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Assessment of Outcome of Orthodontic Mini Dental Implants: An Observational Study

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***Abstract*---Background**: Successful orthodontic therapy has always depended upon on intraoral anchorage with a great resistance to displacement. Osseointegrated implants are considered reliable sources of anchorage for orthodontists hence; the present study was undertaken for assessing the outcome of orthodontic Mini dental implants. **Materials & methods**: A total of 100 patients were enrolled. In all the involved patients, one or more self-drilling mini-screws were inserted. Orthodontic mini-implants were considered successful when they proved a perfect skeletal anchorage during the entire treatment period (independent from the period's length) without sign of mobility. All the results were recorded and analysed using SPSS software. **Results**: Success was observed in 85 percent of the cases. Failure was seen in 15 percent of the cases. Among the failure cases, inflammation was the cause in 10 percent of the cases while screw fracture was seen in 5 percent of the cases. **Conclusion**: Under the hands of skilled

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and experienced clinician, self-drilling orthodontic mini-implants had excellent prognosis.

***Keywords*---**anchorage, dental implants, mini implants, observational study, orthodontic.

Introduction

Successful orthodontic therapy has always depended upon on intraoral anchorage with a great resistance to displacement. The expanding demand for orthodontic therapy techniques that require minimal compliance and deliver maximal anchorage control, particularly for adults, has led to the expansion of implant technology in orthodontics (Kang et al., 2009; Kim et al., 2010; Zhang et al., 2010). Osseointegrated implants are considered reliable sources of anchorage for orthodontists. However, the large size of these implants limits their usage. To overcome this problem, mini-implants were developed. Their advantages, in addition to size, include minimal anatomic limitations, minor surgery, increased patient comfort, immediate loading, and lower costs. Mini-implant–enhanced anchorage has become a popular concept in orthodontics over the past years. Although these systems are routinely used in university settings, there is some reservation because of lack of information in private practices (Wehrbein & Göllner, 2007; Gracco et al., 2008; Jung et al., 2011). Hence, the present study was undertaken for assessing the outcome of orthodontic Mini dental implants.

Materials and Method

The present study was undertaken for assessing the outcome of orthodontic Mini dental implants. A total of 100 patients were included in the study. One or more self-drilling mini-screws were inserted in all the participated patients. Smoking patients and patients with any general systemic diseases were excluded from this study. Orthodontic mini-implants were considered successful when they proved a perfect skeletal anchorage during the entire treatment period (independent from the period's length) without sign of mobility. In contrast, screws showing mobility or loosening (with or without subjective complaints), peri-implant infection, or neighbouring tooth injury occurred, were considered as failures.Before screw insertions, the correct location of the implants was determined by physical and radiological investigations. All the results were recorded and analysed using SPSS software. Chi-square test was used for evaluation of level of significance.

Results

In the present study, a total of 100 patients were analysed. Mean age of the patients was 20.5 years. 56 patients were males while the remaining were females. In 84 percent of the patients, screw was placed in maxilla. In 58 percent of the patents, screw was placed on the right side. Success was observed in 90 percent of the cases. Failure was seen in 10 percent of the cases. Among the failure cases, inflammation was the cause in 8 percent of the cases while screw fracture was seen in 2 percent of the cases.

Table 1
Distribution of patients according to location

Screw location	Number of patients	Percentage
Maxilla	80	80
Mandible	20	20

Table 2
Distribution of patients according to side

Screw side	Number of patients	Percentage
Right side	60	60
Left side	40	40

Table 3
Outcome

Outcome		Number of patients	Percentage
Success		85	85
Failure	Inflammation	10	10
	Screw fracture	5	5

Discussion

Many mini-implants are now available, and orthodontists are trying to incorporate them in various clinical situations. However, with the introduction of new techniques, questions normally arise. Clinicians desire information on actual success rates and possible adverse effects of mini-implants for orthodontic anchorage. Primary stability is necessary for the miniscrews, because of immediate loading on them, and differs according to various patient, the design of the miniscrew, and clinical technique factors, also it is considered as clinical condition of mini-implant immobility and ability to resist loads in different directions (Asscherickx et al., 2010; Viwattanatipa et al., 2009; Mo et al., 2010; Santiago et al., 2009). Hence, the present study was undertaken for assessing the outcome of orthodontic Mini dental implants.

In the present study, a total of 100 patients were analysed. Mean age of the patients was 20.5 years. 56 patients were males while the remaining were females. In 80 percent of the patients, screw was placed in maxilla. In 60 percent of the patents, screw was placed on the right side. Success was observed in 85 percent of the cases. Y-C Tseng et al assessed their stability and the causes of failure. The diameter of the implants was 2mm, and their lengths were 8, 10, 12 and 14mm. The drill procedure was directly through the cortical bone without any incision or flap operation. Two weeks later, a force of 100-200g was applied by an elastometric chain or NiTi coil spring. Risk factors for the failure of mini-implants were examined statistically using the Chi-square or Fisher exact test as applicable. The average placement time of a mini-implant was about 10-15min. Four mini-implants loosened after orthodontic force loading. The overall success rate was 85%. The location of the implant was the significant factor related to

failure. In conclusion, the mini-implants are easy to insert for skeletal anchorage and could be successful in the control of tooth movement (Tseng et al., 2006).

In the present study, failure was seen in 15 percent of the cases. Among the failure cases, inflammation was the cause in 10 percent of the cases while screw fracture was seen in 5 percent of the cases. Yao CCJ et al analysed the potential factors affecting the failure rates of three types of mini-implants used for orthodontic anchorage. Data were collected on 727 mini-implants (miniplates, predrilled titanium miniscrews, and self-drilling stainless steel miniscrews) in 220 patients. The failure rate for miniplates was significantly lower than for miniscrews. All types of mini-implants, especially the self-drilling stainless steel miniscrews, showed decreased stability if the previous implantation had failed. The generalized estimating equation analysis revealed that mini-implants with miniscrews used in patients younger than 35 years, subjected to orthodontic loading after 30 days and implanted on the alveolar bone ridge, have a significantly higher risk of failure. Their study revealed that once the dental surgeon becomes familiar with the procedure, the stability of orthodontic mini-implants depends on the type of mini-implant, age of the patient, implantation site, and the healing time of the mini-implant (Yao et al., 2015).

To achieve initial stability, a certain level of maximum insertion torque is necessary. Studies with dental implants have shown that increases in peak insertion torque can reduce the amount of micromotion and improve their success. However, excessive stress to the bone can cause necrosis and local ischemia and might impede osseointegration and hence secondary stability. Such an association was also suggested in various clinical studies in the orthodontic literature.Garg KK et al evaluated the mobility of orthodontic miniscrews under orthodontic loading using computed tomography. Ten adult patients (7 females and 3 males with mean age of 19 years, 7 mm overjet) who required en masse retraction of upper and lower anterior teeth infirst premolar extraction spaces were included in this study. They concluded that to prevent hitting any vital organs because of miniscrew mobility, it is recommended that they can be placed in a nontooth-bearing area that has no foramen, major nerves, or blood vessel pathway, or in a tooth-bearing area allowing a 1.5 mm safety clearance between the miniscrew and dental root (Garg & Gupta, 2015).

Conclusion

Under the hands of skilled and experienced clinician, self-drilling orthodontic mini-implants had excellent prognosis. From the above results, the authors concluded that inflammatory complications frequently develop even with careful insertion as a result of the patient's poor oral hygiene.

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