



ORIGINAL RESEARCH PAPER

SURGERY

EVALUATION OF EFFICACY OF COLLAGEN PLUG FOR ALVEOLAR RIDGE PRESERVATION IN EXTRACTION SOCKET

KEY WORDS: socket preservation, collagen plug

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ABSTRACT

Aims: The objective of this study was to evaluate the efficacy of collagen plug in ridge preservation after tooth extraction.
Settings and design: The study sample of 20 patients with the need for extraction of at least two permanent teeth on both sides of the same jaw was derived from the population of subjects who presented to the department of Oral and Maxillofacial surgery, YMT Dental College and Hospital, Navi Mumbai.
Materials and methods: Collagen plug was placed in the socket in test site immediately after extraction and secured with horizontal mattress suturing. Follow up was done at 1, 2 and 3 months.
Statistical analysis used: Mann-Whitney U test, Kolmogorov-Smirnov test, Shapiro-Wilk test, Independent t-test.
Results: The difference between measurements made immediate post-operatively and after three months was statistically analysed for both test and control sites. p-value was less than 0.05 indicating significance of difference between test and control.

INTRODUCTION

After the extraction of a tooth, the socket begins to heal by secondary intention. Prior to bone remodelling specific microvascular changes, as well as a bone formation patterns develop¹.

A recent study by Ferrus J et al has suggested that the width of the buccal wall may affect the pattern of bony resorption². Spray et al stated that 2 mm of buccal wall reduces buccal bone loss around implants placed in healed sites³. A minimum of 2 mm of buccal bony wall is necessary for a soft and hard tissue aesthetic outcome for implant placement and restoration.

Here is a technique where in a collagen plug is placed in the extraction socket prior to closure of the socket with horizontal mattress suturing. The collagen sponge particularly has been found to not only protect the bone substitute, but to present hemostatic properties as well, contributing to minimal discomfort of the patient during the postsurgical period. In addition to stabilizing the blood clot, collagen plugs act as a chemotactic agents for fibroblasts⁴.

MATERIALS AND METHODS

The study sample was derived from the population of subjects who presented to the department of Oral and Maxillofacial surgery for extraction procedures. A total of 20 cases of patients of age group between 15-50 years were taken with the need for extraction of at least two permanent teeth on both sides of the same jaw. Patients having systemic diseases including metabolic bone diseases radiotherapy/chemotherapy, pregnancy, heavy smokers, patients with a distinct periapical pathology, patients undergoing complete extraction were excluded from the study.

All surgeries were done under local anaesthesia (2% lignocaine with 1:80,000 adrenaline. Preoperative casts and occlusal stents were fabricated using self-cure acrylic resin. The width of the alveolar ridge was measured clinically as the distance between the most prominent sites buccally and lingually at the crest of ridge using vernier caliper. The height of the ridge was assessed as the distance from the occlusal stent to the crest of the alveolar ridge using William's graduated probe.

The measurements were recorded at the time of extraction and 1, 2, and 3 months post-surgery. The extraction on both sites was carried out at the same time whenever feasible, otherwise within a week of each other.

Surgical procedure:

Tooth extraction:

Atraumatic extractions of the tooth/teeth were performed taking care not to fracture the buccal cortical plate.

Collagen Plug placement: Collagen plug was placed down lightly in the extraction socket and overfill was avoided.



Figure 1 Placement of collagen plug

Closure: Horizontal mattress sutures were then used to secure the surgical site.

Radiographs were taken preoperatively, immediate postoperatively and at 1 month, 2 months, 3 months follow up period.

Parameters for study

Assessment of ridge height: Distance from the occlusal stent to the crest of the alveolar ridge using William's graduated probe was measured at baseline and 1, 2, and 3 months for both test and control site for the patients.

Width of the ridge: Distance between the most prominent sites buccally and lingually at the crest of ridge using vernier caliper at baseline and 1, 2, and 3 months was measured for both test and control site for the patients.

Radiographic measures

Crestal bone level: The distance from CEJ on the tooth adjacent to the extraction site and the radiographic crest of the bone was measured at baseline and at 1, 2, and 3 months with use of

AutoCAD software.



Figure 2 OPG taken immediately after extraction

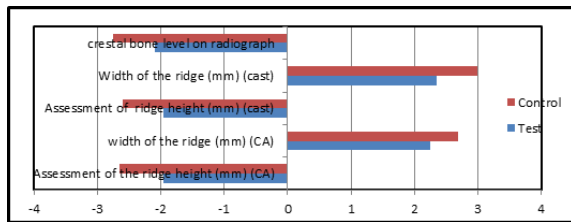


Figure 3 OPG taken 3 months after extraction

OBSERVATIONS AND RESULTS

Out of the 20 patients 12 were females and 8 were male patients. The ages of the patients ranged from 15-50 years. The mean age of the patients in the study was 30.7 ± 8.04 years.

