

Periapical Bone Regeneration with Bone Grafts Vs without Bone Graft: A Clinical Study

Sonal Sinha^{1*} Saurav Kumar² Swati Priya³ Arsha Sagarika⁴ Kunal Kumar⁵

¹Senior Lecturer, Department of Conservative Dentistry and Endodontics, Dr. B. R. Ambedkar Institute of Dental Sciences & Hospital, Patna, India.

²MDS, Department of Oral & Maxillofacial Pathology and Microbiology, ITS CDSR Dental College and Hospital, Ghaziabad, Uttar Pradesh, India.

³Lecturer, Department of Conservative Dentistry and Endodontics, Dr. B. R. Ambedkar Institute of Dental Sciences & Hospital, Patna, Bihar, India.

⁴BDS, Dr. B. R. Ambedkar Institute of Dental Sciences & Hospital, Patna, Bihar, India.

⁵Private Consultant, Muzaffarpur, Bihar, India

ABSTRACT

Background: Apical periodontitis is one of the most periapical lesions reported in dentistry. There is immense dilemma to the clinicians regarding the use of bone graft following the periapical surgery. This study attempts to evaluate and compares the healing clinically and radiographically following periapical surgery with and without using hydroxyapatite granules.

Materials and Methods: Twenty patients were randomly divided into two groups by coin toss method. First group consisted of ten patients who received bone graft during peri apical surgery (Group A) while second group of ten didn't receive any bone graft (Group B). Lesions measuring not more than 2mm were included in the study.

Results: Bone fill was evaluated radiographically for a period one to nine months. Clinical signs like pain on percussion, mobility, swelling was also noted. None of the groups showed any delayed or immediate local tissue reactions. All the patients reported for the follow up visits. Both the group showed the bone formation post-surgery.

Conclusion: The bone fill after periapical surgery can be helped by using bone graft. Hydroxyapatite is found to be very effective alloplastic material.

Keywords: Bone graft, hydroxyapatite graft, periapical lesion.

INTRODUCTION

Apical periodontitis is one of the most periapical lesions reported in dentistry. It is an inflammatory condition that effects the apical area of the tooth.^{1,2} Radiographically it is seen as a radiolucent area in the apical third of the tooth. Patients frequently complains of severe pain while chewing and clinically tooth becomes tender on percussion even before the radiolucency occurs.³ The etiology of the condition could be an endodontic infection.

The renewal of bone following destruction by pathological processes plays an important role in the success of the outcome of treatment. Healing

should be consistent both qualitatively and quantitatively. Periradicular surgery is only required if the conventional treatment fails to attain the results.⁴

There is immense dilemma to the clinicians regarding the use of bone graft following the periapical surgery.⁵ A group of few clinicians believe that there is no requirement of placing bone graft after the periapical surgery while others strongly believe that bone grafts are required for the a better bone fill. Different types of bone grafts are available for dental surgical procedure. These include

Received: Dec. 11, 2020; Accepted: Jaan. 26, 2021

*Correspondence Dr. Sonal Sinha.

Department of Conservative Dentistry and Endodontics, Dr. B. R. Ambedkar Institute of Dental Sciences & Hospital, Patna, India.

Email: sonalsinha322@gmail.com

doi: <https://doi.org/10.53064/jrad.2021.12.2.06>

Copyright ©2021

autografts, allografts, xenografts, and alloplasts. The ideal bone replacement material should be clinically and biologically inert, noncarcinogenic, easily maneuverable to suit the osseous defect, and should be dimensionally stable.⁴ It should serve as a scaffold for bone formation and slowly resorb to permit replacement by new bone.⁶ Calcium-based ceramic materials like calcium hydroxyapatite (HA) and tricalcium phosphate (TCP) had been used popularly for alveolar ridge reconstruction and in periodontal bony defects. In this present study, hydroxyapatite ceramic granules were used as a bone graft in periapical lesion.⁷⁻¹⁰

This study attempts to evaluate and compares the healing clinically and radiographically following periapical surgery with and without using hydroxyapatite granules.

