

## Original Article

# Patients' perception on mini-screws used for orthodontic treatment in Class II Malocclusion

### ABSTRACT

**Introduction:** The aim of the present study was to clinically evaluate the perception of pain of mini-screws in the maxillary arch for anchorage control for retraction of maxillary anterior segment in conjunction with orthodontic treatment.

**Materials and Methods:** The sample consisted of fifty adult patients with a mean age of 24.5 years, with Class II malocclusion, and the patients were divided into two groups. In Group A, 0.022" McLaughlin, Bennett, and Trevisi Bracket System (MBT) was used in 25 patients as fixed orthodontic treatment and 0.016" nickel-titanium (Ni-Ti) wire was placed for initial alignment, whereas in Group B, a total of fifty mini-screws were placed in 25 patients, one mini-screw on each side in the maxilla between the 2<sup>nd</sup> premolar and the 1<sup>st</sup> molar. The patients answered a questionnaire to assess their opinions on treatment.

**Results:** The data of description of pain experienced in 24 h, 2<sup>nd</sup> day, and 7<sup>th</sup> day in Group A and Group B are enumerated. In Group A, the pain experienced in 24 h, 2<sup>nd</sup> day, and 7<sup>th</sup> day was 49.72 (36.22), 37.17 (35.32), and 17.34 (14.45) and in Group B, it was 24.72 (15.65), 13.32 (14.34), and 12.45 (11.60), respectively. The questionnaire set was completed for functional aspect evaluation. The descriptive data of visual analog scale were presented. During this study, patient had difficulty in eating, food sticking around implant, and interference during tooth brushing was moderate, but there was no any anaesthetic appearance and disturbance in chewing ability was noted.

**Statistical Analysis:** The nonparametric Kruskal–Wallis and Mann–Whitney tests were performed to evaluate the differences between the groups for pain. The Chi-square test was used to determine differences between the procedures. Differences at  $P < 0.01$  were considered statistically significant. Statistical software, namely, SAS 9.0 (SAS Institute Inc., Cary, NC, USA), the Statistical Package for the Social Sciences (SPSS), version 15.0 (SPSS Inc., Chicago, IL, USA), and Systat 11.0 (Systat Software Inc., Chicago, IL, USA), were used for the analysis of data.

**Conclusion:** The present study stated that the pain experience after mini-screw insertion is significantly low. The peak of the pain and discomfort level was recorded 4 h to 24 h following the insertion. Thus, mini-screws were found to be an acceptable option in providing orthodontic treatment

**Keywords:** Angle's Class II malocclusion, fixed orthodontic treatment, orthodontic mini-screws, patients' perception

### INTRODUCTION

Class II malocclusion is the most commonly seen malocclusion, and it affects approximately one-third of the population.<sup>[1]</sup> The diagnostic finding in Class II malocclusion is either maxillary protrusion or mandibular skeletal retrusion or a combination of both. Treatment of Angle's Class II malocclusions with maxillary anterior crowding and excessive overjet generally involves either extraction of two maxillary premolars or

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Received: 07-May-2020

Revised: 22-Jun-2020

Accepted: 01-Sep-2020

Published: 23-Sep-2020

Access this article online	
Website: <a href="http://www.orthodrehab.org">www.orthodrehab.org</a>	Quick Response Code 
DOI: 10.4103/ijor.ijor_18_20	

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**How to cite this article:** Tekale PD, Parhad SM, Rathi GC, Fafat KK, Nathani R, Mhaske AR, *et al.* Patients' perception on mini-screws used for orthodontic treatment in Class II Malocclusion. Int J Orthod Rehabil 2020;11:118-22.

distalization of maxillary posterior teeth, or the use of Class II elastics. In orthodontics science, recently, a large number of intra-oral and extra-oral distalizing appliances and techniques have been introduced that reduce or minimize the need for patient compliance in order to correct Class II malocclusion.<sup>[2]</sup>

During the past two decades, the use of temporary anchorage devices (TADs) for absolute anchorage has been amplified significantly in orthodontic practice. The use of skeletal anchorage systems has become a new orthodontic treatment approach.<sup>[1,3]</sup> TADs provide stationary anchorage for various tooth movements without the need for active patient compliance and with no undesirable side effects.<sup>[3]</sup> Recently, titanium mini-screws and titanium plates have gradually gained acceptance for use in stationary anchorage because besides providing absolute anchorage, mini-screws have clinical advantages such as versatility of placement at anatomic locations, being economical, and making placement easier with minimal trauma.<sup>[1]</sup>

The mini-screw placement procedure is not complicated, but patients' anxious nature and additional discomfort together could change their decision while selection between mini-screws and other orthodontic appliances. It may further contribute to the patient avoiding orthodontic treatment. Some studies have shown that patients complain of pain and discomfort during orthodontic treatment.<sup>[4,5]</sup> Pain and discomfort are frequently experienced during orthodontic treatment, including initial archwire placement and separation.<sup>[6]</sup> Therefore, it is important to take into consideration the pain experienced by patients during mini-screw insertion and its comparison with pain experienced from other orthodontic procedures.

