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Original Research Article

The Rate of Alveolar Ridge Height Resorption of Maxillary Anterior Arch in Patients Treated with Immediate Partial Denture

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Abstract: ***Background:*** In dental prosthetics many advances have been achieved, but the great problem is still having with us: that is the resorption of the residual alveolar ridge and managing or preventing the secondary soft tissue changes brought on by bone loss. ***Objective:*** To evaluate the rate of resorption of alveolar ridge height of maxillary anterior arch in patients treated with immediate partial denture. ***Materials and Methods:*** This observational comparative study was conducted in the Department of Prosthodontics, Bangabandhu Sheikh Mujib Medical University for the duration of one year. On the basis of inclusion criteria patients were initially included in the study. A written informed consent was obtained from every patient. Study sample divided equally into two groups, Group A and Group B. Each group consists of 15 patients. Group A patients were treated with extraction of teeth followed by immediate denture prosthesis and group B patients were treated with extraction of teeth, but not provided by any prosthesis. Data were collected on the basis of alveolar bone resorption in the period of 1 month, 3 months and 6 months of extraction on a predesigned data collection sheet. ***Results:*** Mean vertical height at one month follow up was 25.48 (±2.41) mm in group A and 23.43 (±2.85) mm in group B which was statistically significant. Mean vertical height at three month follow up was 23 (±1.33) mm in group A and 22 (±2.99) mm in group B which was statistically significant. Mean vertical height of alveolar bone at six month follow up was 22.5 (±2.71) mm in group A and 21.5 (±3.18) mm in group B which was also statistically significant. ***Conclusion:*** Patient treated with immediate partial denture following extraction of teeth shows less alveolar bone resorption than patients treated without immediate partial denture.

Keywords: Alveolar ridge, resorption, immediate partial denture.

INTRODUCTION

The portion of the alveolar process that houses the alveoli is referred to as an alveolar ridge and is a bony ridge found on the maxilla or jaw. Immediately upon extraction, a number of inflammatory processes begin, and blood coagulation temporarily seals the extraction socket. Within the first week, epithelial tissues start to proliferate and migrate, and the damaged tissue integrity is rapidly recovered [1]. Alveolar ridge resorption after a tooth extraction is an inevitable phenomenon. After tooth extraction, the bundle bone lining the alveolar socket loses its function and is absorbed. Resorption of the alveolar ridges most often occurs during the first 6 months after the extraction and continues to decrease at an average rate of 0.25 to 0.5% per year until death [2].

Implant dentures have been shown to be effective in restoring the morphology and function of missing maxillary incisors [3]. However, the large variation in alveolar bone changes after tooth extraction brings difficulties in preoperative evaluation and plan development, which may impair implant placement and cause unpleasant aesthetic results of the final restorations [4]. These problems may introduce many uncertainties for implant restorations in maxillary incisor sites,

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including the timing and angle of placement and whether to perform bone augmentation. All these factors may lead to increased surgical difficulty, prolonged procedures, or even treatment failure [5]. Therefore, it is essential to evaluate the resorption of alveolar bone after tooth extraction in this region to facilitate implant treatments.

Patients can preserve the horizontal plane of their arches and appropriate mastication, which in turn inhibits bone resorption, by utilizing an immediate partial denture in their maxillary arches.

MATERIALS AND METHODS

The study was an observational comparative study carried out in Department of Prosthodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka, Bangladesh. The period of the study - 12 months. The patients with severely damaged anterior teeth which need extractions. Patients were selected from Out Patient Department (OPD) of Dept. of Prosthodontics by lottery method, among the patient who came for extraction of tooth in the upper anterior segment. At first 30 numbers of slip in equal group were kept in a container. Each patient was asked to draw a slip from the container. The group he/she draw fell under that group. Then the slip was returned back to the container, till the completion of selection of the sample this procedure was continued. The patients under inclusion criteria were initially included in the study. Each patient was evaluated by a thorough medical and dental history as well as clinical and radiographic examination as per history sheet enclosed herewith. The patients were explained in details about the clinical procedure of the study, but regarding the result, were not enclosed to the patient. According to patient's concern, he/she was selected for treatment of with or without immediate denture. A written informed consent was obtained for every patient. The procedure was examined by supervisor and was recorded in the data collection sheet. In this way, 15 patients were selected and then treated with immediate denture and grouped them into A. Another 15 patients were selected and grouped them into B who was not to be provided with immediate partial denture. Panoramic radiograph was taken with particular attention to the horizontal and sagittal positioning of the head with a 70 KvP, a 15-mApanoramic machine (Siemens Orthopos II CD D 3200. Munuch, Germany), and processed with an automatic processor (Dent X 9000, New York, USA).

