae like bone regenerative potential, swelling, infection, probing depth, crestal height and wound dehiscence, paraesthesia, healing, alveolar bone was evaluated on 1st post-operative day,3rd and 6th post-operative month in every case. A total of 28 patients having bilaterally symmetrical impacted mandibular 3rd molar age between 18 to 40 years irrespective of gender were included in study. The density of bone was calculated by measuring on grey scale histogram values of digitalised RVG/OPG/IOPA radiographic images. The parameters of bone regeneration, swelling, infection, probing depth and crestal height were measured on 1st post-operative day, 3rd and 6th post- operative month.

Wound healing was evaluated on day 1, 3rd and 6th follow up month and it was according to the Landry et al criteria for soft tissue healing and found that in 2 out of 28 patients wound healing was poor and it was good in rest 26patients on the 1st follow up period. Swelling was measured by 5-point scale. In both the group there was no statistically significant difference evaluated at day 1, 3rd and 6th month. Swelling was present in about 14.3% and absent in 85.7% in group A on 1st day follow up and no swelling present at follow up

period 3 month and 6 month respectively .6 patient of group B had swelling on 1st follow up day and only 2 patient had mild swelling on 3rd month follow up period which reduced with time and there was no swelling present on 6th month follow up period.

Paraesthesia was evaluated postoperatively and it was found that only one patient of 28 had mild paraesthesia on follow up day 1 and that remained till the 3rd month follow up period, there was no paraesthesia seen in any patient on 6th month follow up period. **Re-Mee Doh, Sooil Shin, Tae Min You** in their study regarding Delayed paresthesia of inferior alveolar nerve after dental surgery concluded that Paresthesia is an altered sensation of the skin, manifesting as numbness, partial loss of local sensitivity, burning, or tingling. the inferior alveolar nerve (IAN) and lingual nerves are the most commonly implicated nerves, in this study IAN paresthesia occurs in 0.35% to 8.4% of patients, and the neurologic symptom duration varies greatly from days or weeks to several months. So, neurosensory deficits after third molar surgery spontaneously recover in the first 6 postoperative months and the incidence of permanent sensory disturbance was reported as 0.12%. Direct traumatic injury to the IAN during dental procedures and indirect trauma from edema or hematoma are reported mechanisms of IAN paresthesia.

Infection was evaluated post operatively in group A it was found that there was infection present in 2 patients on first follow up period which was already present preoperatively, and patient was put on antibiotics for the same. In group B on 1st follow up period total 3 patients was there with infection which was kept under observation with oral antibiotics that got subside with time. **Giulia Brunello et al** did an Observational Cohort Study on Delayed- Onset Infections after Mandibular Third-Molar Extractions, Delayed-onset infections (DOI) after mandibular third molar extractions have been described as a rare complication characterized by swelling, usually with a purulent discharge at the extraction site, developing approximately a month after surgery.

Bone regeneration in the form of bone density was evaluated at day 1 and 3rd and 6th month follow up period.

The statistical analysis also showed highly significant difference at the 3rd and 6th month post-operative period between group A and group B. **Young kyun kim et al** in his study stated that Teeth and bones share many similarities. Teeth, cartilages, nerves, and maxillofacial bones all embryologically originated in the neural crest, sharing identical origin and concluded that tooth-derived bone graft may be considered as an option given its autogenous origin and favorable clinical and histological outcomes when teeth extraction is necessary.

Measurement of the probing depth distal to second molar was done at pre-operative, 1st post-operative day, 3rd and 6th post-operative month. The statistical analysis showed highly significant reduction in probing depth from 1st post-operative day to 3rd and 6th post-operative month in all groups. The measurement of alveolar bone level was performed periodically at pre-operatively, immediate 1st post-operative day, 3rd and 6th post-operatively. It was revealed that the decrease in the alveolar bone height distal to second molar was highly significant at 3rd and 6th month post-operatively. **Shadia Abdel-Hameed Elsayed** et al presented one study with purpose 1) to compare the regeneration with and without applying nanohydroxyapetite (nHA) bone graft and to determine if there is a clinical potential benefits of nHA in the regeneration on postextraction alveolar bone healing of distal bone defects of mandibular 2nd molar, 2) to determine whether there are differences in postoperative clinical symptoms between the two groups. Here they concluded that there was significant reduction in probing depth in 3rd and 6th month follow up period but there was no significant difference between probing depth value of two comparing groups. And also the reduction in crestal bone height which got reduce with follow up period 3rd month and 6th month respectively.

IV. CONCLUSION

The present study was attempted to evaluate and compare the efficacy of tooth autogenous graft and tooth autogenous graft with PRF on bone regeneration of extraction socket after surgical removal of bilateral similar impacted mandibular third molars, as an adjunct to promote wound healing and osseous regeneration.

The present study clearly indicates a definitive improvement in periodontal health (distal to 2nd molar) after thethird molar surgery, in cases treated with tooth graft and graft with PRF. Similarly, the improvement in bone regeneration was more in group A that is tooth graft with PRF than only with group B i.e. tooth graft.

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