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## AGE ESTIMATION BASED ON A 3D CBCT STUDY OF THE PULP CAVITY AND HARD TISSUES OF THE TEETH FOR FORENSIC PURPOSES

Francesco Pradella\*, Claudio Baldinotti, Giulia Vitale, Jacopo Buti\*\*, Vilma Pinchi

\* Dep. Section of Forensic Medical Sciences, University of Firenze, Italy

\*\*School of Dentistry, University of Manchester, Manchester, UK

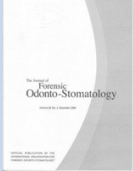
\* Member of the IOFOS board and current Secretary of IOFOS. Private dental practitioner and forensic odontologist since 1985. MD degree at the University of Padua, DDS degree at the University of Verona and MSc degree in forensic odontology at the University of Firenze. He has been involved in damage evaluation cases and in forensic odontology cases since 1985, as a consultant for insurance companies, private or public institutions. He regularly acts as expert consultant in criminal and civil court cases involving the different fields of forensic odontology.

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**Background:** The age estimation is a mainstay of the reconstructive identification pathway of the living individual as well as of the dead, and, among the others, the odontological methods are considered to be quite reliable. In the adults, the dental age can be estimated by the analysis of the progressive physiological and degenerative phenomena which affect the tooth and, among them, the secondary dentinal apposition. Along with the histopathological methods of dental age estimation, the recent introduction of the devices for the three-dimensional processing of the radiographic images of the teeth – such as the modern CBCT – allows the adoption of a non-invasive/destructive, reliable and rather accurate method for dental age estimation.

**Aim:** The aim of the present research is to develop a non-invasive, conservative, reliable, accurate and simple method of dental age estimation by means of the analysis of the volume decrease phenomena which affect the pulp cavity of the teeth. The experimented method provides a specific software which allows the measurement of the volume of dental tissues on the basis of the three-dimensional radiographic images of the CBCT.

**Materials and Methods:** We have randomly selected 295 CBCT radiographs of caucasian subjects made for ordinary clinical purposes (Scanora 3D dental cone beam unit - Soredex, Tuusula, Finland). The sample of the CBCTs consists of an equal distribution of the number of the radiographic exams in the male/female genders and in the cohorts of age between 15 and 65 years. The image of the upper left central incisor has been extrapolated from the radiographs with



*a dedicated software in DICOM file format (OnDemand 3D software - CyberMed Inc, Seoul, South Korea). To measure the volume of dental tissues, the images have been then elaborated with an innovative method providing a geometric approximation of the dental figure: the ratio “pulp cavity volume/dental hard tissues volume” has been obtained and then correlated with the age of the subject.. The results have been statistically analyzed.*

*Results: The research is still in progress and it needs to be implemented with the results from a larger number of exams before drawing final conclusions. Anyway the preliminary results are encouraging since the CBCT allows a precise and accurate measurement of the volume changes of dental tissues caused by ageing. Moreover the study of the volume instead of the linear or area measurement of the dental structures seems to be a promising approach, being the volume less influenced by x-rays distortion. Hence the method offers the best chance to reveal and to measure the correlation of such volume changes with the age of subject thus obtaining useful evidence to assess age of an adult in the forensic practice.*

*Conclusion: The presented method is a promising tool in the procedure for age estimation, permitted by the high technological level achieved by the currently available machines for the CBCT. Due to the correlation with age, the low dose exposure to x-rays, the conservative and easy approach, the save of time and the economically irrelevant difference in costs between the OPG and the CBCT exam, the adopted procedure can be considered technically reliable and affordable for forensic purposes.*

**KEYWORDS:** Forensic Odontology, Age Estimation, Pulp volume, CBCT.