MATERIALS AND METHODS

Patients were selected from the out-patient department of conservative dentistry and endodontics. All the patients were informed about the study and written consent were obtained. This research was approved by the institutional ethical board from our institution (uni/Ins/2017/099). The study was carried out from Jan 2018 to May 2018. Power of study was calculated for this work. Twenty patients were selected for this study. In these twenty patients a total of twenty tooth were selected from both genders. The patients selected were systemically healthy and had no medical history.

Twenty patients were randomly divided into two groups by coin toss method. First group consisted of ten patients who received bone graft during periapical surgery (Group A) while second group of ten didn't receive any bone graft (Group B). Lesions measuring not more than 2mm were included in the study.

Surgical Procedure

Semilunar flap was reflected on the apical region of the tooth. The inflammatory hyperplastic tissues were curetted out along with the resection of root apex. Root apex cavities were prepared with low speed bur and then restored with IRM.^{11,12} In Group A after the surgery bony defect was filled with hydroxyapatite and was taken as test groups. In

Group B, after surgery no bone graft was placed and kept as a control group.

Data Recording:

A. Border between the graft and the bone:

- 1: Definite margins of separation
- 2: blending of margins of bone and grafts.

B. Radiopacity of the graft in comparison to surrounding bone:

- 1: more radiopaque than the bone
- 2: irregular radiopacity of the graft
- 3: uniform radiopacity of graft and bone areas

C. Presence or absence of trabecular bone pattern

- 1: Absent
- 2: Presence

D. Size of radiolucency in comparison to the preoperative size

1. Decrease
2. Increase

RESULTS

Table 1: Parameter recording of group A

No	Border between the graft and the bone				Radiopacity of the graft in comparison to surrounding bone				Presence or absence of trabecular bone pattern			
	1m	3m	6m	9m	1m	3m	6m	9m	1m	3m	6m	9m
1	1	2	2	2	1	2	3	3	1	2	2	2
2	1	2	2	2	1	2	3	3	1	2	2	2
3	1	2	2	2	1	1	2	3	1	2	2	2
4	1	2	2	2	1	2	3	3	1	2	2	2
5	1	2	2	2	1	2	3	3	1	2	2	2
6	1	2	2	2	1	2	3	3	1	2	2	2
7	1	2	2	2	1	2	3	3	1	2	2	2
8	1	2	2	2	1	2	3	3	1	2	2	2
9	1	2	2	2	1	1	2	3	1	2	2	2
10	1	2	2	2	1	2	3	3	1	2	2	2

Table 2: Parameter recording of group B

No	Presence or absence of trabecular bone pattern				Decrease in size of lesion			
	1m	3m	6m	9m	1m	3m	6m	9m
1	1	2	2	2	1	1	1	2
2	1	2	2	2	1	1	2	2
3	1	2	2	2	1	1	2	2
4	1	2	2	2	1	1	2	2
5	1	2	2	2	1	1	2	2
6	1	2	2	2	1	1	2	2
7	1	2	2	2	1	1	2	2
8	1	2	2	2	1	1	1	2
9	1	2	2	2	1	1	2	2
10	1	2	2	2	1	1	2	2

Bone fill was evaluated radiographically for a period one to nine months. Clinical signs like pain on percussion, mobility, swelling was also noted. None of the groups showed any delayed or immediate local tissue reactions. All the patients reported for the follow up visits. Both the group showed the bone formation post-surgery. The formation of bone was a bit faster in group A. In the follow-up period of 6-9 months, radiographically the bone graft became indistinguishable from the surrounding bone, which indicates complete bone regeneration. Whereas in the control group ever after 9 months, the radiographs showed inadequate bone fills.

DISCUSSION

The goal of the periapical surgery is to achieve complete resolution of the bone defect to provide functional efficacy to the tooth. Incomplete formation of bone can be caused due to the ingrowth of connective tissue in the bony space. In order to prevent this tissue ingrowth, bone grafts and membrane can be placed at the surgical site. This will allow a better probability of bone fill.

