F18   Dental Age Estimation Using X-Ray Microfocus Computer Tomography

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The goal of this presentation is to discuss pulp/tooth volume ratio which is an age-related change and as such an important parameter in a new dental age estimation procedure.

This presentation will impact the forensic community and/or humanity by demonstrating a completely new technique for dental age estimation that is being introduced to the community. The technique needs further research in order to optimize the procedure and obtain more statistically sound results.

Introduction: The aging of teeth is a unique process. Especially the volume of the pulp canal system considerably reduces over time. Based on this age-related changes a variety of methods for age estimation were proposed. Most of them require extraction with or without preparation of microscopic sections. During the last 20 years X-ray microfocus computer tomography (µCT) has shown its potential in various fields, also in dental research. The aim of the present study was to correlate the volume ratio of pulp versus tooth with the chronological age of an individual using µCT.

Materials and Methods: Forty-three teeth were collected from 25 individuals, ranging from 24-66 years. The selection was restricted to upper and lower single rooted teeth. Only those teeth that revealed neither profound caries nor restorations were included.

Scanning was performed using a desktop X-ray microfocus CT scanner providing data sets that were used later for qualitative and quantitative purposes. Each tooth was vertically positioned on a metal holder in the center of the scanner using cyanoacrylate glue.

Custom made software, written on top of the public domain Visualization Toolkit (VTK) package was developed for segmentation and volume measurements by voxel counting. All measurements and additional information was entered into a Microsoft® Excel® spreadsheet. Statistical analysis was carried out.

Results: The analysis of principal components showed that only the pulp/tooth volume ratio had a coefficient significantly different from zero, and therefore the remaining components, being gender and type of tooth, were disregarded.

Regression analysis with age as dependent variable and the pulp/tooth volume ratio as independent variable showed a coefficient of determination : $R2 = 34\%$. The formula was given as : age = 61,78 – 788,94 ratio.

Conclusion: X-ray microfocus computer tomography is a nondestructive tool for imaging internal structures of teeth. The presented methodology shows promising results for estimating biological age based on the pulp/tooth volume ratio. Optimisation of scanning and measuring technique is subject of further investigation.

Dental Age Estimation, Pulp/Tooth Volume Ratio, Odontology