

Pain and Discomfort Following Insertion of Mini Screws

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Abstract:

Introduction: *This study was to assess the level of pain and discomfort reported over a period of 1 week following the insertion of miniscrews, using a feedback from.*

Materials and Methods: *A total of 78 miniscrews were placed in the mandible and maxilla of 66 patients using a self-drilling JB head type miniscrew under local anesthesia. Patients were requested to indicate the level of pain and discomfort experienced on a visual analog scale (VAS) after 1 hour, 12 hours, 1 day, and 1 week post-insertion.*

Results: *The study found no significant correlation between the length of the miniscrew ($P = 0.448$), the jaw ($P = 0.870$), and the side of insertion ($P = 0.346$) with pain levels. The highest level of pain was reported 1 hour after insertion, with a VAS score of 48.79 mm, which then decreased significantly after 12 hours, 1 day, and 1 week. The least amount of pain was reported 1 week after miniscrew insertion, with a VAS score of 2.31 mm.*

Conclusion: *On the basis of the patient responses, it can be concluded that miniscrew could be an acceptable option in orthodontic treatments.*

Keywords: Miniscrew, Discomfort, pain

INTRODUCTION

The preparation of anchorage is a crucial aspect of orthodontic treatment. The effectiveness of the treatment largely depends on the anchorage protocol designed for each individual case. It is essential to plan and prepare the anchorage before initiating tooth movement in order to prevent undesired tooth movements and ensure optimal orthodontic outcomes.[1] Absolute anchorage refers to the absence of any movement in the anchorage unit due to the reaction forces applied during tooth movement.[2] Conventionally, extraoral and intraoral appliances such as headgear, transpalatal arch, and quad-helix are used to reinforce anchorage.

The use of extraoral appliances is prevented by poor patient compliance [3] and potential iatrogenic injuries associated with these appliances.[4] Intraoral appliances eliminate the need for patient compliance, however, they depend on the relative number of dental anchorage units and periodontal support. In a majority of

cases using intraoral anchorage appliances, there are certain degrees of anchorage loss resulting in dental tipping or translation.[5,6] In an effort to hamper these complications, skeletal anchorage has been progressively incorporated into orthodontic treatment.

Orthodontic skeletal anchorage devices are categorized into miniplates, miniscrews, palatal implants, onplants, and dental implants. Buccal plates were utilized by Sherwood et al.[7] to enhance open bite through molar intrusion. Park et al.[8] performed fixation of maxillary molars using buccal miniscrews for the treatment of bimaxillary protrusion.[9] Wehrbein et al. employed miniscrews at the median palatine suture to stabilize maxillary molars for the treatment of maxillary protrusion.[10] Kyung et al. utilized mini-implant anchorage to move inferior second molars to first molar extraction sites.[11] Carano et al. employed mini-implants to provide anchorage during incisor intrusion. Lee et al. proposed that mid-palatal mini-implants could be effectively used for the intrusion of maxillary molars.[12]

Miniscrews have been favored in the last decade because they can be inserted easily under local anesthesia by the orthodontist at various locations within the dentoalveolus. The success rates are reported to be 80–90%, which is slightly lower than that of miniplate and palatal implant.[13] Miniscrews can easily be inserted and removed with a simple procedure, can be loaded immediately, are commercially available in a number of sizes (width and lengths), and are relatively cost-effective.[14-16]

Despite the straightforward nature of miniscrew insertion, patients often feel apprehensive about the procedure. Instances have arisen where the pain felt by patients during miniscrew placement was overlooked, leading to discomfort for the patient. Hence, it is crucial to acknowledge and address the pain that patients may experience during miniscrew insertion.[17] Pain has previously been defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage.[18,19] Pain and discomfort are frequently experienced during orthodontic treatment.[20] including initial archwire placement and separation. It has also been reported that every tenth orthodontic patient fails to complete the treatment because of the pain experienced during the treatment.[21-25] So far, not much is known regarding the pain associated with miniscrews as an orthodontic procedure. We believe studying it can provide a general understanding of its usefulness to help satisfy patients.[1,26] On the basis of the patient responses, it can be concluded that miniscrew could be an acceptable option in orthodontic treatments.

MATERIALS AND METHODS

Sixty-six patients receiving orthodontic treatment and in need of miniscrew placement in the buccal side of their dental arches were selected from the Department of Orthodontics at Bolan Medical College/Sandeman Provincial Hospital Quetta for the study. All participants were in good health and had no notable medical conditions or specific requirements.

