IJAE
Vol. 118, n. 2 (Supplement): 187, 2013
ITALIAN JOURNAL OF ANATOMY AND EMBRYOLOGY

Registration of dental arch models in 3D facial volumes: an alternative to CBCT acquisitions

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Digital 3D models of dental arches and facial soft tissues may constitute an important support for clinicians and maxillofacial surgeons. They can be obtained using a noninvasive and harmless method[1] starting from acquisitions made with a dental scanner and a stereophotogrammetric device. The aim of the study was to compare measures taken on the 3D dental and facial models with the ones obtained through a Cone Beam Computed Tomography (CBCT) device in order to evaluate the reliability of the proposed method and its repeatability. Dental and facial data about a population of seven healthy subjects just undergone CBCT have been acquired and registered twice by three operators following a protocol devised for previous works published by this same laboratory[2,3]. Five craniofacial and six dental landmarks have been taken into account and their linear distances have been calculated. The errors between the corresponding distances in the alternative method and in the CBCT volume have been normalized on the corresponding distance measured on the CBCT model. Statistically significant differences between repetitions and operators were found in the distances between the orbitalis and dental landmarks. We assume that these differences might have been caused by the difficulty in the positioning of the craniofacial soft-tissue landmarks on the CBCT scans. Also the delicate steps for registering the models of the dental arches could have generated errors as it has been suggested by the significant difference between experienced and inexperienced operators. It is advisable to continue the study on more patients in order to obtain a larger data set. It might also be good to consider soft tissue landmarks that are closer to the respective bone tissue ones.

References

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Key words
Digital anthropometry, dental arches, registration, CBCT, face.