In the current study, twenty patients of age group of 20 to 40 years were chosen. They were randomly divided into two groups by coin toss method. Periapical curettage was performed. The root apex was resected and was restored with IRM. According to studies by Trope et al.¹² Harrison Tw et al.¹¹ Yi Tai Jon et al. reinforced ZOE (Super EBA and IRM) were found and be an ideal retrofilling material. In group A after surgery G graft (Surgicare, India) were packed into the bony defect. Group B was kept as a control group in which after surgery no bone graft were used.

In a study conducted by Kenney et al. porous hydroxyapatite on periodontal defect found connective tissue infiltration through the pores and bone formation from the 3rd month examination onwards. Further in a study undertaken by Kwalitter et al. stated that a minimum pore size of 5-15 μ is necessary to encourage fibrous tissue ingrowth. HA used in the study have a pore size of 100-200 μ .¹³

Scarring of periapical lesion healing was reported by Hames as early in 1933. He established the fact that this occurred due faster soft tissue growth than the bone regeneration process. The hydroxyapatite

will act as a filling materials as well as a scaffold, which gradually gets resorbed while preosteoblasts and osteoblasts migrate from the adjacent bone (Osteoconduction).

CONCLUSION

The bone fill after periapical surgery can be helped by using bone graft. Hydroxyapatite is found to be very effective alloplastic material. In this present clinical study, hydroxyapatite was used as a bone graft to fill the osseous defects following periapical surgery and was evaluated both clinically and radiographically. On the basis of review of literature and the clinical and radiographic outcomes hereby presented, it might be concluded that in large bone destruction caused by periradicular lesion bone regeneration can be facilitated by effective bone replacing materials like hydroxyapatite. The early bone regeneration also gives functional support to the tooth especially with large periapical bone defects.

REFERENCES

1. Karamifar K, Tondari A, Saghir MA. Endodontic Periapical Lesion: An Overview on the Etiology, Diagnosis and Current Treatment Modalities. *Eur Endod J*. 2020 Jul 14;5(2):54-67.
2. Graunaite I, Lodiene G, Maciulskiene V. Pathogenesis of Apical Periodontitis: a Literature Review. *J Oral Maxillofac Res*. 2012 Jan 1;2(4):e1.
3. Fukuda K. Diagnosis and treatment of abnormal dental pain. *J Dent Anesth Pain Med*. 2016 Mar;16(1):1-8.
4. Sreedevi P, Varghese N, Varugheese JM. Prognosis of periapical surgery using bonegrafts: A clinical study. *J Conserv Dent JCD*. 2011;14(1):68-72.
5. Chaturvedy V, Chaturvedy S. Regenerative Therapy as an Adjunct to Periapical Surgery: A Case Report. *Int J Clin Pediatr Dent*. 2012;5(1):75-7.
6. Polo-Corrales L, Latorre-Esteves M, Ramirez-Vick JE. Scaffold Design for Bone Regeneration. *J Nanosci Nanotechnol*. 2014 Jan;14(1):15-56.
7. Barnett JD, Mellonig JT, Gray JL, Towle HJ. Comparison of freeze-dried bone allograft and porous hydroxylapatite in human periodontal defects. *J Periodontol*. 1989 May;60(5):231-7.

8. Kenney EB, Lekovic V, Sa Ferreira JC, Han T, Dimitrijevic B, Carranza FA. Bone formation within porous hydroxylapatite implants in human periodontal defects. J Periodontol. 1986 Feb;57(2):76-83.
9. Molven O, Halse A, Grung B. Incomplete healing (scar tissue) after periapical surgery--radiographic findings 8 to 12 years after treatment. J Endod. 1996 May;22(5):264-8.
10. Jou YT, Pertl C. Is there a best retrograde filling material? Dent Clin North Am. 1997 Jul;41(3):555-61.
11. Harrison JW, Johnson SA. Excisional wound healing following the use of IRM as a root-end filling material. J Endod. 1997 Jan;23(1):19-27.
12. Trope M, Lost C, Schmitz HJ, Friedman S. Healing of apical periodontitis in dogs after apicoectomy and retrofilling with various filling materials. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1996 Feb;81(2):221-8.
13. EB K, Lakovic V, Carrenza F, Dimitrijenci B. The use of porous hydroxyapatite implants in periodontal defects-clinical results after 6 months. J Periodontol. 1985;56:42-88.