CHAPTER 1

INTRODUCTION

Miniscrew implants were introduced as an orthodontic treatment option to simplify challenging molar distalization treatments and as absolute orthodontic anchorage. Miniscrew implants were developed from dental implants. Initially, the dental implants were inserted in edentulous areas for prosthetic purposes.[1-3] However, the dental implants needed to have invasive surgical procedures and long waiting periods for osseointegration before force application.[4-6] To reduce these limitations, Block and Hoffman[7] developed a disc-like structure called an "onplant" that was designed to provide orthodontic anchorage from the palatal bone. Nevertheless, some time was required to obtain complete osseointegration before force loading. Creekmore and Eklund[8] successfully applied a surgical vitallium screw as a skeletal anchorage in the maxilla. Kanomi[9] used miniplate fixation screws for anchorage. After that, many small screws with specially designed head shapes were developed for use in orthodontics. They are called "miniscrew implants".

These miniscrew implants have been successfully applied to augment orthodontic anchorage. They have several advantages over the previous skeletal anchorage devices, including simple insertion and removal procedures.[10-14] Miniscrew implants also have the potential for immediate loading without osteointegration.[15-19]

In orthodontic treatment, molar distalization is a good example of a challenging treatment to show that miniscrew implants needed to augment the treatment mechanics. In the past, it was difficult to distalize molars with headgear because patient compliance was the main factor in success.[17,20-25] Later, intra-oral conventional distalizing devices were invented to solve the patient compliance problem.[22,26] However, conventional distalizing devices still presented difficulties with anchorage loss because an anchorage unit is unable to completely resist distalizing force; this is seen often as an increase in overjet and incisor protrusion.[27] Therefore, miniscrew implants have been applied to reinforce anchorage units in conventional distalizing devices.[5,23,28-31]

More recently, several designs were developed for miniscrew implant-supported distalizing devices.[15] These miniscrew implants were placed in different areas of the maxilla for distalization of the molars. The placement sites could be broadly grouped into two different areas; buccal and palatal. The most common site was the buccal aspect of the maxilla, because of the associated simple placement and simple mechanics.[32,33] Nevertheless, such buccal placement might have interfered with the roots of the teeth during the retraction phase, necessitating replacement of the miniscrew implant.[14] The palatal miniscrew implant placement did not present such difficulties because the placement sites did not interfere with the roots. Miniscrew implant placement in the palate was reported with a high success rate.[33,34] The palatal bone contains a large amount of cortical bone and it is mostly covered with attached mucosa.[31,33-36] Lee et al.[23] placed implant in midpalatal suture while Kinzinger et al.[37] placed implant at paramedian of the palate. Different areas of the palate have

different bone height and bone density.[35-38] These differences may result in different success rates for different implant placement locations.[33,34]

The success rate of implant placement depends on various factors. Insertion torque is one factor that is measurable and can be used to predict the success rate of miniscrew implants.[16,39] Motoyoshi et al. recommended that the maximum insertion torque of miniscrew implant placement should be within the range of 5 to 10 Ncm for 1.6-mm diameter miniscrew implants.[39]

Therefore, the development of distalization with miniscrew implants as anchorage has gained popularity, since there is no effect on the anterior teeth and no need for patient compliance.

Because the bone quality and quantity in the palate varies, the insertion torque of the miniscrew implant in different areas may vary. Therefore, the objective of this study was to assess the insertion torque of miniscrew implants in different areas in the palate, to assess the suitability the various implant placement sites.