

## CHAPTER 1

### INTRODUCTION

#### Statement of the problems and objectives

Recently, the use of miniscrew implants has become an accepted and reliable method for providing temporary additional anchorage during orthodontic treatment.<sup>1-5</sup> Because these miniscrews use the bone as anchorage, they have become broadly accepted as viable alternatives to extra-oral devices in patients who either have insufficient dental support suitable for anchorage or who are not compliant in wearing extra-oral devices.<sup>6-8</sup> Moreover, because of the small size, they can be inserted in sites that were previously unavailable, such as the interradicular space.<sup>8-12</sup>

The placement of miniscrew implants in the dento-alveolar bone site has been frequently recommended by the specialized literature for allowing simple placement and removal procedures, and for allowing the application of relatively simple force systems.<sup>13,14</sup> However, concerns of damaging dental roots allied with the limited interradicular space still represent a barrier for the clinical application of miniscrew implants.<sup>10,15-17</sup>

In order to solve this problem, several clinical approaches to safely guide the miniscrew implant placement into the dento-alveolar bone, and anatomical studies of the availability of the interradicular spaces for miniscrew implant placement, have been described in the literature.<sup>9,11,18-32</sup>

Clinical approaches for miniscrew implant placement into the dento-alveolar bone, such as the use of templates, wire guides and 3-D surgical guides, are designed

to aid in the planning and subsequent orientation of the miniscrew implant placement into the dento-alveolar bone. However, the safe placement of miniscrew implants in the dento-alveolar bone depends on the availability of a minimal amount of interradicular bone.<sup>9,23</sup> Moreover, the proximity of miniscrew implants to the dental root has been reported to be an important risk factor for miniscrew implant failure.<sup>15</sup>

Therefore, several radiographic and anatomical studies have been performed to accurately assess the availability of interradicular spaces for allowing safe miniscrew implant placement while providing an anatomical guide for placing the implants between the dental roots, the so-called “safe zones”.<sup>11,9,19,21,23,29</sup> Accordingly, the safest sites in dento-alveolar bone for miniscrew implant placement have been described, in the maxilla as the area between the second premolar and the first molar, and, in the mandible the area between the first and the second molars.<sup>9,11,19,21,23,29</sup>

However, in these anatomical studies, the effects of different dento-skeletal patterns and the respective dento-alveolar compensations of the samples were not taken into account for the assessment of the amount of interradicular space required for miniscrew implant placement. Moreover, a relatively small sample size was included in these studies.

Previous studies have shown that the different patterns of dento-skeletal patterns are directly related to the patterns of dento-alveolar compensation.<sup>33-36</sup> However, the effects of dento-skeletal patterns on the amount of interradicular spaces for miniscrew implant placement have not been investigated.

Therefore, the purposes of the present study were 1) to assess interradicular spaces for miniscrew implant placement in different dento-skeletal patterns, and 2) to

determine whether there is a relationship between dento-skeletal pattern and interradicular space.



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