

## ORIGINAL ARTICLE

# A Cross-Sectional Study on Mean Perception of Pain after Mini-Screw Placement among Patients Seeking Orthodontic Treatment

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## ABSTRACT

**Background:** The orthodontist and patients prefer the usage of mini-screw anchorage due to its feasibility of insertion and removal, which necessitates minimum patient cooperation, and cost-effectiveness.

**Aim:** The aim of the study is to access the mean perception of pain using a visual analogue scale after placing the mini-screws in orthodontic patients.

**Methods:** Using convenient sampling technique, this cross-sectional study was held at Armed Forces Institute of dentistry, Rawalpindi and Shahida Islam Dental College, Lodhran for six-months duration from July 2022 to December 2022. A total of 80 patients took part in the study. On a 10-millimeter visual analogue scale (VAS), where 10 signifies "the severe pain presumable" and 0 signifies "no pain," they were asked to rate their anticipated level of pain

**Results:** A total of 80 patients were selected for this study with the mean age of  $21.1 \pm 2.8$ . The majority of subjects (60%) were female, and the posterior maxilla (48.8%) and posterior mandible (30%) were mostly implanted with mini-screws. Mostly, patients described pain on the 1st day of mini-screws insertion with mean VAS was  $4.10 \pm 1.65$  and on 7th day; minimum pain was experienced with VAS of  $2.9 \pm 1.09$ . There was a significant variation ( $p \leq 0.01$ ) in the VAS score between the sexes, with women exhibiting a higher VAS score ( $39 \pm 52.7$ ) compared to men ( $35 \pm 47.3$ ).

**Conclusion:** Mini screws can more precisely carry out difficult tooth movements than the traditional anchorage used in standard orthodontic treatment.

**Keywords:** Pain, mini-screws placement, mean pain perception and visual analogue scale.

## INTRODUCTION

Orthodontic treatment is frequently accompanied by pain and discomfort. After the first wire placement, soreness and pain are noted certainly<sup>1</sup>. Another potentially painful phase has been added to the orthodontic treatment plan since invasive skeletal anchorage has become a part of regular orthodontic treatment<sup>2</sup>.

Mini Screw Implants, a sort of temporary orthodontic anchorage, are simple and very successful technique to improve the predictability and efficacy of orthodontic treatment. Kaaouara Y et al stated that orthodontists have a better understanding of the biomechanical requirements and the knowledge of the best placement for mini-screws implantation<sup>3</sup>. So, they should perform this procedure. According to a recent survey, only 55% of orthodontist's self-insert mini-screws with the reported reasons for recommending mini-screws being the invasiveness of the procedure and the resulting pain and anxiety for the patient<sup>4-5</sup>. Some authors have claimed that a compound topical local anaesthetic could be used as the only anaesthetic for mini-screw insertion, despite the fact that mini-screw insertion with local anaesthetic injection has been recorded in numerous clinical trials.

In a survey of 61 US orthodontists about the usage of mini-screws in private clinics, Celebi F et al. discovered that 30.8% of them only employed CTA while inserting mini-screws<sup>6</sup>. The comfort of the patient, the ease of the process for the orthodontist, the absence of tissue swelling to obscure the mini-screw implant site, and feedback from the patient if the mini-screw is put too closely to the root structure are all benefits of using a CTA<sup>7</sup>. The application of skeletal anchorage involves a number of variables, including screw type, insertion site, anaesthesia given, and pre- and post-operative drugs. There are only a few broad considerations made about the discomfort and pain caused by mini-screws due to the wide variety of screw types available in the market and their extensive uses<sup>8</sup>. One study by Bolm I et al. revealed that drilling a pilot hole was as painful as inserting self-drilling screws into bone, and patients complained of even more discomfort when their treatment involved soft tissue drilling or flap surgery<sup>9</sup>.

