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## Original ARTICLE

### Retrospective Assessment of patients undergoing orthodontic mini-implants

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#### ABSTRACT:

**Background:** Small-sized mini-implants have been applied for skeletal orthodontic anchorage. Orthodontic mini-implants have a smaller diameter and a shorter length than the implants used for prosthodontic treatment. Hence; the present study was undertaken for retrospectively analysing patients undergoing orthodontic mini-implants. **Materials & methods:** The study sample size was selected as 65 patients. Analysis of the data record files of all the patients was done and complete demographic and clinical details were obtained. Radiographs (both pre-treatment and post-treatment) were obtained from the record files and a chart was prepared for recording the findings. Profile of all the patients was separately recorded. All the results were analysed by SPSS software. **Results:** In 43.08 percent of the patients, single mini-implant was placed while in 29.23 percent of the patients, two mini-implants were placed. Class I malocclusion was found to be present in 44.62 percent of the cases. Overall excellent prognosis of mini-implants was found to be 81.54 percent. Among 29 patients with class I malocclusion, success occurred in 23 patients while failure occurred in 6 patients. While assessing the prognosis of mini-implants according to type of malocclusion, non-significant results were obtained. **Conclusion:** Dental mini-implants have greatly influenced the orthodontic speciality. Orthodontic treatment protocols have been largely improved by these mini-implants due to their higher success rate.

**Key words:** Mini-implants, Orthodontic

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#### INTRODUCTION

Small-sized mini-implants have been applied for skeletal orthodontic anchorage. Orthodontic mini-implants have a smaller diameter and a shorter length than the implants used for prosthodontic treatment. Therefore, orthodontic mini-implants tend to demonstrate a higher failure rate than conventional implants. The frequent failures of orthodontic mini-implants during treatment are a weak point of their use and can affect treatment plans and duration. Other studies have reported 0% to 30% failure rates of orthodontic mini-implants inserted into alveolar bone.<sup>1-3</sup>

There certainly was high-quality Orthodontics before the advent of mini-implants. Severe malocclusions were treated and, by the end of treatment, the ideal objectives of orthodontic therapy were

achieved. Professional skills and clinical experience in similar cases contributed to establish a stable and functional occlusion. Nevertheless, more complex orthodontic mechanics occasionally led to or allowed unwanted movements of teeth involved in appliance use. Thus, there was a need to control such side effects so as to allow treatment to be properly developed. Mini-implants can be installed by an orthodontist, provided that previous planning has been made with a proper sequence of procedures that respect all clinical steps. In addition, patient's anatomical features should be carefully considered together with the limitations imposed by the technique.<sup>4-6</sup> Hence; the present study was undertaken for retrospectively analysing patients undergoing orthodontic mini-implants.

**MATERIALS & METHODS**

With the aim of assessing the profile of patients undergoing orthodontic mini-implants, the present study was initiated. After conferring the statistics, the study sample size was selected as 65 patients. Analysis of the data record files of all the patients was done and complete demographic and clinical details were obtained. Exclusion criteria for the present study included:

- Patients in which complete pre-treatment and post-treatment data records were not available,
- Patients in which positive history of any systemic illness was present,
- Patients with presence of diabetes or hypertension

Radiographs (both pre-treatment and post-treatment) were obtained from the record files and a chart was prepared for recording the findings. Profile of all the patients was separately recorded. 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**

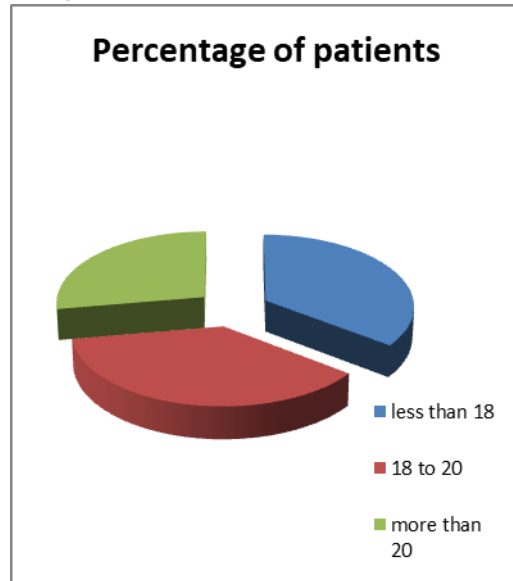
In the present study, mean age of the patients was found to be 19.45 years, with 36.92 percent of the patients belonging to the age group of 18 to 20 years. A male preponderance was found to be present with 66.15 percent of the patients being males. In 43.08 percent of the patients, single mini-implant was placed while in 29.23 percent of the patients, two mini-implants were placed.

