

## PATIENTS' PERCEPTION OF INSTALLATION, USE AND RESULTS OF ORTHODONTIC MINI-IMPLANTS

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### ABSTRACT

The purpose of this study was to evaluate patient acceptance and perception of pain with regard to orthodontic mini-implants. The study was conducted on 58 individuals undergoing orthodontic treatment, who had orthodontic mini-implants placed as anchorage devices. Data were collected using a questionnaire containing 6 questions evaluating perception of pain during mini-implant placement and during use, difficulty with cleaning, unaesthetic appearance, difficulty with eating and benefits observed. Data were tabulated and analyzed using Fisher and Spearman's Correlation Coefficient tests. It was found that 94.8% of the patients reported that they would

be willing to undergo treatment with mini-implants again. Of the negative aspects evaluated, the most significant was discomfort during placement, while the least significant was difficulty with eating. Patients' perception of aspects related to mini-implants was shown to be independent of the quantity of these devices placed. Although the patients evaluated some aspects of mini-implants negatively, the mean score for benefits observed was very high, indicating good patient satisfaction with treatment.

**Key words:** Orthodontics, Orthodontic Anchorage Procedures, Pain.

## PERCEPÇÃO DOS PACIENTES QUANTO A INSTALAÇÃO, USO E RESULTADOS DOS MINI-IMPLANTES ORTODÔNTICOS

### RESUMO

O objetivo do presente estudo foi avaliar a aceitabilidade e percepção dolorosa dos pacientes em relação aos mini-implantes ortodônticos. Este estudo foi realizado com 58 indivíduos em tratamento ortodôntico que tiveram a instalação de mini-implantes ortodônticos como recurso de ancoragem. O instrumento de coleta de dados foi um questionário contendo 8 perguntas que avaliaram a percepção dolorosa durante a instalação e uso dos mini-implantes, dificuldade de higienização, aspecto anti-estético, dificuldade de alimentação e os benefícios observados. Os dados foram tabulados e analisados pelos testes de Fisher e de Coeficiente de Correlação de Spearman. Os resultados demonstraram que 94,8% dos pacientes relataram que

se submeteriam novamente ao tratamento com mini-implantes. Dos aspectos negativos avaliados, o mais significativo foi o incômodo e dor durante a instalação, enquanto o menos significativo foi dificuldade de alimentação. A percepção dos pacientes sobre os aspectos relacionados aos mini-implantes mostrou-se independente da quantidade desses dispositivos instalados. Conclui-se que apesar da avaliação dos mini-implantes pelos pacientes ter apresentado alguns aspectos negativos, o escore médio dos benefícios observados foi bastante alto, indicando boa satisfação dos pacientes com o tratamento.

**Palavras-chave:** Ortodontia, Procedimentos de ancoragem, Dor.

### INTRODUCTION

Anchorage is essential to achieving the objectives of orthodontic treatment.<sup>1</sup> The main advantage of mini-implants is that they allow the movement of several teeth without loss of anchorage.<sup>2-4</sup> Other advantages include the small size, minimal anatomic limitations, more comfortable surgery for patients, immediate loading and low cost.<sup>5</sup> They provide an excellent alternative, as extra-oral appliances depend on patients' cooperation, thus limiting treatment.<sup>6</sup> There are many studies on

mini-implants in the literature, particularly discussing their properties and clinical applications. Nevertheless, even with the popularization of orthodontic treatment with mini-implants, there are few studies on the tolerance, acceptability and opinion of patients with regard to treatment with them.

Based on this premise, the aim of this study was to evaluate patients' perception of mini-implants with respect to pain, aesthetics, hygiene and benefits observed, and thereby fill this gap in the literature.

