



GUIDED BONE REGENERATION (GBR) USING COLLAGEN MEMBRANE BARRIER TECHNIQUE FOR PRESERVATION OF THE ALVEOLAR BONE FOLLOWING TOOTH EXTRACTION

Dental Science

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KEYWORDS

INTRODUCTION

Alveolar ridge resorption is a phenomenon observed following the removal of the teeth in an otherwise healthy individual. The conditions appears to be progressive and irreversible, resulting in a host of esthetic and functional problems.

Post extraction bone loss is accelerated in the first 6 months, followed by a gradual modelling(changes in size and shape) and remodeling (turn over existing bone) of the remaining bone as 40% of the alveolar height and 60% of the alveolar width lost in the first 6 months.

Current methods used to prevent ridge resorption include placement of particulate autografts, allografts, alloplasts and xenografts. These biomaterials present advantages and disadvantages and depending on their structure and biochemical composition, may be resorbable and nonresorbable.

Guided bone regeneration(GBR) is a technique in which bone growth is enhanced by maintaining the space and preventing soft tissue in growth in the area utilizing either a resorbable or non resorbable barrier membrane. GBR has become a predictable surgical technique to enhance bone formation in alveolar ridge augmentation, even though it is being highly technique sensitive and requires high surgical skill.

The main surgical goal in application of GBR is protecting the space for bone regeneration underneath the membrane barrier, permitting blood clot stability and migration of osteogenic cells, and excludes soft tissue penetration.

A wide variety of barrier membrane has been used in numerous studies over the years, eg, expanded poly tetrafluoroethylene (ePTFE), collagen, polyglycolic acid and polygalactin 910.

The aim of our present study is to determine the effectiveness of bone graft material and collagen membrane in preserving the dimensions of extraction sockets in ridge preservation groups during 6 month healing period compare to tooth extraction alone group.

AIMS AND OBJECTIVES

To evaluate the efficacy of alveolar ridge preservation procedure in maintaining alveolar ridge height after tooth extraction when used with/ without buccal full thickness flap.

To evaluate the efficacy of collagen membrane to serve as an effective barrier in guided bone regeneration procedure when used with/ without full thickness flap

To evaluate the efficacy of bone graft material in ridge preservation procedure when used with/without buccal full thickness flap

MATERIAL AND METHODS

Ninety number of patients reporting to the department of Oral and Maxillofacial Surgery, Regional dental college Assam, presenting

with the need for extraction were selected for this study. Patients were selected irrespective of their age and sex with no systemic disease and falling under ASA-I

Ninety patients were divided in to three groups.

Group A30 → Patients, extractions were done, socket filled with bone allograft and protected with fish derived collagen membrane without buccal or labial full thickness flap.

Group B 30 → patients were selected, extraction were done. Buccal/labial full thickness flap elevated, socket were filled with bone allograft and protected with fish derived collagen membrane barrier.

Group C 30 → patients, selected as control groups. Extraction were done. no bone graft material and collagen membrane were used.

The result will be compared with statistical analysis. Clinical measurements from the test and control groups will be statistically analyzed to compare treatment result between and within groups.

Barrier Membrane

Collagen membrane used in this study is periocol GTR supplied by EucarePharma(p) Ltd, gamma sterilized. It is non allergic, non immunogenic and overall biocompatible.

Bone Graft Material

Bone graft material used in this study is G-Bone supplied by Surgiwear LTD. Made of hydroxyapatite granules made from calcium hydroxyapatite in high crystalline form. Derived from bovine bone sintered at very high temperature of +500°C.

SURGICAL PROCEDURE

FLAP DESIGN

Following local anesthesia, in group B patients a sulcular incision was made with anterior and posterior vertical releasing incisions to mobilize a flap for primary coverage after the graft is placed.

Before placing the graft material, periosteal releasing incisions are made to release the flap to allow for a tension free primary closure of the extraction site. Full thickness flap was elevated on the buccal side/labial side. The wound margin will undermine about 3mm, creating a space in to which the membrane could be tucked

For group A and C patients no vertical release incision was given and no buccal/labial full thickness flap was taken

TOOTH EXTRACTION

Removed atraumatically, if necessary long carbide burs are used to separate the roots in multirrooted teeth.