In the present study, class I malocclusion was found to be present in 44.62 percent of the cases. Overall excellent prognosis of mini-implants was found to be 81.54 percent. Among 29 patients with class I malocclusion, success occurred in 23 patients while failure occurred in 6 patients. While assessing the prognosis of mini-implants according to type of malocclusion, non-significant results were obtained.

**DISCUSSION**

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. Because these devices are used for specific time periods, mostly rely on mechanical retention, and do not always osseointegrate, other terms such as miniscrews, miniscrew implants, microscrews, and temporary anchorage devices have been used. There is no general agreement on the nomenclature. Different authors have used the term “mini-implant” because it is currently the most frequently used in the orthodontic literature. Many mini-implants are now available, and orthodontists are trying to incorporate them in various clinical situations.<sup>6-9</sup>

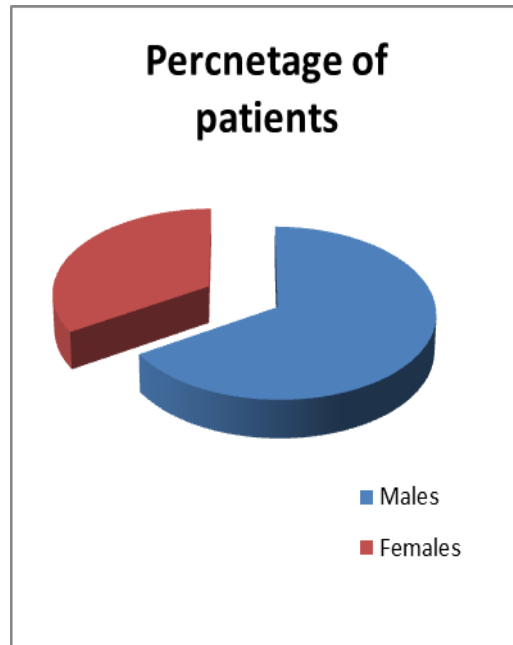
**Graph 1: Age-wise distribution**



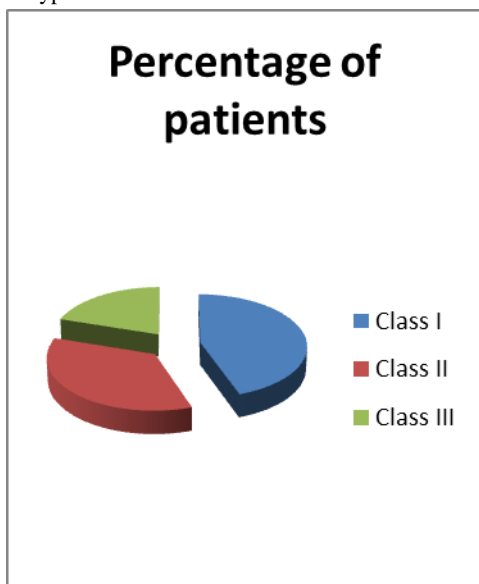
**Table 1: Number of mini-implants per patient**

Number of mini-implants	Number of patients	Percentage of patients
One	28	43.08
Two	19	29.23
More than two	18	27.69

