Int. J. Oral Maxillofac. Surg. 2013; 42: 823–829
http://dx.doi.org/10.1016/j.ijom.2013.03.020, available online at http://www.sciencedirect.com

International Journal of Oral & Maxillofacial Surgery

Clinical Paper
Orthognathic Surgery

Self-reported hypoesthesia of the lower lip after sagittal split osteotomy

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C. Politis, Y. Sun, I. Lambrichts, J. O. Agbaje: Self-reported hypoesthesia of the lower lip after sagittal split osteotomy. Int. J. Oral Maxillofac. Surg. 2013; 42: 823–829.

Abstract. Sagittal split osteotomy may result in sensory impairment of the inferior alveolar nerve; altered sensation in the lower lip varies from patient to patient. We evaluated individual and intraoperative risk factors of sagittal split osteotomy and correlated these findings with self-reported postoperative changes in lower-lip sensation. Follow-up data for 163 consecutive patients who underwent a bilateral sagittal split osteotomy were assessed for self-reported sensibility disturbances in the lower lip at the last follow-up visit. These self-reports were categorized as normal, hypoesthesia, hyperesthesia, or slightly diminished sensation in the central area of the chin. The overall rate of self-reported changed sensibility was 15.1% (49/324; 13.0% on the right side and 17.3% on the left side). Of 16 patients (9.9%) who experienced hypoesthesia on the right side and 25 patients (15.4%) who experienced hypoesthesia on the left side, 10 experienced bilateral hypoesthesia (31 patients total, 19.1%). Genioplasty and age at surgery were significant predictors of hypoesthesia; a 1-year increase in age at surgery increased the odds of hyposensitivity by 5%, and the odds of hypoesthesia in patients with concurrent genioplasty were 4.5 times higher than in patients without genioplasty. Detachment of the nerve at the left side, but not at the right side, was significantly correlated with hypoesthesia.

Key words: hypoesthesia; sagittal split osteotomy; sensory impairment; inferior alveolar nerve; trigeminal nerve; mandible.

Accepted for publication 26 March 2013
Available online 30 April 2013

A drawback of the sagittal split osteotomy (SSO) is possible sensory impairment of the inferior alveolar nerve (IAN). The patient usually reports varying degrees of numbness in the lower lip and chin, which occurs in 9–85% of the operated sides.[1] The impact of altered sensation in the lower lip after SSO varies from patient to patient, but altered sensation significantly impacts everyday life in the majority of affected patients.[2]

The wide variation in the incidence of IAN disturbance is due to the large variability in nerve function assessments and follow-up periods from study to study.[3,4] Additionally, the lack of uniform terminology for neurosensory disturbances as expressed by patients renders the categorization of patient complaints difficult.[5] The use of sensory terms is not standardized, and many cultural and medical traditions assign different meanings to similar words.[6]

Since IAN injury is a well-known and undesired complication of bilateral SSO (BSSO), refining known surgical techniques is important. One approach to this problem is to investigate risk factors that can introduce changes in technique. The aim of this study was to evaluate individual and intraoperative risk factors of SSO and to correlate these findings with self-reported postoperative changes in lower-lip sensation.

Materials and methods

Patients

As part of a nerve-detachment study,[9] data from follow-up appointments of 163 consecutive patients who underwent BSSO were collected from patient charts. Appointments were only included if the charts contained a written report. Patients who had finished their postoperative orthodontic treatment by the 6-month appointment, experienced fully normalized sensation in the lower lips, and were complaint-free were exempted from additional follow-up but remained included in this study.

The primary outcome measure was the presence of a self-reported sensibility disturbance in the lower lip at the last follow-up visit. Self-reports were categorized by the assessor as normal, hypoesthesia, hyperesthesia, or slightly diminished sensation in the central area of the chin. The hypoesthesia group included data only on the presence or absence of a neurosensory disturbance, not its severity. Patients with positive sensory phenomena such as paresthesia, dysesthesia, and pain were categorized as 'hyperesthesia', while patients with negative sensory phenomena were classified as 'hypoesthesia'.[6] No patient who reported any altered sensation in the lower lip was categorized as 'normal'. Since no patient presented with complete numbness, no 'anesthesia' category was created.