DEGRANULATION

ALL granulation tissue that was remaining in the extraction socket was removed by periodontal curette. Irrigation of socket was done with

saline or .2% chlorhexidine.

BONE GRAFT PLACEMENT

The G-Bone graft material was dispensing from it container in to a sterile glass bowl. Using a suitable instrument, the graft was placed in to the socket and packed until it filled the socket space. Condensed gently with an instrument handle. The material outside the socket was carefully retrieved and discarded.

COLLAGEN MEMBRANE PLACEMENT

The collagen membrane was trimmed to the appropriate size with scissor. The membrane was placed over the grafted size, covering at least 3mm of bone area beyond the alveolar margins of the socket. The membrane was 1 mm away from the necks of the adjacent teeth.

FLAP CLOSURE

The buccal periosteum was released at the buccal vestibule to allow the extension of the buccal flap for primary closure with silk suture.

METHODS OF COLLECTION OF DATA

Pre-operative intra oral peri apical (I. O. P. A) radiograph was with individual bite blocks attached to bean guiding device(Rinn). The bite registration was fabricated using silicon impression material. The individualized bite blocks was kept in a refrigerator between appointments.

The vertical distance from the the alveolar crest, to the base of the alveolar socket was measured using an electronic digital caliper and was recorded.

IOPA film of the site was obtained at immediately after extraction, after graft placement and 6 months after surgery and the vertical measurement was recorded.

The comparison between the pre and post –operative X-ray measurements of bone height in group A and group B will give us the results of the efficacy of the ridge preservation procedure compared to control group (group-C)

RESULTS AND OBSERVATION

TABLE 1 Average of bone height and difference of bone height in Group A

STATUS	MEAN SD
PREOPERATIVE	12.44 +/- 2.37
AFTER GRAFT PLACEMENT	12.44 +/- 2.37
6 MONTH POSTOPERATIVE	12.07 +/- 2.34
DIFFERENCE OF BONE HEIGHT	0.36
ANALYSIS OF VARIENCE (F)	0.36
P	0.55 NS

Table 1 shows the average of bone height and difference of bone height of group A patients and significance of difference. Thirty extraction socket were treated with guided bone regeneration without using buccal full thickness flap.

The mean bone height preoperatively(n=30) was found to be 12.44mm and SD was found to be 2.37. It was further reduced to 12.07 and 2.34 after 6 months respectively. Thus the percentage of reduction of bone height was only 2.89% after 6th month. Here we found analysis of variance (F) was 0.36. the changes in bone height difference of pre and postoperatively was found insignificant. (p> 0.05)

TABLE 2 Average of bone height and difference of bone height in group B

STATUS	MEAN SD
PREOPERATIVE	11.32 +/- 1.51
AFTER GRAFT PLACEMENT	11.32 +/- 1.51
6 MONTH POSTOPERATIVE	11.02 +/- 1.49
DIFFERENCE OF BONE HEIGHT	0.30 +/- 0.21
ANALYSIS OF VARIENCE (F)	0.60
P	0.44 NS

Table 2 shows the average of bone height and difference of bone height of group B patients and significance of difference. Thirty extraction socket were treated with guided bone regeneration with using buccal full thickness flap.

The mean bone height preoperatively(n=30) was found to be 11.32mm

and SD was found to be 1.51. It was further reduced to 11.02 and 1.49 after 6 months respectively. Thus the percentage of reduction of bone height was only 2.65% after 6th month. Here we found analysis of variance (F) was 0.60. The changes in bone height difference of pre and postoperatively was found insignificant. (p> 0.05)