In a cohort research, Lee et al found that patients believed buccal mini-screw insertion to be more painful than it actually was<sup>10</sup>. To evaluate pain and discomfort during and after the

installation of skeletal anchorage placement, a simple procedure is needed. The limits of clinical orthodontics have been significantly increased by the mini screw anchorage. Due to the ease of insertion and removal, better patient compliance, absolute anchorage and cost, mini-screw placement have received widespread acceptance from orthodontists and patients. Patients were inserted with mini-screws more readily, conferring to a Brazilian study by Hoffman H et al<sup>11</sup>. They reported pain at the time of mini-screw insertion as  $3.03 \pm 2.30$  and  $1.56 \pm 2.16$  at the conclusion of treatment. This allowed the tooth to move in directions that were not achievable with traditional orthodontic mechanics. However, there are side effects and complications associated with using the mini screw anchorage in clinical settings, including tooth root injury, screw fracture, oral mucosa ulcers and peri-implant inflammation<sup>12</sup>. Hard tissue injuries are irreversible and must be avoided, but soft tissue injuries are transient and typically recover.

Although patients do not consider the additional expense to be an issue, the increased pain and discomfort may change their decision of using mini-screws<sup>13</sup>. The avoidance of orthodontic treatment by patients due to probable pain and discomfort during even with the smallest surgical procedure can be problematic<sup>14</sup>. It has been stated that individuals experience pain and discomfort when undergoing orthodontic treatment. However, nothing is known about how the pain felt during orthodontic treatment compared to the pain and anxiety felt after mini-screw placement. One of the common adverse effects and a key contributor to non-compliance for many individuals is pain. Patient education on treatment perception can ultimately assist in educating patients about informed consent by supporting patients in developing accurate expectations regarding the possible pain that may arise all through orthodontic treatment<sup>15</sup>.

In contrast to tooth extractions, palatal implants induce bearable amounts of pain and discomfort, according to earlier randomised clinical trials. There is a great uncertainty regarding discomfort and pain due to the various types of test designs, mini-screws and statistical methods used. As a result, after mini-screws placement how to relieve pain and discomfort is not well studied.

This study, which provided detailed information on patient perceptions of pain after mini-implants placement, sought to govern the mean pain experienced by patients with mini-screw placement.

**METHOD AND MATERIALS**

Using convenient sampling technique, this cross-sectional study was held at the Department of Orthodontic at Armed Forces Institute of dentistry, Rawalpindi and Shahida Islam Dental College, Lodhran for six-months duration from July 2022 to December 2022. A total of 80 patients took part in the study. With confidence interval of 95% and power of the test as 80%, the pain perception during mini-screw placement was estimated to be 3.03 ± 2.30, and 1.56± 2.16 after mini-screw placement recorded from the previous study. The ethics committee granted the ethical approval of the study. The patients were given information regarding the study's objectives, methods, risks, and advantages and informed consent was taken. The privacy of the patient's record was maintained. The inclusion criteria were patients of both genders, aged 15-65 years of age, patients requiring mini-screw placement. The study excluded patients with systemic bone disease, < 14 years of age, those who were allergic to local anaesthetics or titanium and patients with cleft lip and palate. Following a radiological assessment of the interdental space, the patients had a one-stage self-drilling procedure during which 1.3 mm diameter, 7 mm, or 10 mm long mini-screw implants were inserted. During consultation sessions for orthodontic treatment planning, all patients got a written proforma with visual analogue scale of 10 mm for documentation of pain score and were routinely briefed about the processes of orthodontic treatment. On a 10-millimeter visual analogue scale (VAS), where 10 signifies "the severe pain presumable" and 0 signifies "no pain," they were asked to rate their anticipated level of pain. Following treatment, patients were given a standardised pain questionnaire to assess their pain on days 1, 3, and 7. Version 20.0 of SPSS was used to analyse the data. For grading the pain, the standard deviation and mean were calculated. The comparison of mean changes between two VAS scores were done by means of the paired-sample t-test. A one-way ANOVA was applied to determine the mean change in VAS score at various sites and an independent sample t-test was performed for comparing the VAS score (P1, P3, P7) between both genders.

**RESULTS**

A total of 80 patients were selected for this study with 21.1± 2.8 years of mean age. The majority of subjects (60%) were female,

and the posterior maxilla (48.8%) and posterior mandible (30%) were mostly implanted with mini-screws. Mostly, patients described pain on the 1st day of mini-screws insertion with mean VAS was 4.10± 1.65 and on 7th day; minimum pain was experienced with VAS of 2.9±1.09. (Table 1).

