Original Research Article

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A comparative study of socket compression versus non-compression after orthodontic tooth extraction

Parveen Akhtar Lone, Jasbinder Kumar, C. Lalmuanpuia

Department of Oral and Maxillofacial Surgery, Indira Gandhi Govt. Dental College, Jammu, Jammu and Kashmir, India

Address for correspondence: Dr. Jasbinder Kumar, BC Road, Amphalla, Jammu - 180 005, Jammu and Kashmir, India. Mobile: +91-8899832283. E-mail: jasbinderk068@gmail.com

Abstract

Aim: The purpose of the study is to compare the influence of post-extraction socket compression on socket dimension and orthodontic space closure.

Materials and Methods: This prospective study was conducted in the Department of Oral and Maxillofacial Surgery, Indira Gandhi Government Dental College, Jammu. A formal ethical clearance was obtained from the institution. In this study, 40 samples were taken that required tooth extraction for orthodontic purposes. Group A and Group B. In Group A, patients received socket compression after orthodontic tooth extraction (n=20). Compression Group. In Group B, patients did not receive socket compression after orthodontic tooth extraction (n=20). No Compression Group.

Result: There was a statistically significant change in ridge width after 1 week between Group A and Group B. In other parameters, such as relative vertical ridge position, wound opening, mesiodistal space closure distance, and Visual Analog Scale score, there was no statistically significant difference between the two groups.

Conclusion: The present study found that with respect to ridge height, sites that were compressed did not lose significantly more dimensions than those that were not compressed. The present study found that socket compression negatively affect the alveolar ridge width after 1 week. In relation to other parameters like wound opening, space closure and pain, there was no statistical significant value between two groups.. With respect to ridge width, the compression group did show a trend of having a small ridge width.

Keywords: Alveolar ridge dimension, orthodontic tooth extraction, Socket compression

Introduction

Exodontia or tooth extraction is defined as the painless removal of a whole tooth or tooth root, with minimal trauma to the investing tissue, so that bone heals uneventfully and no post-operative prosthetic problem is created.[1]

The most common method of resolving substantial tooth size – arch length discrepancies is to treat patients with the extraction of premolars. Extracting a premolar can create more space that is needed to resolve the discrepancy.

Removing the first premolars is a straightforward method to correct anterior crowding, excessive overjet, and protrusion. The created space is utilized for alignment and retraction of incisors.[2,3]

Extraction of teeth with minimal trauma to the surrounding structures is necessary to prevent harmful sequela, including alveolar osteitis and loss of ridge dimensions.[3] The procedure of an extraction and the healing process affect the residual ridge dimension.

The first step in an extraction procedure is the separation of the periodontal ligament from the tooth. This is done by placing an elevator in the purchase point (an area between the tooth root and the alveolar bone) and rotating the instrument in an apical direction. This elevator luxates the tooth. Extraction forceps are then used to deliver the tooth from the socket.[1]

After extraction, significant dimensional changes occur in bone height and width.[4-6] This may range from an average vertical loss of 1.5–2 mm and an average loss in bucco-lingual width of 40–50%.[7,8] After the healing, it is often seen that the crest of the residual ridge lingual to the initial tooth position before extraction and concavity on the buccal aspect of the ridge. Management of post-extraction socket promotes healing of the alveolar ridge so that prosthodontic replacement of teeth is not impaired. One post-extraction management technique that has traditionally been taught is socket compression. Socket compression is the process of placing digital pressure on the buccal and lingual/palatal aspects of the alveolus following the extraction of a tooth. Sufficient pressure is applied to reapproximate the alveolus that is expanded during extraction. The compression is carefully done so as not to crush or fracture the bony walls. The rationale for the compression is:

1. To reduce the wound dimensions, which in turn leads to faster healing by reapproximating the buccal and lingual plate.
2. To reapproximate the buccal and lingual walls that were damaged or stretched apart while luxating the tooth for better healing.
3. To reduce the bony undercuts,[9] reduce post-operative pain.[10]

Aim

The purpose of the study is to compare the influence of post-extraction socket compression on socket dimension and orthodontic space closure.

