

STANDARDIZED LANDMARK-BASED METHODOLOGY FOR MAXILLARY ANALYSIS IN PATIENTS WITH CLEFT CONDITIONS

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Background: Craniofacial development in early ontogenesis is characterized by considerable morphological variability. Cleft conditions represent altered developmental pathways of palatal structures and provide a unique model for studying variation in craniofacial morphology beyond typical development. Modern digital approaches using 3D scanning and specialized software enable detailed evaluation of these structural differences.

Objective: The aim of this study was to assess morphological variability of the isolated cleft palate in infants using a standardized landmark-based morphometric methodology and to evaluate whether this approach is feasible and reliable for clinical and research use.

Subjects and methods: The study included 72 children aged 8–18 months with isolated cleft palate treated at University Hospital Brno. Morphometric analysis was performed using CleftMeter and standardized Seckel landmarks (I, C, Q, T). All measurements were independently obtained by three evaluators, and inter-rater reliability was assessed for the Q–Q', T–T', and C–C' palatal widths.

Results: Inter-rater reliability was evaluated using the Intraclass Correlation Coefficient (ICC) for each dimension separately. A two-way random-effects model with absolute agreement was applied (ICC(2,1)). All dimensions showed excellent agreement: T–T' (ICC=0.97), C–C' (ICC=0.95), and Q–Q' (ICC=0.96), with near-perfect reliability for averaged ratings (ICC=0.98–0.99).

Conclusions: This study demonstrates that a standardized landmark-based morphometric approach using CleftMeter is both feasible and highly reliable for the assessment of isolated cleft palate in infants. Excellent inter-rater agreement across all evaluated parameters confirms the robustness and reproducibility of the proposed methodology.

Keywords: Craniofacial variability; Palatal morphology; Seckel landmarks.

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