## MATERIALS AND METHODS

The research was conducted on 58 individuals aged 30 to 50 years (Mean: 35 years 5 months), who were undergoing orthodontic treatment with mini-implant placement at the Orthodontic Clinic of the Southwest Bahia State University. Initially, all the patients presented skeletal Class II and Class I malocclusion, in which the proposed treatment involved premolar extractions. A total of 132 self-drilling mini-implants were placed, all of the self-tapping type, measuring 1.6mm thick and 8mm long (SIN - Sistema de Implantes Nacionais, São Paulo, Brazil). All mini-implants were inserted by the same orthodontist.

The mini-implants were placed after infiltrative local anesthesia with a little less than 1/4 of the anesthetic cartridge. A lancet was used to demarcate the cortical bone at the site defined as ideal for mini-implant placement, and the mini-implants were inserted directly into the bone using a manual driver. All the mini-implants were placed between maxillary second premolars and first molars. They were loaded using a nickel titanium spring with 100 g force measured with a dynamometer.

Data were collected by means of a questionnaire containing questions about pain perception during mini-implant placement and use, difficulty with cleaning, unaesthetic appearance, difficulty with eating and the benefits. Patients were asked to use a scale of 0 to 10 to rank their perceptions. One question asked whether the subject would be willing to undergo mini-implant placement again, and another asked how many mini-implants were placed. The questions were asked at different times. The question about perception of pain during placement was asked immediately after implant placement. The questions about pain perception while using mini-implants, difficulty with cleaning, unaesthetic

appearance, and difficulty with eating were asked 28 days after placement. The question about the benefits observed was asked 6 months after placement (Figure 1). The research was conducted in compliance with the criteria established by Resolution CNS 196/96 of the Ministry of Health (Brazil, 1996), so the questionnaire was only administered after approval by the Research Ethics Committee of the Southwest Bahia State University, Protocol Number 125/2011.

The Spearman correlation coefficients were calculated to evaluate the relationship between the visual analog scale scores of the various aspects investigated. The scores were compared according to the number of mini-implants placed, using the Mann-Whitney test. The level of significance adopted was 5% ( $\alpha = 0.05$ ). The data were tabulated and analyzed using the statistical software BioEstat (version 5.0, Belém-PA, Brazil).

## RESULTS

The number of mini-implants placed in patients participating in the research ranged from 1 to 5, with mean  $\pm$  SD =  $2.3 \pm 1.1$ . Of the 58 participants, 55 (94.8%) reported that they would be willing to undergo further treatment with mini-implants, 2 (3.4%) would not be willing to do so and 1 (1.7%) did not answer the question. The descriptive statistics for the Visual Analog Scale scores for the six aspects investigated are presented in Table 1. The factor with the most negative impact on mini-implant placement is discomfort and pain during placement, followed by the difficulty with cleaning. The factors that had the least negative impact were, in order, difficulty with eating and unaesthetic appearance. The mean score for benefits observed was very high, indicating good satisfaction with the end result of the treatment.

**Table 1: Descriptive statistics of visual analog scale, according to the aspects evaluated.**

Feeling with regard to	Mean	Standard Deviation	Min-Max
Discomfort and pain (during placement)	3.03	2.30	0.0 - 8.3
Discomfort and pain (during use)	1.56	2.16	0.0 - 8.0
Difficulty with cleaning	2.12	2.61	0.0 - 8.0
Unaesthetic appearance	0.81	1.87	0.0 - 10.0
Difficulty with eating	0.77	1.61	0.0 - 10.0
Benefits observed	8.56	2.21	0.0 - 10.0

**IDENTIFICATION**Gender Male       FemaleAge \_\_\_\_\_

Please provide your answer on the following scale by marking the level that represents how you feel regarding:

→ Discomfort and pain (during placement) – immediately after placement.



→ Discomfort and pain (during use) – 28 days after placement.



→ Difficulty with cleaning – 28 days after placement



→ Unaesthetic appearance – 28 days after placement



→ Difficulty with eating – 28 days after placement



→ Benefits observed – 6 months after placement



→ How many mini-implants were placed? \_\_\_\_

→ Would you be willing to undergo mini-implant placement again? ( ) Yes ( ) No

Fig. 1: Assessment Questionnaire.