Materials and Methods

This prospective study was conducted in the Department of Oral and Maxillofacial Surgery, Indira Gandhi Government Dental College, Jammu. A formal ethical clearance was obtained from the institution. Informed consent was obtained from the patients before including them in the study. In this study, 40 samples were taken that required tooth extraction for orthodontic purposes. Group A and Group B:

- In Group A, patients received socket compression after orthodontic tooth extraction (n = 20). Compression group
- In Group B, patients did not receive socket compression after orthodontic tooth extraction (n = 20). No compression group.

All teeth were extracted under Local anesthesia atraumatically. The compression group received socket compression after extraction using digital pressure to reduce the expanded socket dimensions toward the original pre-extraction width, whereas the no compression group did not receive any sort of socket manipulation or compression after extraction. Patients were recalled after 1 week, 1 month, and 3 months.

Inclusion criteria

Patients who are 18 years and above, and those who required orthodontic tooth extraction, were included in the study.

Exclusion criteria

- Patients who required a transalveolar tooth extraction.
- Conditions that may impair wound healing (HIV/AIDS), chemotherapy, systemic steroids, radiotherapy, bisphosphonates, and benign or malignant pathology within the jaws were excluded from the study.
- Smokers and alcoholics were also excluded from the study.

Measurement and evaluation parameters

1. Ridge width and Height:
    - Bone width (BW) was measured as the width (in mm) of the alveolar crest recorded at h3mm with the help of a specifically

designed bone caliper. The sharp points of the caliper penetrate the anesthetized mucosa until the surface of the bone is reached. A millimeter scale near the handle end of the caliper will give an accurate reading of ridge thickness [Figure 1].

- Relative vertical ridge position (rVRP) was measured as the distance (in mm) from hCEJ to hcrest.
- hCEJ – plane passing through CEJ of adjacent teeth, hcrest- the most coronal point of the alveolar crest. The distance between the hCEJ and the hcrest is measured on the mesial and distal side of the socket, and the mean is taken [Figure 2].

2. Wound opening with the help of a calibrated William periodontal probe.
3. Space closure-mesiodistal distance (in mm) of the gap after orthodontic tooth extraction between the distal surface of the canine and mesial surface of the second premolar [Figure 3].
4. Pain was measured using the Visual Analog Scale (VAS). [SCORE – 0 to 10] [Figure 4].

Statistical methods

The recorded data were compiled and entered in a spreadsheet (Microsoft Excel) and then exported to the data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Data were expressed as mean±SD. The Shapiro–Wilk test was applied to

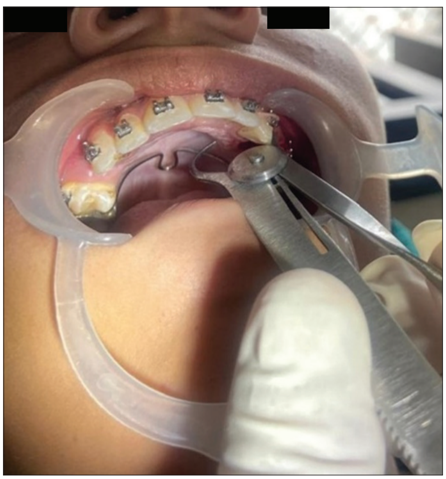

Figure 1: Measurement of bone width with a specifically designed bone caliper

Figure 2: Measurement of relative vertical ridge on RvG through a plane passing through the CEJ of adjacent teeth

Figure 3: Measurement of space closure – mesiodistal distance after orthodontic tooth extraction

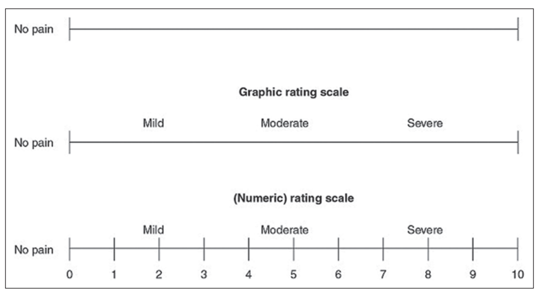

Figure 4: Visual Analog Scale for pain

test the normality of the data. Student's independent t-test was employed for comparison of various variables between two groups. $P < 0.05$ was considered statistically significant.