Table-1: shows the demographic features of the patients

Univariate/Analysis	Categories	Mean	Standard deviation
Variable			
Gender	Male	32	40
	Female	48	60
Mean age of the patients		21.1	2.8
Mini-screw placement site	Anterior mandible	9	11.3
	Posterior mandible	24	30
	Anterior maxilla	8	10
	Posterior maxilla	39	48.8
VAS score	VAS-P1	4.10	1.65
	VAS-P3	3.5	1.38
	VAS-P7	2.9	1.09

To assess the mean difference between various visual analogue scales, a paired-sample t-test was performed. The mean change between P1 and P3 was 0.69 ± 1.39. Similar to P1 and P7, P3 and P7 had mean differences were 1.88±1.30 and 0.83± 0.89, correspondingly, with a P value of <0.05 for all three comparisons. (Table 2).

Table-2: shows the mean visual analogue score variations between each VAS group

Bivariate Analysis	Mean	S.D	Confidence Interval of 95%		P value
			Lower	Upper	
VAS_P1 -P3 Comparison	0.690	1.39021	0.29226	1.02159	0.001
VAS_P1 -P7 Comparison	1.875	1.30298	1.20157	1.82001	0.003
VAS_P3 -P7 Comparison	0.830	0.89215	0.60861	1.01201	0.002

In order to determine the mean VAS changes by gender, we performed an independent sample t-test.

In P3, there was a large gender gap with males scoring 2.3 ±1.3 and females scoring 3.3± 0.93. As indicated in Table 3, P7 had a very similar outcome to VAS-P1 with no significant differences (P value = 0.33).

Table-3: shows the Gender wise differences of visual analogue scores

	Gender Categories	N	Mean	Std. Deviation	Mean Difference		95% Confidence Interval		P value
					Lower	Upper	Lower	Upper	
VAS-P1 with Gender	Male	32	3.3102	1.75364	-1.55656	-1.15220	.320	0.337	
	Female	48	3.8645	1.91887					
VAS-P3 with Gender	Male	32	2.2649	1.37419	-0.89071	-1.60598	.000	0.003	
	Female	48	3.3112	0.93577					
VAS-P7 with Gender	Male	32	1.4946	1.89198	0.39738	-1.11587	.038	0.038	
	Female	48	2.5115	1.17967					

The mean VAS difference at three different days was also examined using a one-way ANOVA (P1, P2 and P7). The findings revealed a significant difference (P <0.05) between the three days. For additional information, see also Table 4.

Table-4: shows the mean change in VAS in various groups

	Mean Square	F	P value
VAS-P1	7.568	3.297	0.020
VAS-P3	4.279	3.371	0.031

**DISCUSSION**

The goal of this study was to provide detailed information on patient perceptions of pain after mini-implants placement, sought to govern the mean pain experienced by patients with mini-screw

insertion. Patient compliance, which is impacted by a variety of factors, most notably the pain felt over the course of treatment, is one of the essential components of the effectiveness of orthodontic treatment. Patients frequently report pain and discomfort, which differs from person to person.

There haven't been many studies on how people feel pain after the mini-screw implantation. In this analysis, the majority of participants reported VAS P1 pain on Day 1, while fewer reported pain on 7th day. This result in comparable with the analysis done by Kumar D et al<sup>16</sup>. Zubir ZM et al. studied the pain that patients felt after the mini-screw implantation and came to the conclusion that the pain was severe for the first hour after the mini-screw implantation and then greatly reduced a week later and a day after that<sup>17</sup>. The fact that both studies were cross-sectional hospital

studies could be one explanation for the identical outcomes. The patient reported much less pain and less impact on daily activities after mini-screw implantation compared to premolar extraction, according to Giri M et al analysis<sup>18</sup>. Women reported a higher VAS score than men in this study. This is perhaps because placing the mini-screws can be more stressful for women. According to various studies, women's cortical bones is thinner than men's, which could make a mini-screw insertion in this area painful and has less stability<sup>19</sup>. No issues were identified, and patients were simply managed in the dentist chair. In the study by Alqadasi B and Sabzijati M et al; the possibility of complication includes soft tissue inflammation, PDL and tooth root trauma, and fracture or bending of mini-screws<sup>20-21</sup>.

## CONCLUSION

Mini screws can more precisely carry out difficult tooth movements than the traditional anchorage used in standard orthodontic treatment. The pain during mini-screw placement is minimal and if any complications occurs can be managed quickly. To maximise the compliance and acceptability of mini-screws, it is crucial to appropriately educate patients on their insertion, complications and uses.

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