The aim of the present study was to clinically evaluate the perception of pain of mini-screw in the maxillary arch for anchorage control for retraction of maxillary anterior segment in conjunction with orthodontic treatment.

## MATERIALS AND METHODS

### Sample

The study involved a total of fifty patients aged between 21 and 28 years requiring orthodontic treatment, with a mean age of 24.5 years. The inclusion criteria were patients having overjet >4 mm and <7 mm with proclined and forwardly placed maxillary anterior teeth with Class II malocclusion requiring orthodontic treatment. Patients having any systemic disorder, mental illness, one or more missing teeth, and poor oral hygiene were excluded from the study. Patients with a history of digit or thumb sucking, mouth breathing,

or previous orthodontic treatment were also excluded from the study.

The patients were divided into two groups, Group A and Group B, with 25 patients in each group.

Group A patients were opted for orthodontic treatment with conventional orthodontic treatment with extraction of the upper 1<sup>st</sup> premolars and lower 2<sup>nd</sup> premolars.

Group B patients were opted for orthodontic treatment with mini-screw placement to reinforce the anchorage for maxillary arch distalization (nonextraction). The study was performed in Group A, patients were bonded with 0.022" MBT appliance for initial alignment of the upper arch only. In Group B, the initial alignment and leveling is already completed, only mini-screw placement is to be done in the maxillary arch only between the 2<sup>nd</sup> premolar and 1<sup>st</sup> molar during the study.<sup>[3]</sup>

Information about the treatment and the study was given orally to all patients and their parents. In addition, a written consent was obtained from all the selected patients and their parents. The study questionnaires and informed consent were approved by the Ethical Review Board, Dr. Rajesh Ramdasji Kambe Dental College, Akola, Dnr. 2009/188.

### Mini-screw placement

The mini-screws used in this study were self-tapping and self-drilling (13-0.06 mm [Dentos, AbsoAnchor<sup>®</sup>, Korea]). In the maxilla, mini-screws of 6-mm length and 1.6-mm diameter were used. Topical anesthesia with 5% lidocaine gel was applied. Buccal infiltration of 0.3-mL xylocaine dental adrenalin per site (Dentsply Pharmaceutical, Charlotte, North Carolina, U.S A.) and chlorhexidine mouth rinse for 30 s was made. Insertion of two mini-screws 13-0.06 mm (Dentos, AbsoAnchor<sup>®</sup>, Korea), was done; one on the right and one on the left side, buccally and interdentially between the maxillary 2<sup>nd</sup> premolar and 1<sup>st</sup> molar. Immediate loading of the mini-screws was done as direct anchorage with 250-g closed-coil springs (TAD coil spring), as shown in Figure 1. Figure 1 represents the mini-screws placed between the 2<sup>nd</sup> premolar and 1<sup>st</sup> molar, which are images of two different patients.

The following questionnaire was used for the evaluation:

- How was the discomfort and pain (during placement)?
- How was the discomfort and pain (during treatment)?
- Was there any difficulty with cleaning?
- Was it an Anaesthetic appearance?
- Was there any difficulty with eating?



Figure 1: The mini-screws placed between the 2<sup>nd</sup> premolar and 1<sup>st</sup> molar of the patients

Table 1: Description of pain experienced in two groups

	Time	N	Mean SD	Median	P-value
Group A Initial Alignment	24 hours	25	49.72 (36.22)	43.07 (23.23)	0.01*
	2 <sup>nd</sup> day	25	37.17 (35.32)	39.72 (15.28)	0.36
	7 <sup>th</sup> day	25	17.34 (14.45)	15.64 (11.33)	0.65
Group B Mini-implants	24 hours	25	24.72 (15.65)	27.22 (26.11)	0.01*
	2 <sup>nd</sup> day	25	13.32 (14.34)	20.33 (13.18)	0.23
	7 <sup>th</sup> day	25	12.45 (11.60)	12.33 (11.90)	0.33

P<0.01=Significant

Table 2: Descriptive statistics of visual analog scale (VAS), according to the functional aspects evaluated

	Not At All	A little	Moderately	Severe	Extremely severe	Total	Mean (Standard Deviation)
Discomfort and pain (during placement)	12	8	2	2	1	25	4.12 (3.48)
Discomfort and pain (during use)	10	10	4	2	1	25	2.13 (2.67)
Difficulty with cleaning	9	8	4	3	1	25	3.12 (3.23)
Anaesthetic appearance	14	7	2	2	0	25	0.9 (1.4)
Difficulty with eating	9	5	5	4	2	25	0.8 (1.1)
Food stacking around the mini-implant	6	8	6	2	3	25	1.2 (2.1)
Chewing ability disturbance	14	7	2	2	0	25	2.1 (2.3)
Interference during tooth brushing	7	8	5	4	1	25	2.5 (2.1)
Speech disturbance	13	8	3	1	0	25	3.1 (1.2)

- Was there any food stacking around the mini-screw?
- Was there any disturbance in chewing ability?
- Was there any interference during tooth brushing?
- Have you noticed any speech disturbance?