The calculation of the sample size was performed utilizing SPSS V 22.0, taking into account the $\alpha = 0.05$, $\beta = 5$, and the standard deviation (23.38) derived from the research conducted by Lee et al.[27]. All patients and their parents were provided with both oral and written information regarding the treatment and the study. Furthermore, written consent was acquired from all the chosen patients and their parents.

The miniscrews used in this study were self-tapping, self-drilling, JB head type miniscrew. In the maxilla, 8 mm length 1.6 mm diameter miniscrew was used and 10 mm length \times 1.6 mm diameter was used in mandible. Miniscrews were located interdentially between roots in the buccal side of the posterior segment of the maxilla and mandible. The location was determined with the aid of periapical radiography. One operator performed all the procedures for all the patients. 0.12% chlorhexidine mouth rinse was prescribed prior to the insertion of the miniscrew.[28] One operator placed all miniscrews under local anesthesia with 2% lidocaine hydrochloride with 1:100,000 epinephrine.

No mucoperiosteal flap was raised, and no pilot hole was required. After administration of local anesthesia, miniscrews were placed manually by screw driver through attached gingival. Patients were requested to notify the operator if any pain or discomfort was experienced during the procedure. After the insertion, periapical radiographs were obtained to check the miniscrew position.

The patient's perception after miniscrew insertion was evaluated using a questionnaire. Topics for patient's response were as follows:

- Degree of pain and discomfort after 1 hour, 12 hours, 1 day, and 1 week
- The time and frequency of taking analgesics after the insertion
- Degree of pain and discomfort caused using analgesics.

The patients were directed to mark their responses on a 10-cm visual analog scale (VAS) for questions and to respond with a "yes" or "no" to question 3 about analgesics. A follow-up appointment was arranged after 1 week to check the stability of the miniscrews and the health of the surrounding gingiva. Patients were observed until the end of miniscrew usage in their treatment, after which they were removed. The mobility of the miniscrews, along with gingival health and plaque accumulation, was assessed monthly during orthodontic treatment.

Results were analyzed using the Statistical Package for the Social Sciences version 22.0.

Repeated measures analysis of variance (ANOVA) considering the jaw, side of insertion, and length of miniscrew as a between subject factor was used. The level of statistical significance was considered to be $P < 0.05$.

RESULT:

None of the inserted miniscrews were lost during the study period. A total of 33 patients were assessed for eligibility for the study. Their average age was 21.4 years (3.6). All participants completed the questionnaire. In total, 39.3% of them were women and 60.7% were men. From a total of 39 miniscrews, 64.1% were inserted in the maxilla (8 mm \times 1.6 mm) and 35.9% in the mandible (10 mm \times 1.6 mm). 30.7% of miniscrews were placed bilateral and 69.3% on one side.

On the basis of the patient responses, the most amount of the pain was experienced 1 hour after the insertion (48.79 mm in VAS scores) [Table 1]; after 1 hour, the pain started to decrease significantly after 12 hours, 1 day, and 1 week ($P < 0.001$) [Table 2].

In addition, no significant relation was detected between the length of miniscrew ($P = 0.448$), the jaw ($P = 0.870$), and the side of the insertion ($P = 0.346$) and causing pain [Table 2].

The number of times the patients took an analgesic after miniscrew insertion is presented in Table 3.

DISCUSSION

Orthodontic treatment needs significant patient compliance and is significantly influenced by experiences such as pain. Orthodontic patients often experience pain during treatment.[1] Pain is a complex sensation that varies from one individual to another, and hence objective quantification of pain is difficult. Limited articles have focused on patients' experience of pain for orthodontic treatment with miniscrews. Therefore, we used a patient questionnaire to survey pain and discomfort for 1 week after miniscrew insertion. The VAS score was chosen for this study.

This is one of the most commonly used tools to assess pain intensity and has been shown to be a valid and reliable method of measuring discrete pain as well as being a sensitive, simple, reproducible, and universally accepted method of assessing pain. Other methods are categorical scales such as the VRS and the NRS. The VRS is mostly used to evaluate the quality of pain, and the NRS is preferred when measuring pain intensity.[27]

The result of this study showed that no significant difference for jaw, length of miniscrew, and side of insertion with respect to causing pain and discomfort, so the analysis was conducted on the whole sample rather than a separated sample. When the degree of pain and discomfort was assessed, the highest score was recorded 1 hour after insertion. It was significantly decreased over the 1-week observation period, which is in accordance with other studies.[24,29,30] In addition, no significant relation was detected between the length of miniscrew, the jaw, and the side of the insertion and causing pain. It would have possibly been better to design the study with considering all these factors separately by a randomized clinical trial study.

