

Abstract

The human face is not perfectly symmetrical, slight asymmetries commonly occur in every individual across all populations. The aim of the work was to monitor the asymmetry on the entire surface of the soft and hard tissues of the heads of individuals with respect to age and sexual dimorphism. The follow-up goal was then to evaluate the difference in asymmetry between the tissues. The material for the work was a transverse set of CT images of the adult Czech population in the age range of 21–84 years. Individuals were divided according to gender into 50 men and 48 women and according to age into groups up to 39 years, 40–59 years and over 60 years. Geometric morphometry methods (CPD – DCA, asymmetry analysis, per vertex T-test, superprojection methods) were used for data analysis. The results were visualized using color maps and significance maps that show asymmetry and statistical significance. The variability of the file was analyzed by principal component analysis.

The results of the evaluation of hard tissues showed a right protrusion on the anterior and lateral surfaces of the skull, in both men and women at all age intervals. This asymmetry was statistically very significant, in contrast to the posterior region, which was evaluated protrusion on the left side and had lower p-value. On the soft tissues surfaces, the asymmetry was also found in terms of location, the same in men and women. In contrast to the skulls, the protrusion of the right side was found only on the nose and forehead posterior to the top. The rest of the soft tissue surface was protrusive on the left side. Sexual dimorphism was very low and statistically insignificant; only small local areas in soft tissues were found to be significant on significance maps. With increasing age, the asymmetry was evaluated as decreasing, but this result is debatable due to the transversal nature of the work. From a comparison of the results of both types of tissues, it was possible to see that in areas with a smaller depth of soft tissues, the asymmetry of both surfaces is consistent, and the laterality corresponds to each other. However, in areas with greater depth of soft tissues, the asymmetry of both surfaces is inconsistent. From the obtained results it was possible to accept the possible existence of a compensatory mechanism, where one type of tissue tries to balance the asymmetry of the other by having the area more or less prominent.

Keywords: Asymmetry, soft tissues, hard tissues, geometric morphometry, computed tomography