### Statistical analysis

The nonparametric Kruskal–Wallis and Mann–Whitney tests were performed to evaluate the differences between the groups for pain. The Chi-square test was used to determine differences between the procedures. Differences at  $P < 0.01$  were considered statistically significant. Statistical software, namely, SAS 9.0 (SAS Institute Inc., Cary, NC, USA), the Statistical Package for the Social Sciences (SPSS), version 15.0 (SPSS Inc., Chicago, IL, USA), and Systat 11.0 (Systat Software Inc., Chicago, IL, USA), were used for the analysis of data.

### RESULTS

A total of fifty patients aged between 21 and 28 years, with a mean age of 24.5 years, were involved in the present study.

In Group A, 0.022” MBT brackets were bonded in 25 patients and 0.016” nickel-titanium (NiTi) wire was placed for initial alignment, whereas in Group B, a total of fifty mini-screws were placed in 25 patients, with one mini-screw on each side in the maxilla between the 2<sup>nd</sup> premolar and 1<sup>st</sup> molar. The data of the description of pain experienced in 24 h, 2<sup>nd</sup> day, and 7<sup>th</sup> day in Group A and Group B are enumerated in Table 1. The pain experienced by patients in Group A during initial alignment was high as compared to those in Group B in 24 h and decreased on the 2<sup>nd</sup> day till the 7<sup>th</sup> day. In Group A, the pain experienced in 24 h, 2<sup>nd</sup> day, and 7<sup>th</sup> day was 49.72 (36.22), 37.17 (35.32), and 17.34 (14.45) and in Group B, it was 24.72 (15.65), 13.32 (14.34), and 12.45 (11.60), respectively. The questionnaire set was completed for functional aspect evaluation. The descriptive data of visual analog scale (VAS) are presented in Table 2. During this study, patient had difficulty in eating, food sticking around implant, and interference during tooth brushing was moderate, but there was no any anaesthetic appearance and disturbance in chewing ability was noted.

## DISCUSSION

Orthodontic patients often experience pain during treatment.<sup>[6]</sup> Orthodontic tooth movement begins with the placement of NiTi archwire in the initial alignment of teeth, which is known to cause pain to the patient in the initial days. In such a scenario, pain increases gradually from the 4<sup>th</sup> h to the 24<sup>th</sup> h, but returns to a normal degree on the 7<sup>th</sup> day.<sup>[4-6]</sup> The fear of pain associated with mini-screw placement can contribute to patient's avoidance of mini-screw placement procedure. Orthodontic treatment needs noteworthy patient obedience and is significantly prejudiced by experiences such as pain. Pain is a complex perception that contrasts from one individual to another and hence, objective quantification of pain is problematic.<sup>[7]</sup> In orthodontics, very few literature is available on patients' experience of pain in orthodontic treatment with mini-screws. Therefore, in the present study, a patient questionnaire was used to survey pain in the 24 h, 2<sup>nd</sup> day, and 7<sup>th</sup> day after mini-screw insertion by the use of VAS score. The VAS is one of the most commonly used tools to assess pain intensity and has been shown to be an effective and consistent method of assessing distinct pain as well as being a simple, subtle, reproducible, and universally accepted method of assessing pain. Other methods are categorical scales such as the verbal rating scale (VRS) and the numerical rating scale (NRS). The VRS is most commonly used to assess the quality of pain, and the NRS is mainly useful and an authenticated index to assess pain and symptoms during treatment.<sup>[8]</sup>

The pain experienced by patients in Group A was high as compared to that in Group B in 24 h, and later pain decreased on the 2<sup>nd</sup> day and on the 7<sup>th</sup> day. In Group A, the pain experienced in 24 h, 2<sup>nd</sup> day, and 7<sup>th</sup> day was 49.72 (36.22), 37.17 (35.32), and 17.34 (14.45) and in Group B, it was 24.72 (15.65), 13.32 (14.34), and 12.45 (11.60), respectively.

During this study, patient had difficulty in eating, food sticking around implant, and interference during tooth brushing was moderate, but there was no any anaesthetic appearance and disturbance in chewing ability was noted.