In comparison with other procedures causing pain and discomfort during orthodontic treatment, Lee et al. found that the postoperative pain of microimplant surgery was significantly less than that of the initial tooth alignment.[27] Baxmann et al. concluded that significantly lower pain levels are experienced with microimplant insertion than that for tooth extraction.[18]

In this study, all the miniscrews were placed under local anesthesia by injection of 2% lidocaine hydrochloride with 1:100,000, epinephrine. Although many clinical studies describe placing miniscrews using needle injections of local anesthetic,[31] some authors have suggested that a topical anesthetic could be used as the sole anesthetic for placing miniscrews. There are several advantages of using a topical anesthetic for placing miniscrews, including patient comfort; simplicity of the procedure for the orthodontist; lack of tissue ballooning, which can obscure the miniscrew placement site; and patient feedback if the miniscrew is placed too close to the root structure.[32-34] Although Reznick et al. found that a compound topical anesthetic was more effective in controlling pain during miniscrew placement than a single-drug topical anesthetic gel, compound topical anesthetics provided less predictable, often inadequate, and less comfortable local anesthesia than an injection of a local anesthetic for placing miniscrews in buccal sites.[35]

Self-drilled miniscrews were inserted without flap surgery on buccal sides. Baxmann et al. compare the transgingival placement of a microimplant with the soft tissue-punch technique for gingival-tissue preparation.

Punch technique has been described in the literature as a basic method for gingival preparation in implant treatment. These techniques were designed to reduce the risk of peri implantitis, 38 and to create 39 or preserve 40 the papilla between the teeth and prosthetic implants.

Transgingival placement was generally reported to be felt as pressure rather than pain, whereas the feeling of soft-tissue punch was more often described as pain. Evaluation 1 day after the surgical intervention showed a statistically significant preference for the transgingival procedure. The slightly larger wound area and the resulting pain and swelling might have caused this from the soft-tissue punch. There was a statistically significant difference in patient's perception regarding the placement technique. Transgingival placement was clearly favored by the patients.[27]

Miyawaki et al. reported that patients having buccal miniscrews inserted without flap surgery experienced almost no swelling or pain.[36] Kuroda et al., Kawaguchi et al., and Tseng also compared pain levels from insertion of miniplates and miniscrews. They found that miniplates resulted in significantly stronger pain than miniscrews without incision, but that no significant difference was observed between miniplates and miniscrews with incision. From these results, a major factor causing pain in orthodontic skeletal anchorage device insertion is suggested to be surgical stress due to incision, periosteal detachment, and suturing. On the other hand, the volume of the parts of miniplates that was exposed in the oral cavity was large and the plates were inserted within the range of motion of the buccal mucosa. Therefore, discomfort caused by the movement of the buccal mucosa occurred continuously. However, most parts of the miniscrews, including the screw heads, were inserted into the attached gingiva such that their surrounding soft tissues were not traumatized by the movement of alveolar mucosa.[17,30,36]

CONCLUSION

The result of this study showed that the pain experience after miniscrew insertion is significantly low. The peak of the pain and discomfort level was recorded 12 h following insertion, and after that started to decrease. On the basis of the patient responses, it can be concluded that miniscrew was accepted option in orthodontic treatments.

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Table No. 1: Pain in different time courses descriptive date

Time	Minimum	Maximum	Mean ± STD. Deviation
1 st Hour	0	100	49.98 ± 36.98
12 th Hours	0	100	29.98 ± 29.89
1 Day	0	100	15.96 ± 26.05
1 Week	0	50	4.62 ± 9.49

Table No. 2: ANOVA with considering the jaw, side of insertion, and length of miniscrew as a between subject factor

Effect	Value	P- Value
Factor 1	1.539	0.001
Factor 1 * side	0.119	0.346
Factor 1 * jaw	0.024	0.87
Factor 1 * length	0.094	0.448
Factor 1 * side * jaw	0.178	0.185
Factor 1 * side * length	0.169	0.204
Factor 1 * jaw * length	0.216	0.124
Factor 1 * side * jaw* length	0.018	0.915

Table No. 3: Number of times the patients took an analgesic

Time	No. of Time an analgesic use		
	None	One Time	Two Time
1 st Hour	15	8	9
12 th Hours	27	3	3
1 Day	30	2	1
1 Week	33	0	0