Recovery of Impaired Somatosensory Evoked Fields After Improvement of Tongue Sensory Deficits With Neurosurgical Reconstruction

Hitoshi Maezawa, DDS, PhD, Itaru Tojyo, DDS, PhD,† Kazuya Yoshida, DDS, PhD,‡ and Shigeyuki Fujita, DDS, PhD§*

Somatosensory evoked fields (SEFs) induced by tongue stimulation can be useful as an objective parameter to assess sensory disturbances in the tongue. However, whether tongue SEFs can be useful as a clinical, objective follow-up assessment method of tongue sensation after oral surgery is unknown. We describe 2 cases in which tongue SEFs were successfully used in clinical assessment. Two patients with unilateral tongue sensory deficits caused by lingual nerve injury during lower third molar extraction were recruited. Both patients underwent surgery to repair the damaged nerve, and all tongue sensory evaluations were performed once before and once after surgery. SEFs were recorded by stimulating the affected and unaffected sides of the tongue separately, and cortical activity was evaluated over the contralateral hemisphere. The unilaterality of the deficit also was assessed. In both patients, stimulation of the unaffected side evoked reproducible cortical responses before and after surgery. Both patients also recovered some sensation after surgery, given that presurgery stimulation of the affected side failed to evoke cortical activity whereas postsurgery stimulation evoked cortical activity on both sides. Sensation was initially highly lateralized in both patients but was restored to approximately normal in the postsurgery evaluation. Finally, both patients rated their subjective tongue sensations on the affected side over 50% better after the surgical intervention. These cases indicate that tongue SEFs may have a clinical use as an objective parameter for assessing the course of tongue sensory recovery.

J Oral Maxillofac Surg 74:1473-1482, 2016

Sensory disturbance of the tongue caused by lingual nerve injury can sometimes lead to speech and eating difficulties and can substantially affect the patient's quality of life. Several recent articles have reported that surgical procedures for the impaired lingual nerve, such as microneurosurgical reconstruction, are useful for recovering sensation and reducing the sensory disturbance.[1-8] In clinical situations, several sensibility tests, such as the 2-point discrimination (TPD) test, are often used to assess the course of symptomatic sensory recovery of the tongue. However, the reproducibility of these tests is not high because they depend on subjective self-assessments. Therefore assessment methods that are objective, more reliable, and reproducible are required for following the sensory recovery of the tongue.[9,10]

Recently, we showed that the evoked cortical response after tongue stimulation as measured by

*Assistant Professor, Department of Oral Physiology, Graduate School of Dental Medicine, Hokkaido University, Sapporo, Japan, and Human Brain Research Center, Graduate School of Medicine, Kyoto University, Kyoto, Japan.

†Lecture, Department of Oral and Maxillofacial Surgery, School of Medicine, Wakayama Medical University, Wakayama, Japan.

‡Department Chief, Department of Oral and Maxillofacial Surgery, National Hospital Organization, Kyoto Medical Center, Kyoto, Japan.

§Professor, Department of Oral and Maxillofacial Surgery, School of Medicine, Wakayama Medical University, Wakayama, Japan.

Supported by Grants-in-Aid for Young Scientists, (B)25862071 (H.M.), from the Japan Society for the Promotion of Science.

Address correspondence and reprint requests to Dr Maezawa: Department of Oral Physiology, Graduate School of Dental Medicine, Hokkaido University, Kita-ku, Sapporo, Hokkaido 060-8586, Japan; e-mail: maezawa@den.hokudai.ac.jp

Received October 2 2015
Accepted January 5 2016

0278-2391/16/00026-4
http://dx.doi.org/10.1016/j.joms.2016.01.011

magnetoencephalography (MEG) can serve as an objective parameter for detecting sensory disturbances of the tongue caused by unilateral lingual nerve damage.[11,12] In these studies, we found high intraindividual similarity of somatosensory evoked field (SEF) waveforms between the right and left sides of the tongue, which suggested that the unaffected (control) side of the tongue could serve as a reference for the affected (damaged) side in patients with unilateral lingual nerve injury. To evaluate cortical activity, we used the activated root-mean-square (aRMS) parameter (details are presented in the Data Analysis section), which uses the time average of the 18-channel root-mean-square (RMS) obtained from tongue SEFs. We successfully estimated the unilateral sensory disturbance of the tongue in each patient using a laterality index derived from the aRMS. However, it is not known whether the objective assessment of tongue sensory disturbance using MEG can be useful as a follow-up assessment method in the clinical course of tongue sensory recovery.

We report 2 cases in which we successfully evaluated sensory recovery in the tongue by measuring tongue SEFs both before and after sensory recovery related to oral surgical intervention. A portion of this study has been reported previously.[11]

Case Reports

We recruited 2 right-handed patients (1 man and 1 woman, both aged 21 years) with sensory disturbance of the tongue (Table 1). Both of the patients met the following 5 criteria: *1)* The sensory defect was caused by unilateral lingual nerve injury during third molar extraction; *2)* the initial rating of the subjective sensation of the affected area was less than half of that of the unaffected area; *3)* the TPD of the affected area exceeded 5 mm; *4)* the rating of the subjective sensation recovered to greater than half after surgery (details of the surgical procedures are described later); and *5)* there was no pain sensation. The study was run in accordance with the Helsinki Declaration. Written informed consent was obtained from both participants, in accordance with the study protocol approved by the Ethics Committee, Kyoto University Graduate School of Medicine and Wakayama Medical University.

During the surgical intervention, the injured lingual nerve was exposed through an intraoral mucosal incision and lingual flap reflection performed by the same operator (S.F.). External neurolysis was performed in both patients. Optical magnifying glasses (250 mm) and an operating microscope (Superlux 301; Zeiss, Oberkochen, Germany) were available during surgery.

In the male patient (patient 1), almost all of the lingual nerve at the surgical site for the lower third

Table 1. PATIENT PROFILES

	Gender	Age, yr	Lesion Side	First Oral Surgery*	Second Oral Surgery†	Period 1,‡ mo	Period 2,§ mo	Period 3,‖ mo	Subjective Sensation¶ M1	Subjective Sensation¶ M2
Patient 1	Male	21	Right	Third molar extraction	Neurorrhaphy, removal of fractured tooth	5	3	6	3	7-8
Patient 2	Female	21	Left	Third molar extraction	Neurorrhaphy	6	19	7	2	5

Abbreviations: M1, first measurement; M2, second measurement.
* Surgery that caused lingual nerve injury.
† Second surgery for treatment of lingual nerve injury.
‡ Period between first oral surgery and initial signs of sensory recovery.
§ Period between first oral surgery and second oral surgery.
‖ Period between first magnetoencephalography measurement and second magnetoencephalography measurement.
¶ Tongue sensation on the affected side was assessed on a subjective scale from 0 to 10.

Maezawa et al. Recovery of Tongue Evoked Fields. J Oral Maxillofac Surg 2016.