

## **Abstract**

Different tracing techniques of the subperiosteal and endosteal contours (manual, automatic, semi-automatic) or their combinations taken along femoral length in adult individuals can produce different values of cross-sectional geometric (CSG) parameters. Various tracing techniques are widely used in CSG studies of non-adult individuals as well, however, the accuracy of CSG parameters estimated along femoral diaphysis is not yet known for non-adult individuals. In this study, we investigate whether the manual tracing of the subperiosteal and endosteal contours taken at 80% of the femoral diaphyseal length in non-adult individuals can be replaced by another type of tracing in relation to CSG parameters estimation. We examine the effect of anatomical localization on accuracy of the CSG parameters estimated in non-adult individuals femora.

We digitized the subperiosteal and endosteal contours in the micro-CT scans from femoral diaphyseal cross-sections in Early Medieval sample of non-adult individuals (N = 46). The digitization and computation of CSG parameters were made in Fiji software with EPJMacro implementation. The assessment of estimates' accuracy was expressed by percentage prediction error (%PE) and limits of agreement. Five percent of CSG parameter obtained from manually traced contours was used as acceptable error. Differences in %PEs of CSG parameters estimates in cross-sections at 50% and 80% of femoral diaphyseal length were assessed using Wilcoxon test.

The highest accuracy of CSG parameters estimation is observed in combination with automatically traced subperiosteal contours and manually traced endosteal contours in cross-section at 80% of femoral diaphyseal length in non-adult individuals. Thus, we can increase the effectiveness of obtaining CSG parameters in non-adult individuals. All CSG parameters except the medullary area are estimated with lower accuracy in the cross-section at 80% than in the cross-section at 50% of femoral diaphyseal length in non-adult individuals.

### **Key words:**

non-adult individuals, femur, CSG parameters, anatomical localization, micro-CT, EPJMacro