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BONE HEALING AND PERIODONTAL CONSIDERATIONS FOLLOWING SINGLE TOOTH EXTRACTION: A CLINICAL AND RADIOGRAPHIC 1-MONTH PROSPECTIVE STUDY

Dental Science

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ABSTRACT

Preservation of alveolar bone volume following tooth extraction is the need of hour as it helps facilitate succeeding placement of dental implants and improved aesthetics as well as purposeful prosthetic results. In the present study, the objectives were to evaluate periodontal conditions of teeth adjacent to extraction site clinically and to evaluate morphological contour of bone after extraction by radiographs. Twenty patients reported for extraction of a mandibular premolar or molar and subsequent single-tooth implant treatment were included in this study. The periodontal conditions of the teeth adjacent to the extraction site were assessed by measuring probing pocket depths and clinical attachment levels at the tooth surfaces mesial and distal to the extraction site using a periodontal probe. Intraoral radiographs were obtained before and after extraction. Linear measurements of IOPA were performed using tracing methods. In addition, the bone levels at mesial and distally aspects of the extraction were compared with that of adjacent teeth. Results were evaluated using standard statistical methods.

KEYWORDS

INTRODUCTION

Sufficient alveolar bone volume and favorable contour of alveolar ridge are essential to get ideal functional and esthetic prosthetic reconstruction following implant therapy. Knowledge about contour changes due to bone resorption and modeling as well as healing process at extraction sites is essential to determine prognosis of the treatment. Periodontal disease, peri-apical pathology, or trauma to teeth and bone can result into reduction in alveolar bone before tooth extraction[1,2]. Traumatic extraction procedures may lead to bone loss. The present study was done to evaluate soft tissue changes at extraction site clinically and to evaluate changes in morphological architecture of alveolar bone after extraction by radiographs.

MATERIALS AND METHODS

Twenty patients referred for extraction of a mandibular premolar or molar and subsequent single-tooth implant treatment were included in this study. Patients between 16 to 60 years of age referred for extraction of a mandibular premolar or molar and those willing to participate in the study were included.

The periodontal conditions of the teeth adjacent to the extraction site were assessed by measuring probing pocket depths and clinical attachment levels at the tooth surfaces mesial and distal to the extraction site using a periodontal probe. The measurements were performed medially & distally. Standardized intraoral radiographs were obtained preoperatively & 1 month post-extraction. Linear measurements on IOPA were performed using manual tracing method. To assess the level of bone healing at the extraction site, the changes of the bone level at the mesial and distal aspects of the socket from baseline to 1 month after tooth extraction were assessed & compared on IOPA. In addition, the bone level at mesial and distally aspects of the extraction was compared with that of adjacent teeth.

RESULT

The mean of pre-extraction probing depth medially was 3.3 mm. The mean of post-extraction probing depth medially was 2.15 mm. The difference between mean of pre-extraction and post-extraction mesial probing depth was 1.15 mm. The mean of pre-extraction probing depth distally was 3.45. The mean of post-extraction probing depth distally was 2.15 mm. The difference between mean of pre-extraction and post-extraction distally probing depth was 1.3 mm. The total mean difference between pre-extraction and post-extraction probing depth was 1.22 mm. (Table No. 1)

The mean of pre-extraction gingival recession medially was 0.95mm. The mean of post-extraction gingival recession medially was 0.5mm. The difference between mean of pre-extraction and post-extraction mesial gingival recession was 0.45mm. The mean of pre-extraction gingival recession distally was 0.95mm. The mean of post-extraction gingival recession distally was 0.55mm. The difference between mean of pre-extraction and post-extraction distally gingival recession was 0.4mm. The total mean difference between pre-extraction and post-extraction gingival recession was 0.42mm. (Table No. 1)

Table-1 Change in tooth surface adjacent to extraction sites (cumulative & mean in mm)

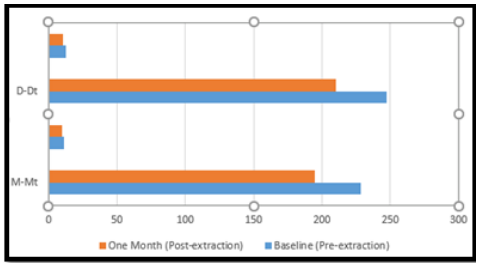
Sr. No.		Baseline (pre-extraction)		One month (Post-extraction)	
	Parameter	Mesial	Distal	Mesial	Distal
1	Probing Depth	66 3.3	69 3.45	43 2.15	43 2.15
2	Gingival Recession	19 0.95	19 0.95	10 0.5	11 0.55
3	Attachment loss	59 2.95	62 3.1	25 1.25	29 1.45

Table-2 Radiograph measurements of mean changes in height of the alveolar process (cumulative & mean in mm)

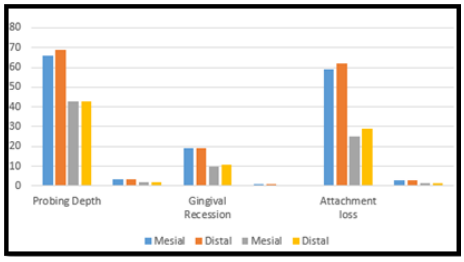
Sr. No.	Parameter	Baseline (Pre-extraction)	One Month (Post-extraction)
1	M-Mt	228.5 11.42	195 9.75
2	D-Dt	247.5 12.37	210.5 10.52

