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ABSTRACT N. 006

TRANSLATIONAL DIGITAL DATA SCIENCE IN MOBILITY MEDICINE

INTRAMUSCULAR ELECTROSTIMULATION PARAMETERS OF DENERVATED FACIAL MUSCLES FOR A BIONIC SMILE

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Electrostimulation can be an interesting and effective alternative or additional option to conventional treatments for facial paralysis, helping to prevent atrophy of the facial muscles following denervation caused by various factors. The success of electrostimulation depends on correctly selecting the stimulation parameters applied. Our study aims to evaluate whether needle electrodes (mimicking implantable electrodes) can selectively activate the zygomaticus muscle (ZYG) in patients with facial paralysis. Ten patients were recruited. Two monopolar needle electrodes, placed under ultrasound guidance, were used to deliver bipolar electrostimulation to the affected ZYG. The stimulation was conducted under general anaesthesia in three patients and under local anaesthesia in four patients. Three patients underwent stimulation in both settings. Selectivity of stimulation was assessed by visually detecting movement of the respective mouth corner, in the

absence of contractions or co-contractions of other facial muscles or discomfort. A selective Zygomaticus response was observed in all patients with pulse widths between 0.5 and 5 ms and amplitudes between 1.5 and 2.5 mA when awake, and between 1.5 and 9 mA when under general anaesthesia. No adverse events or unspecific responses from other facial muscles were observed. The duration of facial paralysis did not significantly affect parameter selection. In conclusion, our initial results suggest that stimulation parameters compatible with implantable devices can elicit a specific response from the target muscle. Ultrasound-guided electrode placement ensures the safety of the procedure. If implanted into the ZYG, a fully implantable electrostimulation device should be able to increase muscle tone and trigger a contraction, enabling a bionic smile.

Keywords: electrostimulation, bionic smile, rehabilitation, muscle atrophy