Table 1: Demographic characteristics of the study patients (N=30)

	Group A (n=15)	**Group B (n=15)**	**P value**
	n (%)	**n (%)**	
Age (years)			
30-35	06(40.0%)	05(33.3%)	
36-40	06(40.0%)	05(33.3%)	
41-45	01(6.67%)	01(6.67%)	
45-45	02(6.67%)	04(26.67%)	
Mean±SD	37.93±12.41	35.93±12.71	[a]0.666[ns]
Sex			
Male	9(60.0%)	10(66.7%)	[b]0.705[ns]
Female	06(40.0%)	05(33.3%)	

ns= not significant
[a]P value reached from unpaired t-test
[b]P value reached from chi square test
Group A = patient with immediate denture
Group B = patient without immediate denture

Table 1 shows that mean age of the patients were 37.93±12.41 years in group A and 35.93±12.71 years in group B.

Nine (60.0%) patients were male in group A and 10(66.7%) in group B. The difference were not statistically significant (p>0.05) between two groups.

Table 2: Vertical height of alveolar bone in different follow-up (n=30)

Vertical height of alveolar bone (mm)	**Group A (n=15)**	**Group B (n=15)**	**P value**
	Mean±SD	**Mean±SD**	
Baseline	26.05±3.67	25.04±1.90	0.352[ns]
One month of extraction of tooth	25.48±2.41	23.43±2.85	0.042[s]
Three months of extraction of tooth	23.0±1.33	22.0±2.99	0.025[s]
Six months of extraction of tooth	22.5±2.71	21.5±3.18	0.362[ns]

s= significant, ns= not significant
P value reached from unpaired t-test

Table 2 shows that in baseline, mean vertical height of alveolar bone was 26.05±3.67 mm in group A and 25.04±1.90 mm in group B. At one month, mean vertical height of alveolar bone was 25.48±2.41 mm in group A and 23.43±2.85 mm in group B. At three months, mean vertical height of alveolar bone was 23.0±1.33 mm in group A and 22.0±2.99 mm in group B. At six months, mean vertical height of alveolar bone was 22.5±2.71 mm in group A and 21.5±3.18 mm in group B. At one month and three months of extraction of tooth were statistically significant (p<0.05) between two groups.

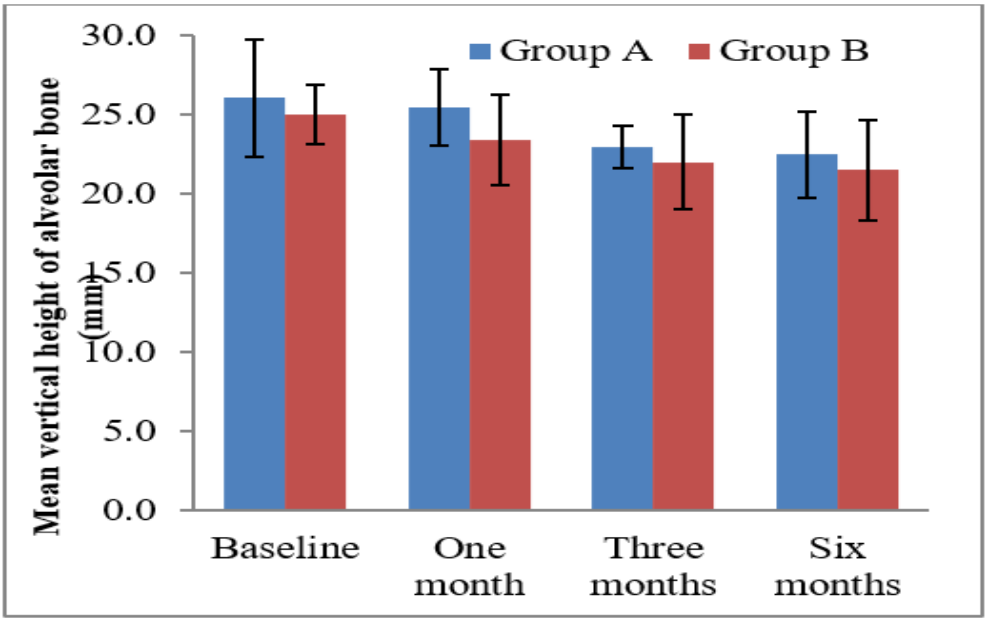

Figure 1: Bar diagram showing mean vertical height of alveolar bone in baseline, 1 month, 3 months and 6 months