The mean of pre-extraction attachment loss medially was 2.95mm. The mean of post-extraction attachment loss medially was 1.25mm. The difference between mean of pre-extraction and post-extraction mesial attachment loss was 1.7mm. The mean of pre-extraction attachment loss distally was 3.1mm. The mean of post-extraction attachment loss distally was 1.45mm. The difference between mean of pre-extraction and post-extraction distally attachment loss was 1.65mm. The total mean difference between pre-extraction and post-extraction attachment loss was 1.67mm. (Table No.1)

The mean of pre-extraction M-Mt was 11.42mm. The mean of post-extraction M-Mt was 9.75mm. The difference between mean of pre-extraction and post-extraction M-Mt was 1.67mm. The mean of pre-extraction D-Dt was 12.37mm. The mean of post-extraction D-Dt was 10.52mm. The difference between mean of pre-extraction and post-extraction D-Dt was 1.85mm. The total mean difference of pre-extraction and post extraction height of alveolar bone was 1.56mm. (Table No. 2)



Radiograph measurements of mean changes in height of the alveolar process (mm)



Changes in tooth surface adjacent to extraction sites (mm)

DISCUSSION

Recent developments in implant surgeries made permanent replacement of lost tooth structure possible. Sound placement of implant is based on sound & firm bone available at the missing tooth site. Recent developments in bone preservation materials require baseline data about bone healing parameters. Atraumatic extraction techniques & socket preservation methods can be effectively measured on basis of this baseline data achieved.

The resorption and remodeling of the alveolar ridge after tooth removal is a physiological phenomenon. This possibly inevitable process can negatively impact implant placement[4,5,6,10,14].

The successful implant depends on its optimal placement, which is influenced by its alveolar ridge dimension.[7] The two-dimensional reduction of the alveolar ridge is commonly observed after tooth extraction.[11] Healing of extraction sockets leads to dimensional changes of the underlying bone as well as surrounding soft tissue architecture. Bone regeneration is promoted by spontaneous soft tissue thickening which is advantageous for implant therapies with high esthetics.[3] Significant bone modeling activities occur during the first 2 weeks of healing.[12]

During the post-extraction healing period, the weighted mean changes as based on the data derived from the individual selected studies show the clinical loss in width to be greater than the loss in height, assessed both clinically as well as radiographically[1].

The post-extraction mesiodistally bone distance between teeth adjacent to the edentulous ridge depends on the size of the edentulous space. Nevertheless, the distance does not affect the distance in bone loss height. The distance of bone resorption height reaches a balance at the midpoint, which we consider indicative of stable healing. This resorption process must be considered when placing dental implants in fresh extraction sockets, especially in aesthetic sites, because the implant surfaces could be exposed after 3 months[2].

In this study, we have selected twenty patients as suggested by statistician as the sample size is sufficient in order to carry out statistical analysis. We have selected the patients referred for extraction of mandibular premolar or molar teeth in order to obtain standardized sample to avoid bias due to variable levels of attachment in the anterior region and it also helped in split arch technique. In our clinical setup, maximum numbers of patients were indicated for mandibular first molar and premolars because of dental caries hence mandibular arch was chosen for better obtaining the results.

Universal probe was used for measuring probing depth as it a standardized technique and easy to carry out on patients with chair side procedure. Pre-extraction probing depth, gingival recession and attachment loss were measured and the same were measured after 1 month of extraction as the maximum reduction in soft tissue architecture occurs within one month of tooth extraction[1].

Measurements of pre-extraction and post-extraction bone levels were obtained using Intraoral Periapical Radiographs rather than using CBCT and OPG as it is cost effective for rural patients. Pre-extraction and post-extraction radiographs were traced using standardized 1mm×1mm graph sheet self-made grids instead of using lead grids in order to further reduce the cost of project as both methods give same results.

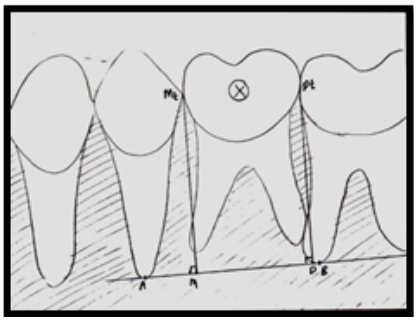


Diagram No. 1: Radiographic tracing method used in present study. A, B are root apices of adjacent teeth.

M is point of intersection of baseline to line drawn perpendicular from mesial crest of tooth (Mt) to be extracted.

D is point of intersection of baseline to line drawn perpendicular from distal crest of tooth (Dt) to be extracted.

For radiographic assessment, baseline was marked joining root apices of the adjacent teeth of the tooth to be extracted. The point of intersection of baseline to line drawn perpendicular from mesial crest of tooth to be extracted was called M and that to the distal side was called D. The highest point on the medial and distal crest of the alveolar bone on the tooth was called Mt and Dt respectively. M-Mt & D-Dt distances were measured preoperatively & 1 month post-extraction. Mean reduction in height of crest of alveolar bone after one month of extraction was 14.7% medially and 15% distally. There is not much difference in reduction of the bone medially and distally hence the alveolar bone reduction takes place uniformly irrespective of the side.

CONCLUSION

The alveolar bone suffers atrophy after tooth extraction, which has been well documented.[8,9,13]

By this project we conclude that there was significant reduction in soft tissue parameters & reduction of alveolar bone by 14.7% medially and 15% distally after one month of extraction. Further long term studies need to be advocated in order to gain more knowledge about the subject which can help betterment of implant therapies and prosthetic surgeries.

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