The samples were then subjected to statistical analysis using Mann-Whitney U test, Kolmogorov-Smirnov test, Shapiro-Wilk test, Independent t-test. Level of significance was kept as 0.05.



Graph - 1: Meanwise comparison of all the parameters in test vs control sites

t-test result:

		t-test	df	p-value	Mean Difference	Interpretation
CA	Assessment of ridge height (mm)	6.102	38	0.000*	0.7	Significant
	Width of the ridge (mm)	-2.635	38	0.012*	-0.425	Significant
CAST	Assessment of ridge height (mm)	4.058	38	0.000*	0.65	Significant
	Width of the ridge (mm)	-3.577	38	0.001*	-0.65	Significant
	Crestal bone level (Radiographic)	3.855	38	0.000*	0.655	Significant

Table - 1: t-test results for all the parameters in test vs control sites

Interpretation: p-value less than that of 0.05 indicates significance of difference between test and control (Difference of Pre and Post 3 months). We also confirm these results using Mann-Whitney U test.

Mann-Whitney U test results:

	Assessment Ridge (mm) CA	width Ridge (mm) CA	Assessment Ridge (mm) cast	width Ridge (mm) cast	radio graph
Mann-Whitney U	40.000	113.500	76.000	83.500	78.500
Wilcoxon W	250.000	323.500	286.000	293.500	288.500
Z	-4.501	-2.471	-3.465	-3.267	-3.296
p-value	.000	.013	.001	.001	.001
Interpretation	Significant	Significant	Significant	Significant	Significant

Mann-Whitney U	40.000	113.500	76.000	83.500	78.500
Wilcoxon W	250.000	323.500	286.000	293.500	288.500
Z	-4.501	-2.471	-3.465	-3.267	-3.296
p-value	.000	.013	.001	.001	.001
Interpretation	Significant	Significant	Significant	Significant	Significant

Table - 2: Mann-Whitney U test results for all the parameters in test vs control sites

Interpretation: p-value less than that of 0.05 indicates significance of difference between test and control (Difference of Pre and Post 3 months)

DISCUSSION

The preservation of extraction socket plays a central role in alveolar ridge maintenance after dental extraction⁵. Resorption rate of the alveolar ridges is faster during the first 6 months following the extraction⁶ and proceeds at an average of 0.5–1.0% per year for the entire life⁷. The height of a healed socket never reaches the coronal level of bone attached to the extracted tooth, and horizontal resorption seems to be greater in the molar region compared to the premolar area⁸.

In our study, we used collagen plug in the extraction socket as a method of preserving the alveolar ridge. Collagen is an insoluble fibrous protein that is an essential component of the connective tissue stroma.

The extraction on both sites was carried out at the same time whenever feasible, otherwise within a week of each other. We did not include patients with teeth having active periapical infection or patients needing surgical extraction or extraction for which flap has to be taken. Girard et al reported a case of a foreign body granuloma following placement of a graft into an extraction socket with pain and sensory disturbance⁹. There is not adequate research data to clearly demonstrate that flapless socket preservation techniques are superior to techniques that involve raising a flap, but an animal study reported that the detachment of the periosteum from the buccal site of the ridge leads to an increase of the resorption rate, resulting in an increase of the ridge resorption of approximately 0.7 mm¹⁰.

In this study, the clinical buccolingual dimension of the socket showed a mean dimension loss of 2.68 mm in the control site and 2.25 mm in the test site. The loss in the vertical measurement clinically as measured from the occlusal stent showed a mean loss of 2.65 mm in the control site and 1.95 mm in the test site.

The mean loss of crestal bone level was 2.1 mm in test site and 2.75 mm in control site as seen radiographically. In the present study, digital orthopantomograms were taken and the radiographic equipment was fully standardized for all the radiographs taken. On the other hand, it should be emphasized that some degree of magnification is inevitable. This magnification could be attributed to possible tooth migration or occlusal changes that occurred during the three months study period.

The difference between measurements made immediate post-operatively and after three months was statistically analysed for both test and control sites. P-value was less than 0.05 indicating significance of difference between test and control. We also confirmed these results using Mann-Whitney U test. Mann Whitney U test had p-value less than that of 0.05 indicating significance of difference between test and control.

The results of this study suggest that a ridge preservation procedure carried out at the time of extraction is a reliable and predictable method to minimize the resorption of the alveolar bone that takes place post extraction and offers the patients a relatively easy, cost effective method that spares them the discomfort of further ridge augmentation procedures that might be necessary for an esthetic rehabilitation or implant placement.

To conclude the results of this study indicate that ridge preservation approach with a collagen plug significantly limited the resorption of hard tissue ridge after tooth extraction compared to extraction alone.

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