Assessment of facial asymmetry using stereophotogrammetry

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Asymmetry in the dimensions and spatial position of facial structures is a common finding in healthy individuals and in esthetically pleasing faces (1). Additionally, a variety of craniofacial anomalies are characterized by severe hard- and soft-tissue asymmetry (2). Facial asymmetry can impair the affected people from both aesthetical and functional points of view. Currently, facial asymmetry is mainly evaluated using the entire facial surface, thus providing measurements that give only general information about facial morphology. In contrast, several pathologies affecting facial appearance are localized in selected parts of the face, and a local assessment can provide helpful information for clinical decisions. For these reasons a detailed, focused and objective evaluation of facial asymmetry is advised, both for surgical planning and treatment evaluation. In this study we present a new quantitative method to assess symmetry in different facial thirds, objectively defined on the territories of distribution of trigeminal branches. Forty healthy young adults (21 women; 19 men; average age 39 ± 12 years) were acquired with a stereophotogrammetric system and the level of asymmetry of their hemi-facial thirds was evaluated, comparing the root mean square of the distances (RMSD) between their original and mirrored facial surfaces. The method resulted highly reproducible (Bland and Altman coefficient of reproducibility for area selection, 98.8%). In the upper facial third, median asymmetry was 0.726 mm (IQ range: 0.579-0.954 mm); in the middle facial third, median asymmetry was 0.739 mm (IQ range: 0.558-0.887 mm); in the lower facial third, median asymmetry was 0.679 mm (IQ range: 0.552-0.907 mm). No significant differences in RMSD values among the facial thirds were found (ANOVA, $p>0.05$). The presented method provides an accurate, reproducible and local facial symmetry analysis, that can be used for different conditions, especially when only part of the face is asymmetric.

References

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Keywords

Facial asymmetry; photogrammetry; 3D.