Table 2 shows the correlation coefficients ( $r$ ) between the visual analog scale scores of the aspects analyzed. There was significant correlation between the variable “discomfort and pain (during use)” and the variables “difficulty with cleaning” and “difficulty with eating”. Significant correlation was also found between “difficulty with cleaning” and “difficulty with eating”.

Table 3 compares the visual analog scale scores of the aspects analyzed according to the quantity of mini-implants placed. There was no statistically significant difference for any of the study questions between patients receiving up to two mini-implants and patients receiving more than two.

## DISCUSSION

The purpose of this study, as was the case with the few available in the literature<sup>7, 8</sup>, was to evaluate patients' perception of mini-implants regarding pain, aesthetics, difficulty with cleaning and eating, and benefits observed. The scale used for evaluation enabled a clearer understanding of level of pain and difficulty related to mini-implants, in addition to the degree of benefits obtained.

The mean score for benefits was 8.56 and the percentage of patients who would be willing to undergo mini-implant placement again was 94.8%, so the rate of satisfaction with the treatment can be considered high. These results agree with Brandão and Mucha<sup>9</sup> (90%), Blayaet *et al.*<sup>7</sup>(100%), Lee *et al.*<sup>10</sup> (77.8%) and Gündüzet *et al.*<sup>11</sup> (94.81%).

Discomfort and pain during mini-implant placement was the negative factor most often reported by patients, although since the mean is low, it is unlikely to be a limitation to this procedure. This finding is very close to other studies by Lee *et al.*<sup>10</sup>, in which 72.2% of the subjects reported little or no pain, and by Kuroda *et al.*<sup>12</sup>, in which only about 25% of the subjects reported pain at the time of self-tapping mini-implant placement. In the study by Baxmann *et al.*<sup>13</sup>, the percentage of patients that felt little or no pain was lower, at approximately 40%.

In addition to discomfort and pain during mini-implant placement, the most relevant side effects, in decreasing order, were difficulty with cleaning, discomfort and pain during use, unaesthetic appearance and difficulty with eating. Other studies<sup>12, 14</sup>

**Table 2: Spearman's Correlation Coefficient between the visual analog scale scores of the aspects evaluated.**

Feeling with regard to	Discomfort and pain (during use)	Difficulty with cleaning	Unaesthetic appearance	Difficulty with eating
Discomfort and pain (during placement)	0.16	0.23	0.09	0.06
Discomfort and pain (during use)		0.37*	0.12	0.31*
Difficulty with cleaning			0.22	0.41*
Unaesthetic appearance				0.21
Difficulty with eating				

\* $p < 0.05$

**Table 3: Mean and standard deviation of the visual analog scale scores of the aspects investigated, according to the number of mini-implants placed.**

Feeling with regard to	Quantity of mini-implants placed		p-Value
	≤ 2	> 2	
Discomfort and pain (during placement)	3.01 ± 2.49	3.07 ± 1.90	0.643
Discomfort and pain (during use)	1.59 ± 2.35	1.51 ± 1.71	0.445
Difficulty with cleaning	2.26 ± 2.76	1.80 ± 2.29	0.649
Unaesthetic appearance	0.90 ± 2.16	0.60 ± 1.00	0.742
Difficulty with eating	0.73 ± 1.79	0.85 ± 1.15	0.249
Benefits observed	8.42 ± 2.41	8.87 ± 1.73	0.464

have mentioned negative effects as being difficulty with speech, cleaning and chewing.

Correlation analysis suggests that patients reporting discomfort and pain during the use of mini-implants would probably also report difficulty with cleaning and/or eating. Similarly, patients reporting difficulty with cleaning may also have difficulty with eating, and vice-versa.

Biofilm control in the peri-implant region is essential for maintaining orthodontic mini-implants within patterns of normality, and is directly related to their successful use<sup>15,16</sup>. As the variable “difficulty with cleaning” was observed in two of the three significant correlations previously mentioned, it is important for the dental surgeon to know and convey a mini-implant cleaning protocol to patients<sup>16</sup>.

