3D PULP VOLUME ANALYSIS IN CLEFT LIP AND PALATE POPULATION

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AIM

Age estimation plays a significant role in human identification in various situations like homicides, suicides and humanitarian massive disasters. The methods to estimate age include macroscopic and radiographic analysis of the maturation and development phases of the bone and dental structures. Once the eruption of permanent dentition is complete, dental age can be predicted by observing the different physiological age-related changes in dental tissues, such as the deposition of secondary dentin. Cleft lip and palate patients have a greater predisposition to tooth malformation (in size, shape, and number), which could affect pulp volume. The aim of this study is to evaluate the dental pulp volume of central incisors in 3D images between individuals with and without cleft lip and palate.

MATERIALS AND METHODS

This retrospective case-control study is a single-centred and conducted in accordance with the Declaration of Helsinki. The study sample is based on the existing records of patients who are followed in Institute of Orthodontics of Faculty of Medicine of University of Coimbra, selected between January 2016 to January 2022. The 3D data was imported by a 3D image semi-automatic segmenting software named ITK-SNAP, to calculate the tooth pulp volume.
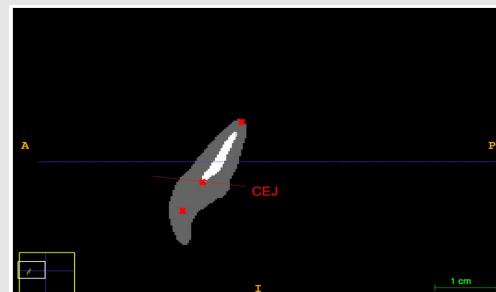

Figure 1. Pulp volume measurement using the ITK_SNAP software. X red: endpoints of the measurements; Red line: Cement-enamel junction

RESULTS

The present study showed statistically significant differences when comparing the pulp volume between sex, showing a higher pulp volume in male individuals. Regarding age, no statistically significant differences were found, contrary to what was expected. In the cleft group, when comparing the pulp volume between the cleft side and the non-cleft side, the cleft side showed a smaller volume.

	Control (47)	CLP (47)	p
Sex (M/F)	31/16 (66.0%/34.0%)	31/16 (66.0%/34.0%)	1.000$^£$
Age	16.1; 16 (3.6) 13.0/19.0	14.8; 14 (3.5) 12.0/17.0	0.065§
Median volume (mm³)	27.0; 26 (11.0) 19.5/33.2	28.2; 27 (12.8) 18.9/33.8	0.757§

Table 1. Control and CLP group for sex and age and the medium dental pulp volume value in both sexes

	Volume (mm³)
Tooth 11 (47)	27.1; 25 (10.7) 20.2/33.6
Tooth 21 (47)	25.4; 11 (20.2) 33.6/26.9
p	0.664§

Table 2. The dental pulp volume in the control group for both upper central incisors

	Volume (mm³)
Non cleft side teeth (47)	30.4; 28 (12.9) 21.3/38.5
Cleft side teeth (47)	28.0; 13 (21.3) 38.5/26.0
p	<0.001$^£$

Table 3. The dental pulp volume for the study group for the cleft side and non cleft side
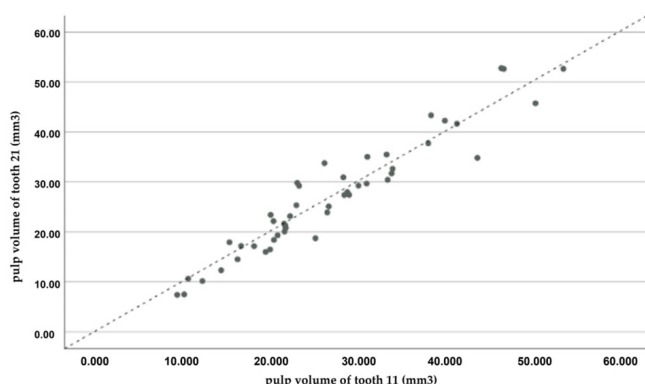

Figure 2. Comparison of the values for the pulp volume of the upper central incisors
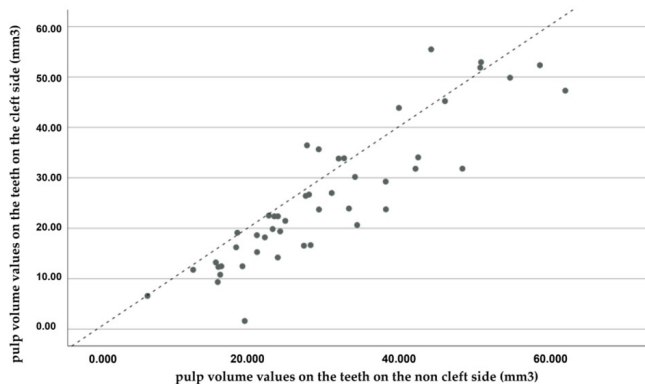

Figure 3. Comparison of the pulp volume values on the teeth on the cleft side and the non-cleft side

CONCLUSION

The study of the 3D pulp volume can be a useful method for human identification in patients with cleft lip and palate.

REFERENCES