

CHAPTER I

INTRODUCTION

Restoration of endodontically treated tooth often need a post and core restoration with crown due to extensive structural defects resulting from caries, large restorations, or access preparation in order to reinforce tooth structure and prevent tooth fracture (1-3). Direct post and core restorations with fiber reinforced composite (FRC) posts became popular owing to their lower modulus of elasticity compared with metal posts, which increases stress distribution along the root, decreasing the risk of root fracture (4). The morphology of the tooth root canal is generally tapered in the coronal to apical dimension and oval in cross-section (5). Kasahara et al. studied root canal preparations in endodontic treatment in maxillary central incisors and reported the canal should be flared at the root canal orifice, tapering towards the apical foramen. The canal preparation may result in a large flaring, requiring a post with wider coronal taper (6). Additionally, when the post space is prepared for a precisely fitted post, the root canal dentin in apical part may need to be removed, weakening the remaining tooth structure. Prefabricated post systems may not precisely fit the prepared root canal requiring resin composite or resin cement to fill the space between post and root canal wall (7) especially in the coronal part of the root canal.

Ananviriyaporn studied the effect of diameter and length of fiber posts on the failure resistance of endodontically treated teeth restored with post and core. This study concluded using the diameter of FRC post which only properly fit the cervical part of the canal or using resin composite reinforced the canal space was as strong as those restored with the fiber post that properly fit to the canal as a whole. However, restorations using posts smaller than the canal resulted in a significant decrease in failure resistance (8).

The presence of ferrule of remaining tooth structure in restoring endodontically treated teeth with post and core has been reported to be important (9-13). Ferrule is the band or ring that fit the root or crown of the tooth (14). A tooth with a crown ferrule can transfer chewing force apically along the root canal wall preventing root fracture (15).

When the tooth had at least a 2 mm ferrule, long term success of the restoration could be expected (16). The results of a study of the fracture resistance of teeth receiving ferrule, suggested there were no significant differences in teeth restored with stainless steel post and resin composite core which received ferrule of different heights (17). A limitation of this study is that it did not simulate the effect of the periodontal ligament. Saupe et al. demonstrated when a bonded resin system was used in structurally compromised teeth, there was no statistical difference in fracture resistance between post and core restorations with ferrule and those with no ferrule (18).

Dikbas et al. studied the effect of different ferrule restored with quartz fiber posts. The results suggested there were no significant differences among the groups with remaining tooth structure of one-wall, two-wall, or circumferentially compared to the group with no ferrule (19). The authors claimed the effect of a quartz fiber post in transferring the stress was more significant than the effect of ferrule. However, the teeth in this study were restored with a precisely fit fiber post. In some clinical situations where the tooth has a large post space or less remaining tooth structure, it may be difficult to find a properly fitting prefabricated post. Therefore, the tooth has to be restored with a post smaller than the post space and reinforced with resin cement or resin composite. To our knowledge, there is no study investigating the effect of different remaining tooth structure of ferrule restored with quartz fiber posts of different diameters in endodontically treated teeth.

The purpose of this study was to evaluate the effect of ferrule and post diameter in endodontically treated tooth restored with quartz fiber post under compressive force. For this study, the null hypothesis was there would be no difference in the fracture resistance of the tooth with and with no ferrule, post diameter that properly fit and not fit to the post space include their interactions.