

AI Assessment Of Dynamic Reanimation In Unilateral Facial Paralysis: Towards Automated Surgical Outcomes

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Background

Clinical assessment of facial paralysis severity remains technically challenging. The current gold standard requires in-person assessment by a qualified provider and remains subjective.

The aim of this study is to evaluate the utility of REF.AI.CE,™ a propriety software powered by artificial intelligence to evaluate improvements in dynamic facial movement in patients with facial paralysis.

Methods

6 females and 4 males undergoing 7 free gracillis transfers with cross facial nerve grafting (CFNG) or 3 babysitter procedures with or without CFNG were selected and videoed in a standard fashion pre and postoperatively.

Evaluation of full smile, eyelid closure, and brow excursion were tracked dynamically using standard fiducial markers.

Excursion distance was determined as the geometric difference of selected markers at minimum and maximum distances during movement. Contralateral non-paralyzed hemiface was used for reference scaling.

Functional movement before and after surgery were compared using paired student t-testing at a 95% confidence interval. Relevant continuous clinical variables are presented using Mean (SD).

Results

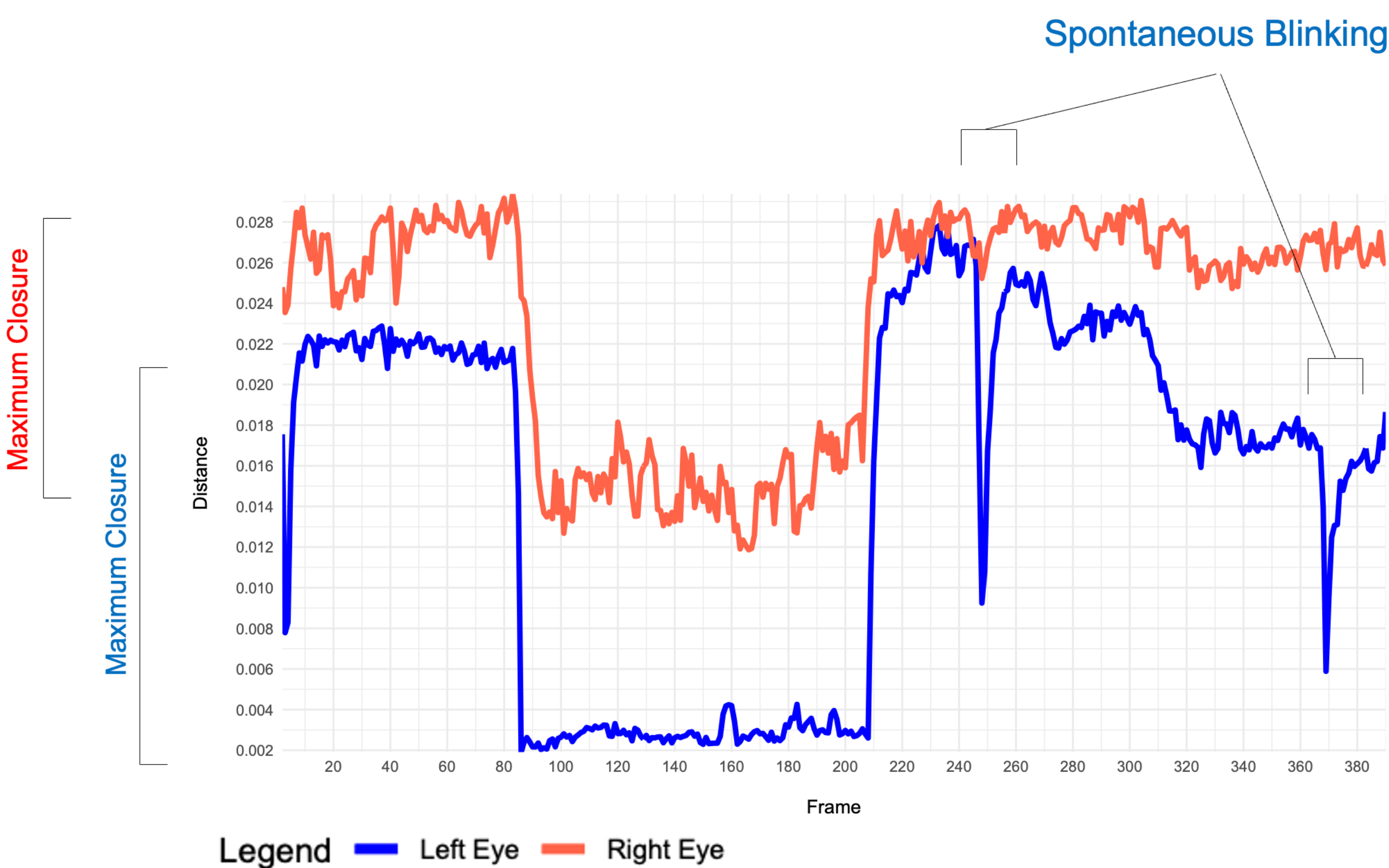


Figure 1. Example of partially paralyzed eye (Left) to functional eye (Right) movement through eyelid closure

