Quantitative Evaluation of Isolated Buccal and Marginal Facial Nerve Branch Transections in the Rat Model: The Importance of Both Branches in Whisking Function

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Introduction

The whisker pad musculature in rats is innervated by the buccal and marginal mandibular branches of the facial nerve. Electrophysiologic recordings have proven that overlap between the buccal and mandibular branches exists (Mattox and Felix, 1987). In addition, transection studies have shown that both the buccal branch and the marginal mandibular branch must be transected to block vibrissal movement (Semba and Egger, 1986). Our objective in this small study was to quantitatively determine the individual importance of the buccal and the marginal mandibular nerves in rodent whisking, by examining the effect of isolated branch transections on whisking function.

Methods

The whisker pad musculature in rats is innervated by the buccal and marginal mandibular branches of the facial nerve. Electrophysiologic recordings have proven that overlap between the buccal and mandibular branches exists (Mattox and Felix, 1987). In addition, transection studies have shown that both the buccal branch and the marginal mandibular branch must be transected to block vibrissal movement (Semba and Egger, 1986). Our objective in this small study was to quantitatively determine the individual importance of the buccal and the marginal mandibular nerves in rodent whisking, by examining the effect of isolated branch transections on whisking function.

Results

Pre-operatively, the buccal branch group had an average amplitude of 79.5 (SD 3.50) and the marginal branch group had an average amplitude of 77.4 (SD 6.51). All animals demonstrated normal to near-normal whisking after isolated branch transection, according to amplitude, velocity, and acceleration parameters of whisk. The buccal transection group average whisk amplitude was 54.4 (SD 17.0) and the marginal branch group had an average whisk amplitude of 64.8 (SD 20.5). There was a statistically significant difference between pre-operative testing and after transection of the buccal branch transection group between pre-operative testing and after transection of the buccal and marginal branch transection group (p<.05, paired one tailed t-test).

After transection of both the buccal and the marginal mandibular branches whisking was eliminated in all animals. The buccal transection group had an average whisk amplitude of 1.56 (SD 3.13) and the marginal mandibular transection group had an average whisk amplitude of 2.46 (SD 2.86).

Facial Nerve Injury Patterns

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Analysis of whisking

Whisking was analyzed in an automated fashion using software adapted from Bermejo et al (1998, 2002). The right facial nerve was cut. The initial Injury was made at either approximately 5 mm distal from the main trunk along the buccal branch (Buccal group, top) or on the marginal branch (Marginal group, bottom). The second injury was made to the previously transected branch. The contralateral intact nerve served as a control in each rat.

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References