

Abstract

Introduction: The morphological variability of human dentition constitutes an important source of information about biological affinity in evolution and in modern human populations, development of an individual or his health. The variability of upper permanent molars is analyzed consistently with current theoretical model of tooth morphogenesis. The variability of molars is studied here through metameric variation and sexual dimorphism. Most of the morphological variates is placed on the occlusal area of the tooth crown, what makes this area very complex. It is difficult to find suitable method of analysis for this complexity. We expect geometric morphometrics and dental topography to deal with this complexity.

Material and Methods: We have analyzed dental casts of 160 individuals (F = 74, M = 86), of which we have studied 607 teeth. The morphology of teeth was analyzed in virtual space with the procedures of geometric morphometrics and dental topographical analysis. We have analyzed the variability of occlusal tooth area with landmarks in 2D and 3D space. In the dental topographic analysis we used the RFI and OPCR variables.

Results: 2D-GMA and 3D-GMA results were different. 2D-GMA variables were not sexually dimorphic, the only exception was the upper first molar. 3D-GMA variables were all sexually dimorphic. Results of the dental topographic analysis showed that the RFI variable is not sensitive to morphological variability of the occlusal area of a tooth, contrary to the OPCR variable.

Conclusion: This study was focused on the comparison of different methodological approaches to the analysis of upper molars morphology. We have analyzed the morphology of upper molars in our sample, especially the meristic variability and sexual dimorphism. The interpretation of our results was made consistently with morphogenetic models and also the possibility of sexually dimorphic sensitivity to environmental stress.

Keywords: tooth morphology, upper molars, odontogenesis, dental topography, geometric morphometrics