

Retrospective Assessment of Patients Undergoing Orthodontic Mini-Implants

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ABSTRACT

Background: Dental implants conceptually required months for crown placement and functional recovery. Successful osseointegration encouraged many orthodontists to use dental implants as stationary anchorage units for force application. However, their use has some drawbacks, which led to the development of miniscrew implants (MIs). Hence the present study was undertaken to analyse the patients undergoing orthodontic mini-implants in a retrospective manner.

Materials & methods: Data records of a total of 50 patients were analysed during the study period. Complete demographic details of all the patients were obtained. Both pre-treatment and post-treatment radiographs of all the patients were obtained. Only those patients were enrolled on whom orthodontic mini-implants were placed. Statistical evaluation included descriptive statistics and survival analysis. All the results were analysed by SPSS software.

Results: In 16 percent of the patients single mini-implant was placed, while in 52 percent of the patients 2 mini-implants were placed. Failure of mini-implants occurred in 20 percent of the patients. A correlation between patients with failed mini-implants and type of malocclusion was done and non-significant result was obtained.

Conclusion: The field of orthodontics has been greatly influenced by mini-implants. They helped in a better orthodontic treatment planning by providing best management of severe discrepancies. Also significant success rate was associated with them.

Keywords: Mini-implants, Orthodontic.

INTRODUCTION

Dental implants conceptually required months for crown placement and functional recovery. It was believed that it took weeks to months for cells to colonize the implant surface, produce matrix and mineralize it by efficient osseointegration. Material science developed and now it is possible to apply a functional load immediately after implants are

placed, provided that they are mechanically interlocked in a previously mineralized bone. Appropriate mechanical interlocking between implant and bone surfaces allow mini-implants to withstand masticatory forces while gradual osseointegration occurs. The type of bone and clinical condition will determine whether

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immediate-load implants are recommended or not.¹⁻³

Anchorage control is important for efficient orthodontic treatment with fixed appliances. Successful osseointegration encouraged many orthodontists to use dental implants as stationary anchorage units for force application. However, their use has some drawbacks, which led to the development of miniscrew implants (MIs).⁴⁻⁶ Titanium mini-implants have been developed and utilized as an anchor during orthodontic treatment. The mini-implants designed for orthodontic anchorage can be placed at various locations in the alveolar bone and the surgical procedure avoids infection because of the small screw size. The success rate of the mini-implant has recently risen to 90% due to consideration of risk factors.⁵⁻⁷ Hence the present study was undertaken to analyse the patients undergoing orthodontic mini-implants in a retrospective manner².

MATERIALS & METHODS

The present study was conducted with the aim of assessing the data records of patient undergoing orthodontic mini-implants in different clinics. Data records of a total of 50 patients were analysed during the study period. Complete demographic details of all the patients were obtained. Both pre-treatment and post-treatment radiographs of all the patients were obtained. Only those patients were enrolled on whom orthodontic mini-implants were placed. Statistical evaluation included descriptive statistics and survival analysis. All the results were analysed by SPSS software. Chi-square test was used for evaluation of level of significance. p-value of less than 0.05 was taken as significant.

RESULTS

In the present study, data records of a total of 50 patients who underwent orthodontic mini-implant were analysed. Mean age of the patients was 22.8 years. Out of 50 patients, 66 percent were males while the remaining were females. 62 percent of the patients were of urban residence while the remaining was of rural residence. 42 percent had Class I malocclusion, 40 percent of the patients had Class II malocclusion and the remaining 18 percent of the patients had Class III malocclusion.

In the present study, in 16 percent of the patients, single mini-implant was placed, while in 52 percent of the patients 2 mini-implants were placed. Failure of mini-implants occurred in 20 percent of the patients. In the present study while assessing distribution of patients with failed mini-implants according to type of malocclusion, non-significant results were obtained.

Table 1: Demographic data.

Parameter		Number of patients	Percentage of patients
Age group	Less than 20	21	42
	More than 20	29	58
Gender	Males	33	66
	Females	17	34
Residence	Rural	19	38
	Urban	31	62

Table 2: Type of malocclusion.

Type of malocclusion	Number of patients	Percentage of patients
Class I	21	42
Class II	20	40
Class III	9	18

Graph 1: Distribution of patients according to number of mini-implants

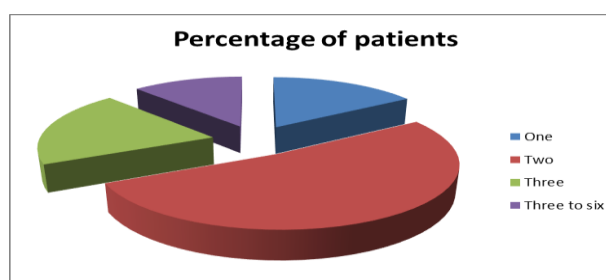


Table 3: Incidence of failure of mini-implants.