Result

The participants in Group A had an initial mean ridge width of 7.84 mm preoperatively, which was measured with a bone caliper, and in Group B, it was 7.87 mm.

The mean ridge width after 1 week was 7.23 mm in Group A, and in Group B it was 7.85 mm. There was a statistically significant change in ridge width after 1 week between Group A and Group B, with $P = 0.032$. The ridge width after 1 month and after 3 months between the two groups was not statistically significant [Table 1 and Figure 5].

The participants in Group A had an initial relative vertical ridge position of 1.54 mm, and after 1 week, 1 month, and 3 months, it was 1.51 mm, 1.46 mm, and 1.42 mm, respectively. The participants in Group B had an initial relative vertical ridge position of 1.51 mm, and after 1 week, 1 month, and 3 months, it was 1.49 mm, 1.43 mm, and 1.38 mm, respectively.

There was no statistical difference between the two groups [Table 2 and Figure 6].

Group A patients had a wound opening of 7.08 mm after extraction of the tooth, and after 1 week, 1 month, and 3 months, it was 6.83 mm, 0 mm, respectively. Group B patients had a wound opening of 7.13 mm after extraction, and after 1 week, 1 month, and 3 months, it was 6.87 mm and 0 mm. There was no statistical difference between the two groups [Table 3 and Figure 7].

Table 1: Comparison based on bone width (mm) in two groups at various intervals of time

Time interval	Group A (*n*=20)		Group B (*n*=20)		*P*-value
	Mean	SD	Mean	SD	
Pre-operative	7.84	1.324	7.87	1.197	0.941
After 1 week	7.23	0.817	7.85	0.854	0.032*
After 1 month	7.76	0.915	7.84	0.873	0.779
After 3 months	7.79	0.891	7.83	0.913	0.889

SD: Standard deviation.*Between Group A and Group B after 1 week, the p value is 0.03 which is statistical significant because p<0.05 was considered significant.

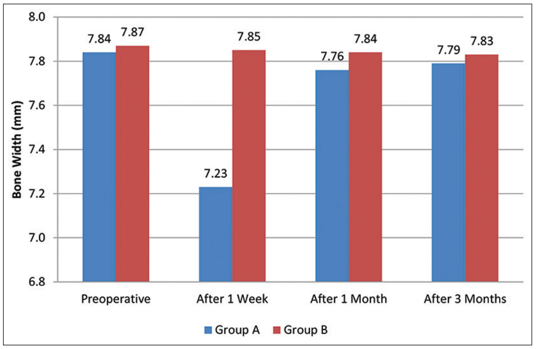

Figure 5: Bone width (mm) in two groups at various intervals of time

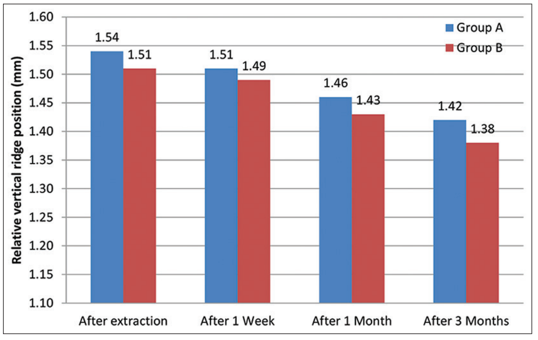

Figure 6: Relative vertical ridge position (mm) in two groups at various intervals of time

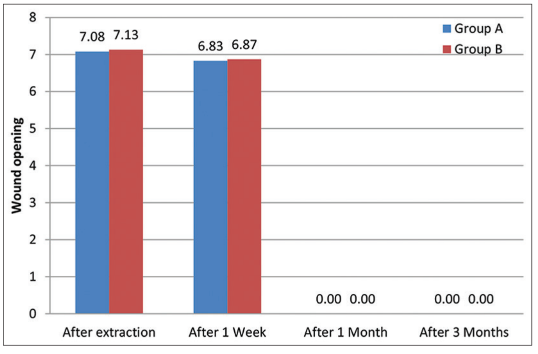

Figure 7: Wound opening in two groups at various intervals of time

Table 2: Comparison based on relative vertical ridge position (mm) in two groups at various intervals of time

