3D COMPUTER-AIDED RECONSTRUCTION OF THE MORPHOLOGY OF SEVEN UPPER PREMOLARS

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ABSTRACT

The knowledge of the internal and external morphology of the teeth is important and essential for a successful endodontic treatment of the teeth, therefore different methods have been used until today for the study of their pulp chamber and root canal configuration. These methods include casts preparation of the root canals with Wood's metal (Preiswerk 1909), celluloid (Fischer 1907) or polyester resin (Carns and Skidmore 1973), decalcification of the teeth and dyes injection (Vertucci et al 1974), sectioning of extracted teeth (Kerekes and Tronstad 1977) and roentgenographic studies (Mueller 1933, Pineda et al 1972).

A new method, the three-dimensional computer-aided reconstruction method was used in this work for the study of the internal and external anatomy of seven first and second upper premolars.

The teeth immediately after their extraction, were put in a 5% NaOCl solution for 24 hours and they were then washed under running water. Followingly, they were embedded in a two phase polyester resin, and serial cross sections were taken from each tooth by using a special microtome (Isomet, Buehler). The thickness of each section was 0.75 mm. The serial cross sections were later photographed under a stereoscopic microscope (Stemy SV8, Zeiss) and the photographs were digitized by using a scanner (Epson 6000). The contours of the external and internal (pulp chamber) surface of the sections were taken and semiautomatic alignment was achieved. The next step was the three-dimensional representation of the inner and outer surface of the teeth by using triangulation. Finally, three-dimensional reconstruction of each tooth was succeeded by using surface rendering from different viewpoints, combined with photorealistic effects such as color and texture addition, lighting and shading.

The results showed in detail the internal morphology of the teeth under investigation. The following morphological types of upper premolars were reconstructed in this study:

1)two single rooted with two root canals
2)four birooted with two root canals
3)one birooted with three root canals.

The fact that we are able to study the teeth under investigation from different viewpoints is one of the main advantages of our method, as one can understand in detail the internal anatomy of the teeth in the space.

In conclusion, the three-dimensional reconstructing method is a useful tool for the study of the external and internal morphology of the teeth.