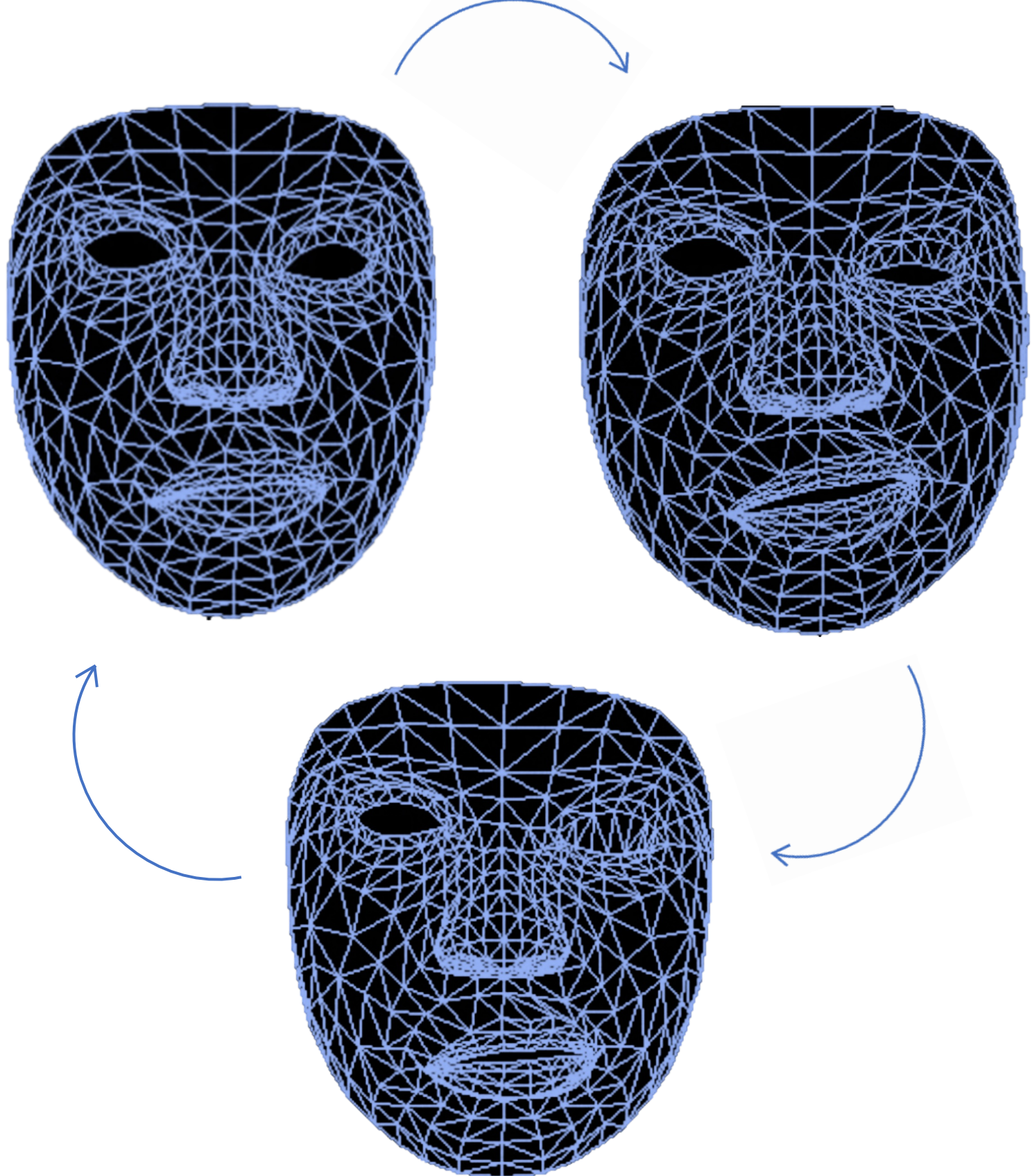


Figure 2. AI generated 3D mesh of face through movement cycle

Table 1: Preoperative and Postoperative Facial Motion Analysis

Clinical Exam	Preoperative Scaled Mean Units (SD)	Postoperative Scaled Mean Units (SD)	Paired T-Test (p- value)
Eyebrow Excursion During Elevation	0.56 (0.19)	0.68 (0.31)	0.286
Commissure Angle During Smile	0.77 (0.12)	0.99 (0.13)	0.0016
	Mean Distance (SD) [mm]	Mean Distance (SD) [mm]	
Minimum Palpebral Fissure Distance During Eyelid Closure	1.1 (0.53)	0.74 (0.46)	0.066

Take-Aways

- Patients were re-evaluated at an average of 40.50 (20.25-61.25) months following their index evaluation.
- Brow excursion demonstrated improvement in 70% of patients.
- Oral commissure opening angle during smiling improved in 90% of patients.
- The minimum palpebral fissure distance decreased in 80% of patients.

Discussion and Conclusions

REF.AI.CE can serve as an effective tool for assessing functional improvement after facial reanimation.

This initial pilot study is one of the first to demonstrate the utility of dynamical facial analysis using artificial intelligence for facial tracking.

Future investigations will focus on validating these finding in a larger cohort and evaluating other possible markers for tracking different targeted mimetic functions.

Acknowledgements

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