Three-dimensional assessment of patients with facial palsy: thirds-based evaluation of the success of reanimation procedures

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The effects of facial palsy can severely compromise aesthetic and functional characteristics of face, that may be ameliorated by facial reanimation procedures providing new neural stimuli and/or muscle grafts (1,2). However, there is no consensus about an objective and quantitative method for assessing the success of surgical procedures in different parts of face. This study aims at testing a method for the 3D assessment of mimicry in different facial thirds of patients treated through facial reanimation. Twelve patients aged between 42 and 77 years affected by recent facial palsy (onset between 6 and 18 months) were treated through triple innervation procedure (masseteric nerve, 30% of the hypoglossal fibers, and contralateral facial nerve through two cross-face sural nerve grafts). Each patient underwent five facial 3D scans: at rest, smiling on the healthy side (facial stimulus), biting (masseteric stimulus), moving the tongue (hypoglossal stimulus), and Mona-Lisa smile. Each scan was registered onto the scan in rest position, and the point-to-point root mean square (RMS) value was automatically calculated on the upper, middle and lower facial thirds defined on the territories of trigeminal branches. An index of asymmetry was computed. Two-way ANOVA test was applied to verify statistically significant differences in RMS and asymmetry index according to the type of stimulus and facial thirds (p<0.05). On the rehabilitated hemiface, the widest facial movements were performed by the masseteric and hypoglossal stimuli in the upper third of face, and by the hypoglossal one in the middle and lower thirds (p<0.05), whereas no statistically significant differences were observed on the healthy side (p>0.05). Facial stimulus evoked the most asymmetrical movement, whereas the hypoglossal one produced the most symmetrical expression, for all the facial thirds. The 3D facial assessment may provide an important contribution for verifying the role of different stimuli in evoking facial movements in patients treated through reanimation procedures.

References

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Key words

3D-3D superimposition, facial palsy, facial reanimation, stereophotogrammetry.