

Alveolar Ridge Preservation Using Beta Tricalcium Phosphate -A Review

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Abstract:

Materials and Methods:

Patients requiring tooth extraction except the third molars and who agreed for bone grafting were selected for the study. Randomly these were divided into two groups, one was the socket preservation group in which after extraction, bone graft is placed in the extraction socket and protected with a collagen membrane and the other was a control group wherein no graft was placed and extraction socket was left to heal normally. Radiographic height and width is assessed, at time of extraction and 6 month postoperatively using vista scan and bone calliper.

Conclusion:

β - TCP placed at the time of grafting extraction socket was well tolerated in all sites with barrier membrane used. There was no incidence of graft rejection or infection .Guided Bone regeneration is a successful method of alveolar ridge preservation and that synthetic bone substitute (β - TCP) with a collagen membrane can be usefully utilized for this purpose

KEY WORDS:

Alveolar ridge preservation, Guided Bone Regeneration, Collagen Membrane, Synthetic bone substitute, Beta tricalcium phosphate, allograft.

INTRODUCTION:-

Alveolar bone plays a major role in providing support to the teeth. Tooth extraction results in typical bone deficiency of ridge width and height of alveolar crest and reduces the likelihood of placing screw titanium implants. The bone resorption process is initiated immediately after extraction, leading to an average 40–60% decrease in the horizontal and

vertical dimensions of the alveolar ridge, during the first 2 years.¹ To restore alveolar bone loss and support efficient placement of dental implants, many different bone substitute such as autografts, allografts, xenografts, synthetic biomaterials and osteoactive agents have been proposed.² Morbidity of donor sites, attempts at reduction within the number of surgical sites, and limitations in amount of bone available are

some objective reasons driving the search of bone substitute to replace the use of autogenous bone. Ridge preservation using the Guided Bone Regeneration (GBR) technique has been shown to improve ridge height and width dimensions when compared with tooth extraction alone.³ The use of bone grafts in the maxillofacial region has been considered for regeneration of bone defects and to re-establish the original skeletal contour and function. According to previous studies β TCP shows great osteoconductive potential because of its

macroporosity (1 micron -1000 micron), which leads to good bone growth. Approximately 90% of this material is interconnected void spaces. β TCP bonds directly to bone, which facilitates healing.⁴ Therefore, in our study we are using Beta Tricalcium Phosphate (β -TCP) with a resorbable collagen membrane. The present study was carried out to evaluate the alveolar ridge preservation achieved following tooth extraction with or without the placement of β -TCP



PLACEMENT OF GRAFT IN EXTRACTION SOCKET

MATERIALS AND METHODS:-

Thirty patients aged between 18-50 years, irrespective of sex for the extraction of teeth were included in the study. Each was given numbers and odd and even numbers were selected. Randomly these were divided into 2 groups of 15 cases each, one was the experimental group i.e. the socket preservation group in which after extraction, bone graft (β tricalcium phosphate) was placed in the extraction socket and covered with a collagen membrane (collagen), and the other was a control group wherein no graft was placed and extraction socket was left to heal normally. The patients were followed up for of 6 months period. Alveolar height and width of both groups was assessed at post extraction / 7th day and 6th months respectively.

Materials Used:-

With granule size 250-350 microns was used as bone graft material. Collagen membrane as barrier over graft. 3-0 Black braided silk sutures were used for primary closure. Informed consent was taken prior to surgery

Surgical procedure :-

Atraumatic tooth extractions were performed using periosteal elevators and forceps under local anaesthesia (lignocaine 2% with epinephrine 1:200,000). Site preparation was accomplished with fine curettes by removing granulation tissue followed by irrigation with saline. Vista scan image of tooth was taken and horizontal (a line joining the CEJ of anterior tooth to the CEJ of posterior tooth adjacent to extracted socket drawn) and vertical height (a straight line joining the CEJ of anterior tooth to the CEJ of posterior tooth adjacent to extracted socket drawn, from centre of horizontal line a straight line drop to the crest of alveolar ridge)

were measured. Buccolingual ridge width was measured using bone calliper (placing its tip one on buccal side and other on lingual side at upper bone level and on most central part of alveolar ridge)

The Bone graft material was dispensed from its container into a sterile stainless-steel kidney tray and placed and packed into the socket until it filled the socket space (Figure 1). Collagen membrane was placed on the grafted site and closure of the site was done with 3-0 silk suture. Postoperative instructions were given.



Figure 2a: Vista scan image immediately after extraction.



Figure 2b: Vista scan image 6 months postoperatively.

DISCUSSION:-

Characteristic of ideal bone replacement graft material include safety, efficacy and ability for the graft material to be replaced by vital alveolar bone. The β tcp graft material used in this study was purely synthetic material,⁶ osteoconductive⁷ in nature and has no organic components, therefore no chance of antigenicity or allergic reaction. Compared with autogenous bone grafting, this synthetic graft has unlimited availability without second site morbidity.⁸ Contrary to GTR procedures, additional bone grafting materials for space maintenance, tend to improve GBR outcomes.⁹ In this study, we used Guided bone graft augmentation (GBGA)¹⁰ which designates a barrier membrane application to help preserve and maintain the bone graft, based on principle of osteopromotion.¹¹ Bone substitutes were able to preserve post extraction alveolar ridge dimensions to some extent, the quantity and the quality of the bone tissue formed in the socket have been variable and their presence often

Postoperatively the alveolar bone height and width of both groups were assessed (using vista scan) and compared with the pre surgical values respectively). The reduction in the ridge dimensions were evaluated and compared. Univariate analyses of the dichotomous variables encoded was performed by means of the Chi square test with Yates correction and Student “t” test was used to determine whether there was a statistical difference between female and male subjects in the parameters measured.

interfered with the normal healing process.¹² But in this study, quantity and quality of bone formed was good with trabeculae resembling adjacent natural bone and there were no cases of infection and dehiscence. Healing was satisfactory and uneventful. Post-extraction alveolar ridge resorption was observed in previous randomized controlled clinical trials where extraction sockets were treated with either β tcp⁴, a combination of HA and β -TCP bone graft and a collagen membrane¹³ or porcine xenograft and a collagen membrane.¹⁴ Also, in a study healing of extraction sockets filled with freeze dried bone and collagen membrane was compared with the healing of “empty” untreated extraction sockets.¹⁵ In study, both pre and postoperative radiographic measurements on Vista scan were taken from the Cemento-enamel junction of the adjacent mesial tooth to Cemento-enamel junction of the adjacent distal tooth to the corresponding highest Alveolar bone crest level. The results clearly showed less dimensional change in

horizontal width, vertical height and buccolingual width in Group 1 patients which indicate decreased bone resorption as compared to more resorption in Group 2 patients over a period of six months post operatively. Horizontal width measurement with p value < 0.001 gave statistically significant result. One of the advantages of our study is the presence of a negative control group in which unassisted socket healing was observed for a similar period of time in the patient where socket preservation procedure was carried out. The limitation of the present study was that the sample size was small consisting of 15 patients and histological evaluation was not performed for all the treated sites which would have given us a clear picture of bone formation.

CONCLUSION:-

β tricalcium phosphate is a bio-graft material, resorbable, osteoconductive in nature, economical, with minimal rejection and no donor site morbidity. Collagen membrane is resorbable in nature. In the present study we used combination of β tcp and collagen membrane. It gave significant results with regard to preservation of horizontal width of the socket and also helped in preservation of buccolingual width and vertical height. Hence use of β tcp and collagen membrane is viable option after routine extraction of tooth.

Ethical clearance – Not needed as it is a review article

Source of funding- Nil

Conflict of interest- Nil

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