A Quantitative Evaluation of the Thickness of Root Morphology in Mesial and Distal Roots of Human Lower First Molars

—Presence of a Thinner Portion or Danger Zone of the Root Structure toward the Bifurcation Area—

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Abstract: Successful manipulation of instruments clinically requires instinctive dexterity based on a thorough knowledge of dental anatomy. In round and nearly straight roots of upper central incisors in which the canals are centered in the dentin body of the teeth, the wall thickness is approximately equal in the labiobuccal and mesiodistal cross sections. However, the wall thickness of curved canals of molars with two or three roots can be irregular and variable. The presence of a thinner portion or danger zone of the root structure toward the furcation areas of molars had been poorly described in tooth morphology and even in textbooks on endodontics.

The purpose of this study was to precisely measure the thickness of root morphology available for root canal orifice preparation in the mesial roots of lower first molars. We investigated macroscopically the bifurcated root forms viewed from the mesial and distal aspects of 109 human lower first molar teeth. The lengths of all teeth were measured and furcation morphology with root concavities was examined. Modified dental stone replica models of the roots were transversely sectioned at the furcal portion and mid-mesial root length levels to the long axis. The external form of the replica samples was traced at 2 × magnification. The mesio-distal and bucco-lingual length (distance) were examined.

The results were as follows:

1. Type I with the presence of signs of bifurcation at the root tip was found in 22.9% of mesial roots and 4.6% of distal roots. Type II, III and IV with a single root were respectively found in 22.0, 12.8%, 39.4, 41.3% and 15.6, 41.3%.

2. Regarding the furcal aspect of the root, deeper concavity was found in 84.4% of the mesial roots and 41.3% of the distal roots.

3. The average mesio-distal dimension of mesial roots was 2.68 mm in the bifurcation with root concavity and 2.01 mm at halfway between the cervical portion and the apex. The minimum dimension was 1.98 mm and 1.06 mm at the thinnest portion of the mesial roots. There was a significant difference between morphological patterns of mesial and distal roots.

Key words: Lower first molars, Furcation root surface anatomy, Root concavity, Replica method