Time interval	Group A (*n*=20)		Group B (*n*=20)		*P*-value
	Mean	SD	Mean	SD	
After extraction	1.54	0.733	1.51	0.631	0.891
After 1 week	1.51	0.644	1.49	0.772	0.929
After 1 month	1.46	0.757	1.43	0.781	0.903
After 3 months	1.42	0.623	1.38	0.651	0.843

SD: Standard deviation

Table 3: Comparison based on wound opening in two groups at various intervals of time

Time interval	Group A (*n*=20)		Group B (*n*=20)		*P*-value
	Mean	SD	Mean	SD	
After extraction	7.08	1.218	7.13	1.315	0.901
After 1 week	6.83	0.943	6.87	1.038	0.899
After 1 month	0.00	-	0.00	-	-
After 3 months	0.00	-	0.00	-	-

SD: Standard deviation

Table 4: Comparison based on space closure mesiodistal distance (mm) in two groups at various intervals of time

Time interval	Group A (*n*=20)		Group B (*n*=20)		*P*-value
	Mean	SD	Mean	SD	
After extraction	10.43	1.548	10.46	1.463	0.951
After 1 week	10.19	1.463	10.21	1.336	0.964
After 1 month	7.37	1.317	7.41	1.504	0.929
After 3 months	4.16	1.561	4.19	1.418	0.949

SD: Standard deviation

In Group A, the mean mesiodistal distance after extraction was 10.43 mm, and after 1 week, 1 month, and 3 months, it was 10.19 mm, 7.37 mm, and 4.16 mm, respectively. In Group B, the mean mesiodistal distance after extraction was 10.46 mm, and after 1 week, 1 month, and 3 months, it was 10.21, 7.41, and 4.19. There was no statistical difference between the two groups [Table 4 and Figure 8].

Similarly, the VAS score in Group A after 1 week, 1 month, and 3 months was 2.7, 0, and 0. In Group B, the VAS score was 2.6 and 0, respectively. No significant difference was noted between the two groups [Table 5 and Figure 9].

Table 5: Comparison based on VAS score in two groups at various intervals of time

Time interval	Group A (*n* = 20)		Group B (*n* = 20)		*P*-value
	Mean	SD	Mean	SD	
After 1 week	2.7	1.342	2.6	1.465	0.823
After 1 month	0.00	-	0.00	-	-
After 3 months	0.00	-	0.00	-	-

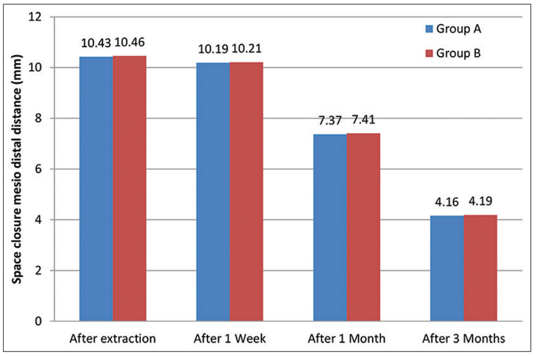

Figure 8: Space closure mesiodistal distance (mm) in two groups

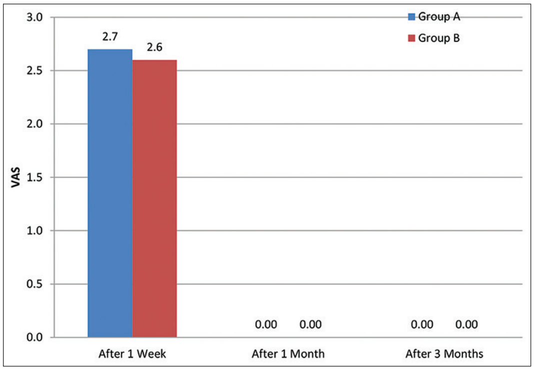

Figure 9: Visual Analog Scale score in two groups at various intervals of time

Discussion

Socket compression has been documented as a protocol after dental extraction.[11-14] In this study, a statistically significant difference was seen in ridge width after 1 week between the two groups. In Group A, there was a significant reduction in ridge width after 1 week when compared to Group B. This significant reduction in ridge width may be potentially attributed to reduced dimensions that have occurred when sockets were compressed digitally with fingers and thumb buccolingually with the help of a gauze piece. The ridge width after 1 month and after 3 months between the two groups was not statistically significant.