DISCUSSION

This study was conducted in the Department of Prosthodontics BSMMU for duration of one year. Total 30 cases with severely damage anterior dentition need extraction were selected as study sample by simple random sampling. After clinical evaluation and diagnosis, surgical and laboratory procedures were done as per standard methods. Clinical and radiological finding were recorded immediate after extraction followed by 1 months, 3 months and 6 months intervals.

Immediate denture gives many advantages, especially increases the patient's self-confidence because the patient has no edentulous period after the anterior teeth extraction.[7] Immediate denture also has therapeutic and prophylaxis functions, because immediate denture acts as a bandage to help control bleeding, to protect against trauma and oral environment aggressions, such as food, debris, and saliva coming in contact with the wound, to protect the blood clot, and promote rapid healing [8,9]. The patient is likely to adapt more easily to the dentures because speech and mastication are rarely compromised [10,11].

In present study shows mean age of the patients were 37.93±12.41 years in group A and 35.93±12.71 years in group B. The difference were not statistically significant (p>0.05) between two groups. Olawale *et al.*, [12] reported mean age of 66.5±9.7 years and mean anterior ridge height of 15.5 ± 2.95 mm participated in this study.

In present study 9(60.0%) patients were male in group A and 10(66.7%) in group B. The difference was not statistically significant (p>0.05) between two groups. Etman and Bikey study showed 75% success rate was observed in male patients compared with female patients [13].

In present study showed no significant difference in mean baseline vertical height between group A and group B, 26.05±3.67 mm vs 25.04±1.90 mm. In current study showed significant difference in mean one month vertical height between group A and group B, 25.48±+2.41 mm vs 23.43±2.85 mm, (p<0.05). The study Johnson shows that the extent of the dimensional changes for group A were appreciably less than those seen in group B [14].

In our study at the end of three month vertical height between group A and group B, 23.0±1.33 mm vs 22.0±2.99 mm, (p<0.05) that was statistically significant. At six month vertical height between group A and group B, 22.5 mm vs 21.5 (+3.18) mm, (p>0.05) that was not statistically significant. Wictorin [16] have reported similar finding for immediate denture when radiographic techniques were used. Olawale *et al.*, [12] reported that the highest anterior ridge height (least depressed) was 21 mm seen in 2 (20%) patients while the lowest (most depressed) anterior ridge height was 12 mm seen in

1(10%) patient. The highest posterior ridge height (least depressed) was 20 mm seen in 1 (10%) patient while the lowest (most depressed) posterior ridge height was 3 mm seen in 1(10%) patient. This could be as a result of flexible denture's texture that is tissue friendly, with light weight that have little or no interference with phonation. In addition, it gives better comfort during use and easier to clean compared to acrylic dentures which is in agreement with previous studies [16-18]. The study by Gehan [19]. showed that it takes up to 10 weeks for patients to fully adapt to the use of denture, this is in agreement with this study that showed improved retention during the third month of denture use. Contrary to this, another study by Gaito *et al.*, [20] showed that it takes up to 42 weeks for patients to get well adapted to denture use.

A study on histologic changes in the upper alveolar process after extractions with or without insertion of an immediate full denture reveals that moderate, intermittent forces exerted on the bony ridge by a prosthesis may be stimulating and help to preserve rather than destroy the ridge. The study also suggests that excessive force causes resoprtion of the residual ridge [21].

In separate studies in different parts of the world, Tallgren [22] and Atwood [23] found that the mean ratio of anterior maxillary residual ridge reduction to anterior mandibular residual ridge reduction was 1:4. However, there were many exceptions to this mean, with a greater reduction of residual ridge in the maxilla in some patients and with insignificant reduction of residual ridge in either jaw in some patients. Therefore, while it is true that, on the average, reduction of residual 'ridge is greater in the mandible than in the maxilla, the reverse may be true in any given patient who comes for treatment. One must treat the particular patient, not the "average" patient (Ogawa *et al.*,) [24].

CONCLUSION

Compared to patients treated without an immediate partial denture, those treated with one exhibit reduced alveolar bone resorption after tooth extraction.

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