

Leading Clinical Paper
Oral Surgery

Lingual nerve injury in third molar surgery

I. Observations on recovery of sensation with spontaneous healing

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Abstract. The aim of this study was to investigate the healing potential of damaged lingual nerves with some remaining function at least 3 months post injury. Forty-six patients were monitored at different time intervals after injury. A simple neurosensory examination included the perception of tactile, thermal stimuli and location of stimulus, as well as two-point discrimination, pain and the presence of a neuroma at the lesion site. Neurogenic signs and symptoms related to the injury and their variation over time were registered. Females were more often referred than males. Most lingual nerve injuries exhibited a significant potential for recovery, but only a few patients made a full recovery with absence of neurogenic symptoms. The recovery rate was highest during the first 6 months. Recovery was not influenced by gender, and only slightly by age. The presence of a neuroma was associated with a more severe injury. Patients should be monitored repeatedly for at least 3 months, and not operated on until neurosensory function no longer improves, and is less than what might be rendered by microsurgical repair. Through proper training and mastery of the surgical approach, every effort should be focused on sparing the lingual nerve, considering its proximity to the field of surgery.

Key words: lingual nerve; nerve injury; recovery; third molar surgery.

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The tongue is an important and sensitive anatomical structure that serves a range of vital functions. Unintended iatrogenic injury to the lingual nerve (LN) may happen during third molar surgery due to its

anatomical proximity, separated from the cortex of the third molar region only by the periosteum^{15,16}. Some LN injuries cause temporary sensory disturbances but a fraction of cases fail to resolve and result in

permanent neurosensory disability, loss of sensory function and neurogenic symptoms⁷.

The incidence of LN injury varies and depends on a number of factors: the

experience of the surgeon²¹, difficulty of the case, depth of impaction, presence of overhanging ramus bone, lingual flap elevation, and operating time¹⁴, surgical approach¹⁹ (lingual split bone technique) and the mere focus on registration and documentation of such injury^{1,20,26}.

Rates of temporary effects on the LN after third molar surgery have been reported in the surprisingly high order of magnitude of 15%, and permanent damage may occur in 0.3–0.6%^{3,4,14}. MASON¹⁴ demonstrated *anatomical factors* (depth of impaction, distal overhanging bone, state of eruption and angulation of tooth) and *surgical factors* (lingual flap elevation, bone removal, lingual plate splitting and operation time), all associated with a significantly increased incidence of disturbance of the LN.

Management of LN injury is a challenge to the oral and maxillofacial surgeon, and decision making in terms of therapeutic action, micro-neurosurgical repair versus wait and see, must be based on evidence-based criteria⁶. These include considerations related to the outcome of neurosensory examination and timing, since an injured nerve may recover with some regained function within a certain time limit.

The aims of the present study were to:

- demonstrate the potential for spontaneous neurosensory recovery in patients that exhibited some nerve function within the first 3 months after the injury or later;
- describe neurosensory malfunctions associated with the injury and their change over time;
- investigate the possible influence of age, gender and the presence of a neuroma on neurosensory recovery.

Patients and methods

Patients with LN injury meeting the criteria given below were drawn from a database of 449 injuries to oral branches of the trigeminal nerve collected consecutively during the period 1987–2005. Of these, 261 were lingual nerve injuries of various etiologies¹⁰.

Criterion for inclusion: patients with iatrogenic injury to the LN nerve caused by third molar surgery and with some remaining sensory function at 3 months after injury or later, depending on time of referral. Patients seen less than 12 months after the injury were offered one or more re-examinations. Only patients with a course of follow up were included, $n = 46$. Criterion for exclusion: neurological disease,

known alcoholism, patients with bilateral injuries and patients who had received reconstructive micro-neurosurgery.

Follow-up examinations were intended at 3, 6 and 12 months post injury or later. The course of follow up was on average 7.4 months (SD = 4.0, range 2–17 months).

Neurosensory evaluation

Patient records included date and mode of injury, an interview addressing the patients' subjective assessment of reduced sensory function of the injured LN, and neurogenic malfunctions (paraesthesia, etc.). A simple neurosensory examination was carried out as described previously^{11,12}. Details of the examination protocol have been presented in a recent article¹⁰. Follow-up examinations were performed with the examiner blinded to the results of preceding examination(s).

Tactile perception of the following stimuli was assessed: (1) feather light touch (by extruded filaments of a cotton stick), (2) pin prick (point of dental probe), (3) point/dull discrimination (point of dental probe versus blunt touch with the tip of the probe handle), (4) warmth (touch of blunt instrument heated to 45–50 °C), (5) cold (touch of blunt instrument cooled to 0–20 °C), (6) point location (touch of blunt instrument), (7) brush stroke direction (blunt instrument moved over area to be examined). The perception of stimuli 1–7 was rated according to a simple scale ranging from 0 to 3: 0 = no perception of touch, 1 = perception of touch with no ability to differentiate (pointed/blunt, warm/cold, localization of touch, direction of moving touch), 2 = perception with ability to differentiate less clear than normal, and 3 = normal perception^{10,12}. The level of overall neurosensory function was characterized through the sum of perception ratings (1–7) that might range from 0 to 21: sum score 0 signifying a total loss of nerve conductivity and sum score 21 denoting normal neurosensory function of the nerve in question.

Two-point discrimination thresholds (2PD) were set to 5, 10, 15, 20 mm (8). Pain perception on pinching with a tissue forceps was rated as present or absent (9). An unpleasant, irradiating sensation in the injured side of the tongue, evoked by digital pressure to the region of suspected injury at the medial aspect of the mandibular ramus, was interpreted as being caused by a traumatic neuroma. The pattern and distribution of fungiform papillae were assessed with the uninjured side as control.

Patients with impaired LN function were informed on the potential of improvement of perception rendered by 'sensory re-education'. They were urged to practice targeted exercises in order to obtain a central adaptation to a changed pattern of afferent neurosensory input²², thus utilizing the plasticity of the central nervous system.

Nerve injuries causing signs and symptoms, reduced function or neurogenic malfunction more than 12 months after the injury were considered permanent.

Statistics

Differences between categorical scores were tested with a 'sign test'. When appropriate, variables were described through mean, standard deviation (SD), range or median values. Chi-square or Kruskal–Wallis tests were applied to test differences between distributions. Level of significance: 5%. The software used were the EPI6 program for DOS and SPSS for Windows version 13, and graphics were produced with the help of the SPSS and Microsoft Office program packages.

Results

Demography

A significant over-representation of referred female patients was found, F/M ratio among the 46 patients being 33/13 (72%/28%), $P < 0.001$. The patients' mean age at time of initial examination was 29 years (SD = 8.9, range 15–53 years) with no difference between gender or side of nerve injury.

The average time course from injury to initial examination was 4.5 months (range 0–10 months). Median time between injury and final examination was 12 months (range 3–24 months). The course of healing from initial to final follow-up examination was monitored in all 46 patients. Of these, 19 patients were also examined between the initial and final examinations.

Subjective signs and symptoms

The patients' subjective rating of sensory function in the injured side of the tongue at the initial examination was classified as anaesthesia ($n = 9$), hypoaesthesia ($n = 36$) and subjective normal sensory function in spite of objective deficit ($n = 1$). At the final examination the ratings were anaesthesia ($n = 1$), hypoaesthesia ($n = 25$) and normal sensation ($n = 14$). Data for comparison were missing in six patients.

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