Parameter	Number of patients	Percentage
Failure of mini-implants	10	20
Success of mini-implants	40	80

Table 4: Distribution of patients with failed mini-implants according to type of malocclusion

Type of malocclusion	Mini-implants		p- value
	Success	Failure	
Class I	17	4	0.785
Class II	16	4	
Class III	7	2	

DISCUSSION

Absolute anchorage during orthodontic treatment may be obtained with mini-implants or miniplates placed in thick cortical bone and dense trabecular bone. Mini-implant threads must be perfectly fitted or adapted to the bone where they are inserted, allowing stability and immediately withstanding the forces applied. Mini-implants are also known as micro-implants, micro-screws or anchorage screws and comprise what is known as temporary anchorage devices (TAD).⁷⁻⁹ Hence the present study was undertaken for retrospectively analysing patients undergoing orthodontic mini-implants.

In the present study, data records of a total of 50 patients who underwent orthodontic mini-implants were analysed. Mean age of the patients was 22.8 years. 42 percent had Class I malocclusion, 40 percent of the patients had Class II malocclusion and the remaining 18 percent of the patients had Class III malocclusion. Motoyoshi M et al determined the success rate of mini-implants in adolescents and also whether a latent period is necessary and the optimum placement torque in an attempt to improve the success rate in adolescent patients. There were 57 orthodontic patients involved in the study, with ages ranging from 11.7 to 36.1 years, who underwent surgery to insert mini-implants (169 implants). When a mini-implant endured an orthodontic force applied for 6 months or more without any mobility, it was considered a success. The success rate was 63.8% in the early-load group (less than 1-month latent period) of adolescents, 97.2% in the late-load group (3-month latent period) of adolescents and 91.9% in the adult group. The success rate of the early-load group of adolescents was significantly inferior to those of the other groups ($P < 0.01$). In measurements of the placement torque in adolescents, the success rate of the 5-10 N cm group was significantly higher than the other groups only in the maxilla of the early-

load group. Although the optimum torque could not be defined, a latent period of 3 months before loading is recommended to improve the success rate of the mini-implant when placed in the alveolar bone in adolescent patients.¹⁰

In the present study, in 16 percent of the patients, single mini-implant was placed, while in 52 percent of the patients, 2 mini-implants were placed. Failure of mini-implants occurred in 20 percent of the patients. Pithon MM et al evaluated 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. 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. Patient's 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.¹¹

In the present study while assessing distribution of patients with failed mini-implants according to type of malocclusion, non-significant results were obtained. Wu TY et al evaluated failure rates and factors associated with the stability of mini-implants used for orthodontic anchorage. They enrolled 166 patients (35 male patients and 131 female patients) who had consecutively received mini-implants for orthodontic anchorage at the Section of Orthodontics and Pediatric Dentistry, Taipei Veterans General Hospital (Taipei, Taiwan) from January 2001 to December 2006. A total of 414 mini-implants with diameters ranging from 1.2 to 2.0 mm were evaluated. Clinical variables for analysis were divided into host-related and implant-related factors. Mini-implants that could be maintained for orthodontic anchorage for more than 6 months were considered to be successful. The overall failure rate was 10.1% (42 of 414 screws) with orthodontic force loading for more than 6 months. Most failures were due to loosening and occurred within the first 2 weeks. Differences in overall failure rates for the maxilla and mandible

(9.3% and 16.3%, respectively) were not statistically significant. A lower failure rate was found for the maxilla with implant diameters equal to or less than 1.4 mm ($P = .036$). The left side had a lower failure rate than the right (6.7% vs 13.9%, $P = .019$). Length and type of mini-implants, age, and gender were not associated with mini-implant failure. Use of mini-implants for anchorage is reliable. In our study the overall success rate was 89.9%. Careful diameter selection for different locations is essential. In the maxilla an implant diameter equal to or less than 1.4 mm is recommended.¹²

CONCLUSION

From the above results, the authors concluded that the field of orthodontics has been greatly influenced by mini-implants. They helped in a better orthodontic treatment planning by providing best management of severe discrepancies. Also significant success rate was associated with them.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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