Surgery

All procedures were performed by the same surgeon, using the same approach. The surgeon's experience extended to more than 1000 BSSO procedures. The BSSO surgical technique has been described in detail in previous publications.[7,8]

First, a horizontal bone cut was made with a Hall burr, aiming at the mandibular foramen. Protection of the soft tissues at the ascending ramus was ensured by the use of a Dumbach retractor. Next, with the same Hall burr, the osteotomy line was extended to the body of the mandible, vestibular to the first molar. There the vertical bone cut was made, again with the Hall burr. The drilling of the lower border occurred in a closed mouth position with an Obwegeser retractor and a fine suction device with a bright light at the tip in place. An excellent view was ensured during drilling.

The buccal osteotomy of the sagittal split osteotomy was started at the lower border and included part of the lingual cortex. Drilling was stopped as soon as bleeding points were observed during the cut of the lower border. Next, the vertical part of the mandibular body osteotomy was made, connecting the lower border cut to the buccal osteotomy of the mandibular body. The second stage of the split was done using unsharp wedge osteotomes. If the neurovascular bundle remained attached to the proximal segment of the mandible during the continuation of the split, the split was stopped and the bundle carefully dissected from the proximal segment, either using blunt instruments (freer, nerve hook) or surgically using an osteotome, a drill, or a piezo ultrasonic device (Mectron s.p.a, Bois d'Amont, France). A freer or a nerve hook-type instrument was used whenever the nerve was not entirely surrounded by bone. Whenever the nerve seemed entirely surrounded by bone, the surgeon had the option to chisel, drill, or use the piezosurgical unit to remove the bony resistance, followed by a freer or a nerve hook-like instrument to further liberate the nerve from its canal.

Data collection

The following information was recorded: patient age, gender, type of detachment, type of movement, and inclusion of genioplasty during the surgical operation. Horizontal and vertical distances from the IAN canal (referred to here as the mandibular canal (MC)) to the inner border (buccal plate) and inner lower border were measured, in cross-section, automatically on the EIZO monitor (Eizo Nanao Corporation, Shikawa, Japan) using the Sidexis XG 2.53 software package (Sidexis, Sirona, Germany) for the cone beam computed tomography (CBCT) scanning system (Fig. 1). The distances were measured at the mesial side of the first molar (M1) and the distal side of the second molar (M2; Fig. 2). The measurement conditions have been described in detail by Agbaje et al.[9]

The type of detachment refers to the surgical technique used to detach the nerve from the proximal segment of the mandible when necessary. The type of detachment was recorded as 0 if the nerve was free, 1 if the procedure was nonsurgical (freer), and 2 if a piezo-surgical intervention was required.

Statistical analysis

All statistical analyses were performed using SAS 9.2 statistical software (SAS Institute Inc., Cary, NC, USA). Continuous

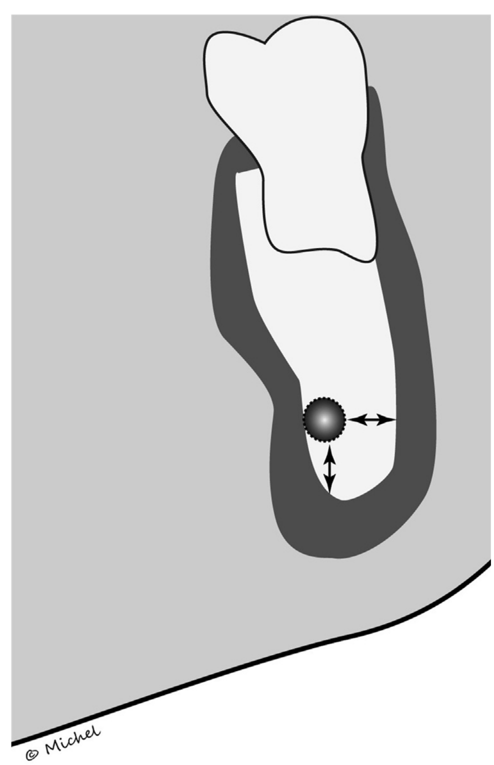

Fig. 1. Measurements from the border of the mandibular canal to the inner and outer borders of the buccal plate (horizontal measurement) and the lower border of the mandible (vertical measurement).