The present study compared the relative vertical ridge position in the compression as well as the non-compression group. However, no statistically significant difference was noted between the two groups. However, it was found that the severity of extraction affects the amount of bone remodeling.[15] If the periosteum is separated, this will lead to more buccal ridge resorption. Extractions that were done with a flapless approach led to less ridge resorption.

In our study, wound opening after orthodontic tooth extraction was compared between two groups. Part of the rationale for compression is that it may help to create a faster soft-tissue closure due to reduced "jump" distance for wound healing. Ramfjord found that epithelium migrates at 0.5 mm/day. In addition, this epithelium would migrate from the edges of the wound toward the center.[16] No statistically significant difference was noted between the two groups.

Similarly, space closure after orthodontic tooth extraction between the distal surface of the canine and mesial surface of the second premolar, and pain with VAS score between the two groups were compared, and no significant difference was noted.

Conclusion

The present study found that with respect to ridge height, sites that were compressed did not lose significantly more dimensions than those that were not compressed. Sites that were compressed and sites that were not, healed and mesiodistal closure of space at approximately the same rate. With respect to ridge width, the compression group did show a trend of having a small ridge width.

Statement of Ethics

This research complies with the guidelines for human studies and was conducted after clearance from the Ethical Committee of the Institution.

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Disclosure

The author reports no conflict of interest in this work.

References

1. Howe GL. Extraction of Teeth. 2nd ed. Bristol, England: Wright; 1970. p. 1-86.
2. Ramos AL, Sakima MT, Pinto AS, Bowman SJ. Upper lip changes correlated to maxillary incisor retraction--a metallic implant study. Angle Orthod 2005;75:499-505.
3. Kusnoto J, Kusnoto H. The effect of anterior tooth retraction on lip position of orthodontically treated adult Indonesians. Am J Orthod Dentofacial Orthop 2001;120:304-7.
4. Amler MH, Johnson PL, Salman I. Histological and histochemical investigation of human alveolar socket healing in undisturbed extraction wounds. J Am Dent Assoc 1960;61:32-44.
5. Lekovic V, Camargo PM, Kenney EB, Klokkevold PR, Weinlaender M, Dimitrijevic B, *et al*. Preservation of alveolar bone in extraction sockets using bioabsorbable membranes. J Periodontol 1988;69:1044-9.
6. Kubilius M, Kubilius R, Gleiznys A. The preservation of alveolar bone ridge during tooth extraction. Stomatologija 2012;14:3-11.
7. Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone

healing and soft tissue contour changes following single-tooth extraction: A clinical and radiographic 12-month prospective study. Int J Periodontics Restorative Dent 2003;23:313-23.

8. Ashman A. Postextraction ridge preservation using a synthetic alloplast. Implant Dent 2000;9:168-76.
9. Hupp JR, Tucker MR, Ellis E. Contemporary Oral and Maxillofacial Surgery. 5th ed. St. Louis: Mosby Elsevier; 2008.
10. Rounds CE, Rounds FW. Principles and Technique of Exodontia. 2nd ed St. Louis: Mosby; 1962.
11. Dym H, Weiss A. Exodontia: Tips and techniques for better outcomes. Dent Clin North Am 2012;56:245-66.
12. Howe GL. The Extraction of Teeth. Baltimore: Williams and Wilkins; 1961.
13. Robinson PD, Howe GL. Tooth Extraction, a Practical Guide. Oxford Boston: Wright; 2000.
14. Sailer HF, Pajarola GF. Oral Surgery for General Dentist. Stuttgart, New York: Thieme; 1998.
15. Fickl S, Zuhr O, Wachtel H, Bolz W, Huerzeler M. Tissue alterations after tooth extraction with and without surgical trauma: A volumetric study in the beagle dog. J Clin Periodontol 2008;35:356-63.
16. Ramfjord SP, Engler WO, Hiniker JJ. A radioautographic study of healing following simple gingivectomy. II. The connective tissue. J Periodontol 1966;37:179-89.