The quantity of mini-implants placed showed no relationship with the negative aspects evaluated by the patients, suggesting that the patients’ perception

with regard to treatment does not depend on the number of mini-implants placed.

The data gathered in this study show that the mini-implant is the greatest revolution in anchorage for orthodontics over the past 15 years, making treatments more predictable, aesthetic and comfortable.

## CONCLUSION

From the information collected and analyzed, it may be concluded that mini-implants are recommended for clinical use, since the patients reported a low degree of discomfort and pain during their placement and use, little difficulty with cleaning, minimal complaints of aesthetic compromise and little difficulty with eating. Moreover, the great majority said that they would be willing to undergo mini-implant placement again, thus showing that the benefits outweigh the possible risks or discomfort.

## CORRESPONDENCE

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## REFERENCES

1. Geron S, Shpack N, Kandos S, Davidovitch M, Vardimon AD. Anchorage loss—a multifactorial response. *Angle Orthod* 2003 ;73:730-737.
2. Pithon MM, Nojima MG, Nojima LI. In vitro evaluation of insertion and removal torques of orthodontic mini-implants. *Int J Oral Maxillofac Surg* 2011; 40:80-85.
3. Pithon MM, Nojima MG, Nojima LI. Primary stability of orthodontic mini-implants inserted into maxilla and mandible of swine. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2012;113:748-754.
4. Carano A, Velo S, Leone P, Siciliani G. Clinical applications of the Miniscrew Anchorage System. *J Clin Orthod* 2005; 39:9-24; quiz 9-30.
5. Gritsch K, Laroche N, Morgon L, Al-Hity R, Vico L, Colon P, Grosogeat B. A systematic review of methods for tissue analysis in animal studies on orthodontic mini-implants. *Orthod Craniofac Res* 2012 ;15:135-147.
6. Ohashi E, Pecho OE, Moron M, Lagravere MO. Implant vs screw loading protocols in orthodontics. *Angle Orthod* 2006;76:721-727.
7. Blaya MG, Blaya DS, Guimarães MB, Hirakata LM, Marquezan M. Patient’s perception on mini-screws used for molar distalization. *Rev Odonto Ciênc* 2010;25: 12-15.
8. Chen CM, Chang CS, Tseng YC, Hsu KR, Lee KT, Lee HE. The perception of pain following interdental microimplant treatment for skeletal anchorage: a retrospective study. *Odontology* 2011;99:88-91.
9. Brandão LBC, Mucha JN. Rate of mini-implant acceptance by patients undergoing orthodontic treatment - A preliminary study with questionnaires. *Dental Press J Orthod* 2008; 13: 118-127.
10. Lee TC, McGrath CP, Wong RW, Rabie AB. Patients’ perceptions regarding microimplant as anchorage in orthodontics. *Angle Orthod* 2008;78:228-233.
11. Gunduz E, Schneider-Del Savio TT, Kucher G, Schneider B, Bantleon HP. Acceptance rate of palatal implants: a questionnaire study. *Am J Orthod Dentofacial Orthop* 2004;126:623-626.
12. 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.
13. Baxmann M, McDonald F, Bourauel C, Jager A. Expectations, acceptance, and preferences regarding microimplant treatment in orthodontic patients: A randomized controlled trial. *Am J Orthod Dentofacial Orthop* 2010;138:250 e1-e10; discussion -1.
14. Justens E, De Bruyn H. Clinical outcome of mini-screws used as orthodontic anchorage. *Clin Implant Dent Relat Res* 2008;10:174-180.
15. Consolaro A, Sant’ana E, Francischone JCE, Consolaro MF, Barbosa BA. Mini-implantes: pontos consensuais e questionamentos sobre o seu uso clínico. *Dental Press J Orthod* 2008;13:20-27.
16. Pithon MM. Mini-implantes ortodônticos: protocolo para higienização e manutenção da saúde peri-implantar. *Inn Implant Journ* 2007;2:12-14.