When the degree of pain was evaluated, the highest score was recorded in 24 h after insertion. It had significantly decreased over the observation period from the 2<sup>nd</sup> day to 7<sup>th</sup> day, which was in accordance with other studies.<sup>[9-11]</sup>

Few reports have been published in orthodontic literature about the pain caused by mini-screws.<sup>[4,5,7,9]</sup> However, the treatment ability and the level to which patients are capable

or prepared to accept the proposed treatment steps should be considered.<sup>[12,13]</sup>

In a study conducted to compare the pain and discomfort during orthodontic procedure, Baxmann *et al.* concluded that significantly lower pain levels are experienced with microimplant insertion than that for tooth extraction.<sup>[14]</sup> Lee *et al.* found that the postoperative pain of microimplant surgery was significantly less than that of the initial tooth alignment.<sup>[9]</sup> These findings are consistent with those of the present study.

Keeping in mind the difficulty with cleaning, food stacking around the mini-screw, and interference during tooth brushing observed among the patients, it is important for dental surgeons and orthodontists to know and convey a mini-screw cleaning protocol to patients. Majority of patients were gratified with the mini-screw treatment and would applaud it to others. As proposed by the adaptation-level theory of pain, Patients' pain thresholds may have been different for mini-screws equated to other treatment procedures since mini-screw placement procedure was performed after other orthodontic treatment procedures.<sup>[15]</sup>

## CONCLUSION

The present study stated that the pain experience after mini-screw insertion is significantly low. The peak of the pain and discomfort level was recorded 4 h to 24 h following insertion followed by a gradual decrease. On the basis of patient reports, it can be clinched that mini-screw is an accepted option in orthodontic treatments.

### Limitations of the present study

Nevertheless, the number of patients enrolled in this study seems to be small, and the results for the present study should be interpreted with caution. Hence, it might be beneficial to increase the number of participants in future studies.

### Recommendations

Further studies are needed to evaluate the pain and discomfort experienced during mini-screws placement in the mandible and also miniplate placement in the maxilla and mandible.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Park HS, Kwon TG, Sung JH. Nonextraction treatment with microscrew implants. *Angle Orthod* 2004;74:539-49.
2. Nanda R. *Biomechanics in Clinical Orthodontics*. Philadelphia: WB Saunders; 1997.
3. Tekale PD, Vakil KK, Vakil JK, Gore KA. Distalization of maxillary arch and correction of Class II with mini-implants: A report of two cases. *Contemp Clin Dent* 2015;6:226-32.
4. Bergius M, Berggren U, Kiliaridis S. Experience of pain during an orthodontic procedure. *Eur J Oral Sci* 2002;110:92-8.
5. Justens E, De Bruyn H. Clinical outcome of mini-screws used as orthodontic anchorage. *Clin Implant Dent Relat Res* 2008;10:174-80.
6. Bergius M, Kiliaridis S, Berggren U. Pain in orthodontics. A review and discussion of the literature. *J Orofac Orthop* 2000;61:125-37.
7. Erdinç AM, Dinçer B. Perception of pain during orthodontic treatment with fixed appliances. *Eur J Orthod* 2004;26:79-85.
8. Blaya MG, Blaya DS, Guimarães MB, Hirakata LM, Marquezan M. Patient's perception on mini-screws used for molar distalization. *Rev Odontol Ciênc* 2010;25:266-70.
9. Lee TC, McGrath CP, Wong RW, Rabie AB. Patients' perceptions regarding microimplant as anchorage in orthodontics. *Angle Orthod* 2008;78:228-33.
10. Kuroda S, Sugawara Y, Deguchi T, Kyung HM, Takano-Yamamoto T. Clinical use of miniscrew implants as orthodontic anchorage: Success rates and postoperative discomfort. *Am J Orthod Dentofacial Orthop* 2007;131:9-15.
11. Scheurer PA, Firestone AR, Bürgin WB. Perception of pain as a result of orthodontic treatment with fixed appliances. *Eur J Orthod* 1996;18:349-57.
12. Feldmann I, List T, Feldmann H, Bondemark L. Pain intensity and discomfort following surgical placement of orthodontic anchoring units and premolar extraction: A randomized controlled trial. *Angle Orthod* 2007;77:578-85.
13. Pithon MM. Orthodontic mini-implants: Protocol for hygiene and maintaining peri-implant health. *Innov Implant J* 2007;2:12-14.
14. Baxmann M, McDonald F, Bourauel C, Jäger A. Expectations, acceptance, and preferences regarding microimplant treatment in orthodontic patients: A randomized controlled trial. *Am J Orthod Dentofacial Orthop* 2010;138:250e1-10.
15. Rollman GB. Signal detection theory pain measures: Empirical validation studies and adaptation-level effects. *Pain* 1979;6:9-21.