**Graph 2: Gender-wise distribution**



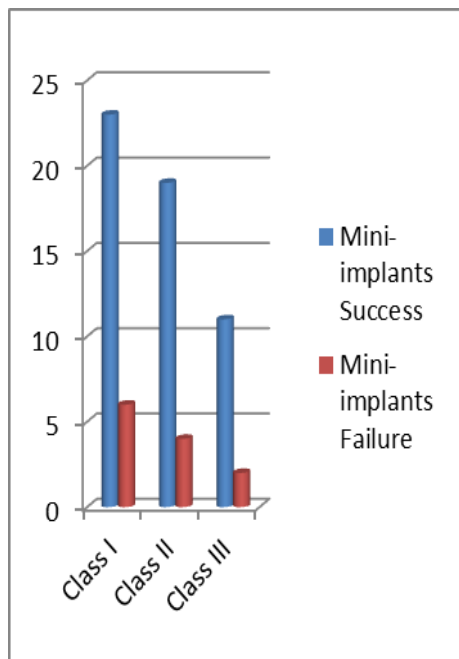
**Graph 3:** Type of malocclusion



**Table 2:** Prognosis of mini-implants

Parameter	Number of patients	Percentage
Failure	12	18.46
Success	53	81.54

**Graph 4:** Prognosis of mini-implants according to type of malocclusion



In the present study, mean age of the patients was found to be 19.45 years, with 36.92 percent of the patients belonging to the age group of 18 to 20 years. A male preponderance was found to be present with 66.15 percent of the patients being males. In 43.08 percent of the patients, single mini-implant was placed while in 29.23 percent of the patients, two mini-implants were placed. Jeong JW et al evaluated patterns of failure time after insertion, failure rate according to loading time after insertion, and the patterns of failure after loading. A total of 331 mini-implants were classified into the non-failure group (NFG) and failure group (FG), which was divided into failed group before loading (FGB) and failed group after loading (FGA). Orthodontic force was applied to both the NFG and FGA. Failed mini-implants after insertion, ratio of FGA to NFG according to loading time after insertion, and failed mini-implants according to failed time after loading were analyzed. Percentages of failed mini-implants after insertion were 15.79%, 36.84%, 12.28%, and 10.53% at 4, 8, 12, and 16 weeks, respectively. Mini-implant failure demonstrated a peak from 4 to 5 weeks after insertion. The failure rates according to loading time after insertion were 13.56%, 8.97%, 11.32%, and 5.00% at 4, 8, 12, and 16 weeks, respectively. Percentages of failed mini-implants after loading were 13.79%, 24.14%, 20.69%, and 6.9% at 4, 8, 12, and 16 weeks, respectively. Mini-implant stability is typically acquired 12 to 16 weeks after insertion, and immediate loading can cause failure of the mini-implant.<sup>10</sup>

In the present study, class I malocclusion was found to be present in 44.62 percent of the cases. Overall excellent prognosis of mini-implants was found to be 81.54 percent. Among 29 patients with class I malocclusion, success occurred in 23 patients while failure occurred in 6 patients. While assessing the prognosis of mini-implants according to type of malocclusion, non-significant results were obtained. 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. After initial alignment of anterior teeth, the 0.019" x0.025" stainless steel archwire were placed in preadjusted edgewise appliance. The miniscrews (diameter - 1.3 mm, length - 7 mm) were inserted in between second premolar and thefirst molar in the maxilla (zygomatic buttress) and in mandible on the buccal side as direct anchorage. Immediately after placement of miniscrews without waiting period, NiTi coil springs (force of 150 g in the maxilla and 100 g in the mandible) were placed for the retraction. Denta Scans were taken immediately before force application (T1) and 6 months later (T2). On average, miniscrews were extruded and tipped forward significantly, by 1 mm at the screw head in the axial plane (Group III) and 0.728 mm in the coronal plane (Group IV). Tail of miniscrews showed average tipping of 0.567 mm in the axial plane (Group I) and 0.486 mm in the paraxial plane (Group V). Least average mobility was shown by screw body of 0.349 mm in the axial plane (Group II). Clinically, no significant

mobility was observed. Miniscrews are a stable anchorage for orthodontic tooth movement but do not remain absolutely stationary like an endosseous implant throughout orthodontic loading although miniscrews might move according to placement site, orthodontic loading, and inflammation of peri-implant tissue.<sup>11</sup>

### CONCLUSION

Under the light of above obtained data, the authors concluded that dental mini-implants have greatly influenced the orthodontic speciality. Orthodontic treatment protocols have been largely improved by these mini-implants due to their higher success rate. Hence; further studies are recommended.

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