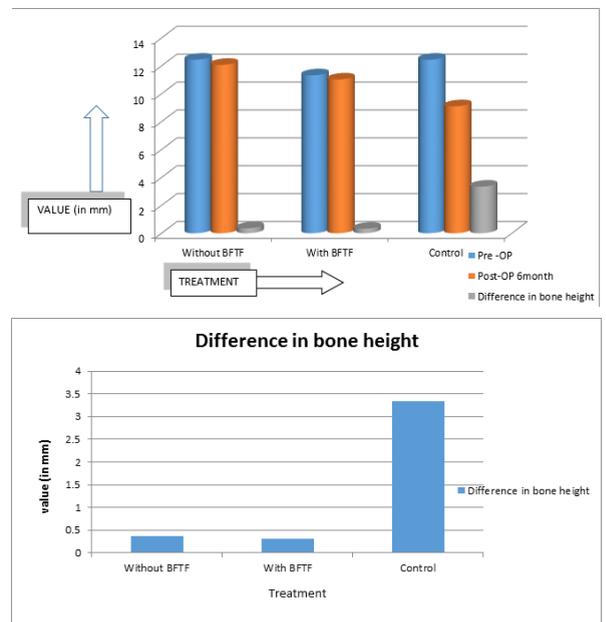
TABLE 3 Average of bone height and difference of bone height in group C

STATUS	MEAN SD
PREOPERATIVE	12.44 +/- 1.66
AFTER GRAFT PLACEMENT	12.44 +/- 1.66
6 MONTH POSTOPERATIVE	9.10 +/- 1.76
DIFFERENCE OF BONE HEIGHT	3.34 +/- 0.94
ANALYSIS OF VARIENCE (F)	57.38
P	0.00 Significant

Table 3 shows the average of bone height and difference of bone height of group C patients and significance of difference. Thirty extraction were performed. No graft materials and collagen membrane were used in this group. Measurement were recorded preoperatively and 6th month postoperatively.

The mean bone height preoperatively(n=30) was found to be 12.44mm and SD was found to be 1.66. It was further reduced to 9.10 and 1.76 after 6 months respectively. Thus the percentage of reduction of bone height was only 26.86% after 6th month. Here we found analysis of variance (F) was 57.38. The changes in bone height difference of pre and postoperatively was found highly significant. (p< 0.01) after 6 months.

Diagram showing average bone height difference within the group



Conclusion and Summary

Bone regeneration using collagen membranes and inorganic bovine bone combination seems promising. In our present study experimental sites were in one group (group A) no flap coverage was done and no significant difference in bone loss compared to control group as well as in group B, where flap coverage was done after bone graft also showed no significant bone loss. Hence the ridge preservation procedure done in group A is much more simpler than group B procedure. But there is obviously a need for long-term studies to confirm the success rate of ridge preservation procedures using buccal full thickness flap and without buccal full thickness flap.

However the role of absorbable collagen membranes in guided bone regeneration will remain a fertile area for further exploration.

References

1. Barry K bart etal, Extraction site reconstruction for alveolar ridge preservation. Part 1: rationale and material selection. Journal of oral implantology Vol.xxvii/no Four/2001,187-193
2. Micheal S. block etal, Treatment of the single tooth extraction site: Oral maxillofacial surgery clin N am 16(2004), 41-63

3. L. Khojastehpour et al, The effect of bit registration on reproducibility of parallel periapical radiograph obtained with two month interval. Journal of dentistry, Tehran university of medical science, Iran (2003; vol:3, no2), 87-91
4. Scabia et al, A comparative study on the use of a HA/collagen/chondroitin sulphate biomaterial(Biosite) and a bovine derived HA xenograft (Bio Oss) in the treatment of deep intra-osseous defects. J clin periodontal 2004, 31: 345-355
5. Vojislav et al, Preservation of alveolar bone in extraction socket using bioabsorbable membrane. J Periodontal 2008, 79: 1232-1240
6. K. Harikumar, K. Nandakumar et al, Guided tissue regeneration (GTR) Principles and GTR device. Journal of Indian Society of Periodontology Vol 2 No 1 1999
7. Arnold E et al, Chemotactic attraction of human fibroblast to type I, II and III collagens and collagen derived peptides. Proc.natl acad Sci. USA VOL 75, No 2, 871-875, Feb 1978.