



Analysis of permanent first molar crown dimensions in digital study models: cross-sectional study

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ABSTRACT

Introduction: The use of digital models obtained through intraoral scanners has been transforming dental morphometric analysis, providing fast, reliable, and non-invasive measurements.

Objectives: To assess the mesiodistal, buccolingual/palatal dimensions and crown height of permanent first molars in a group of children aged 7 to 13 years, using images obtained from intraoral scanners (iTero). To analyze whether there are significant differences in these measurements based on variables such as sexual dimorphism, right-left asymmetry within the dental arch, and differences between the maxillary and mandibular arches.

Methodology: A cross-sectional study was conducted using STL files obtained from intraoral scans of a convenience sample of 100 Portuguese children aged 7–13 years. Only erupted permanent first molars without restorations and developmental defects were included. The mesiodistal and buccolingual/palatal dimensions, as well as crown height, were measured on three-dimensional digital models using 3D Builder software. Statistical analyses were performed using SPSS software. All measurements were performed by a single examiner and independently verified by a second examiner.

Results: Significant sexual dimorphism was observed, with boys presenting significantly larger crown dimensions than girls in six of the nine variables assessed ($p < 0.05$). Homologous permanent first molars showed a high degree of bilateral symmetry, with no significant differences within the same dental arch. In contrast, significant differences were observed between the maxillary and mandibular arches for most crown dimensions ($p < 0.05$). Positive correlations of weak-to-moderate strength were identified between selected crown measurements. Most crown dimensions differed significantly between the two age groups.

Conclusion: This study contributes to a deeper understanding of the dimensions of permanent first molars in the pediatric population, highlighting relevant differences across sex, dental arches, and age groups, thereby supporting the optimization of clinical practice.

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