



F40 Morphometric Analysis of the Root Development of the Third Molar by an Experimental Method Using Digital Orthopantomographs

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After attending this presentation, attendees will understand a study designed to investigate the accuracy and precision of the development of the third mandibular molar, determined on digital panoramic X-Ray, by a morphometric analysis as an indicator of chronological age in a sample of 330 16-19 year-old subjects

This presentation will impact the forensic community and/or humanity by demonstrating a new, very interesting method in personal identification.

Introduction: Determination of adult age by the analysis of teeth is frequently an important forensic issue because it may determine whether an individual convicted of a crime is sentenced as an adult and incarcerated in a state penal institution or sentenced as a juvenile and sent to a juvenile camp.

The aim of this study was to test the possibilities of use of digital OPT on the basis of morphometric analysis of the development of the third molar. The research that was carried out on digital OPT was based on the criteria of identification by morphometric analysis with the purpose of exceeding the limits of an exclusive morphological analysis. In fact, it revealed that morphological analysis presents difficulty in the precise placement of the third molar in the various stages of development.

The risk is therefore one of having a difference in the results obtained from various examiners caused by the subjectivity of the criteria of evaluation adopted from each individual; this kind of analysis indicates the length of the roots, which is a part of the final length neither known nor predictable.

There is therefore a need for conducting a morphometric analysis in the area of looking for a constant dimensional crown-root ratio (C/R) with a standard deviation that consents objective analysis of the example.

The study's goal was therefore of predicting a final root length, having noted the crown dimension, and finally obtaining a ratio between the effective root length in the third growing molars, and that which is finally foreseen.

Materials and Methods: In the application of this method, measurements were taken only on mandibular molars. From the beginning, two points of the cemento-enamel junction (AC) were identified for tracing the straight line that joins those points. Subsequently, parallels to the straight line were created tangent respectively the summit of the highest coronal cusp and the apex of the longest root (or the most apical part of the calcified root in the development phases).

The measurements were done on the perpendicular conducted for the three straight lines between their parallel with the objective of reducing to a minimum the error in the calculating phase. Both passages (design drawing of the line and the measurement), as well as the acquisition of the OPT were accomplished by digital systematic research using a specific dental software.

In the first phase of this study, the existence of a constant ratio C/R was verified on a sample of 100 third molars characterized by a complete root development.

Statistic analysis was conducted targeted at individualizing the arithmetic mean of the ratios with a standard deviation that produced an average value of the C/R ratio equal to 0.518 and a standard deviation of 0.05.

This outcome is supported by results from an inferential study that has permitted researchers to determine, with assurance equal to 95%, an interval (interval of confidence) inclusive between 0.509 and 0.528, with internally inserted the relationship C/R of the population of reference (Italian) from which the sample was taken.

In the second phase of the study, a sample of 330 third molars with developing roots that belonged to the age from and including 16 to 19 years old are analyzed and divided according to sex.

The value obtained from the first phase of the study was used in the successive phase, formulating that in the third molars with developing roots, the measurements of the length roots total (It), knowing the crown height (h): $It = h / (C/R \text{ mean})$

Lastly, knowing the total length of the roots the ratio between the length of the developing roots and those finally foreseen are calculated.

The second statistic analysis was based on the calculation of the standard deviation and the



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interval of confidence where internally was present the ratio between partial roots and total (Rp/Rt) for every class of age. It allowed the attribution at each class of age, whether it is male or female, a different numeric value and therefore being able to estimate the age with a precision equivalent to 95%. The results are shown below:

GROUPS	Ratios Rp/Rt(means)	Dev. Standard	Confidence Interval (95%)
Males 16	0.43364	0.1458615	(0.3734313 ; 0.4938487)
Females16	0.43979	0.2287706	(0.3760983 ; 0.5034786)
Males17	0.66239	0.1517706	(0.6217484 ; 0.7030373)
Females17	0.58784	0.2297738	(0.5263055 ; 0.6493731)
Males18	0.73549	0.1759996	(0.6750277 ; 0.7959437)
Females18	0.71721	0.1670609	(0.6651544 ; 0.7692741)
Males19	0.84992	0.2766183	(0.7357376 ; 0.9641024)
Females19	0.81152	0.2030861	(0.7342674 ; 0.8887671)

Age Identification, Third Molar, Forensic Odontology