

On nerve function after Orthognathic Surgery

Ziad Barghash

Department of Oral and Maxillofacial Surgery

Institute of Odontology

The Sahlgrenska Academy at University of Gothenburg

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Avhandling för avläggande av doktorsexamen i Odontologi som med vederbörligt tillstånd av odontologi fakulteten vid Göteborgs universitet kommer att offentligen försvaras onsdagen den 29 November 2017, kl 13:00 Odontologen, Medicinargatan 12 A-G F-sal 3.

Fakultetsopponent: Anders Westermark, Kirurgkliniken Mariehamn, Mariehamn, Finland

This thesis consists of a summary and the following papers

- I. Br J Oral Maxillofac Surg. 2004 Apr; 42(2):105-11. Incidence of neurosensory disturbance after sagittal split osteotomy alone or combined with genioplasty. Al-Bishri A, Dahlberg G, Barghash Z, Rosenquist J, Sunzel B.
- II. Int J Oral Maxillofac Surg. 2005 May; 34(3):247-51. Neurosensory disturbance after sagittal split and intraoral vertical ramus osteotomy: as reported in questionnaires and patients' records. Al-Bishri A, Barghash Z, Rosenquist J, Sunzel B.
- III. Extraoral Vertical Ramus Osteotomy; a retrospective study on patient satisfaction. Barghash Z, Kahnberg KE, (to be submitted)
- IV. Int J Oral Maxillofac Surg. 2013 Dec; 42 (12):1566-74. Degeneration and regeneration of motor and sensory nerves: a stereological study of crush lesions in rat facial and mental nerves. Barghash Z, Larsen JO, Al-Bishri A, Kahnberg KE.
- V. Betamethasone effect on regeneration in the rat mental and facial nerves after crush lesion. Barghash Z; Larsen JO; Al-Bishri A; Kahnberg KE. (To be submitted)

ABSTRACT

Background

Orthognathic surgery is a surgical intervention to correct dentofacial anomalies. It is a complicated treatment that involves cooperation of different specialties. The success of orthognathic surgery is multifactorial with many elements to be taken into consideration. It is estimated that about 11 patients among every 100.000 Swedish citizens are in need of orthognathic surgeries. The most common surgical procedures for correction of mandibular deformities are the sagittal split osteotomy (SSO) and vertical ramus osteotomy (VRO), which is done either with an intraoral approach (IVRO) or an Extraoral approach (EVRO). Genioplasty is also often done, sometimes combined with other orthognathic surgeries. Despite the various modifications added to these operations to enhance their performance and results, nerve injury afterwards, especially after the SSO can occur. Neurosensory disturbance (NSD) following such trauma is still the main and most common drawback after these operations.

Objectives

This thesis is based on five studies. The aims of the first study were to investigate the incidence of sensory changes after SSO and whether it was different between osteotomy alone and osteotomy with genioplasty and to assess the impact of sensory disturbances on patients' satisfaction. The second study aims were to evaluate NSD after SSO and IVRO, asses the difference between questionnaire and patient's record in evaluating the NSD and to evaluate the discomfort caused by NSD. The aim of the third study was to assess the patients' satisfaction after EVRO and discomfort regarding sensory and motor nerve disturbances. The fourth and fifth study aimed to investigate in an experimental animal model the difference in degenerative and regenerative patterns between a sensory and a motor nerve (the Mental Nerve (MN) and the Buccal branch of Facial Nerve (BF) respectively) using an unbiased stereological technique and further to study the effect of Steroids on nerve de- and regeneration.

Material and Method

For the first 3 retrospective studies, questionnaires were sent to the patients. In addition, answers in the second study were checked against patients' records. Paper 4 and 5 were animal studies; MN and the BF were injured in 48 Wister rats, half of which were treated with steroids perioperatively. The injured nerves were then studied using an unbiased technique called 2D Stereology.

Results

No significant differences in NSD incidence were found between the patients who had osteotomy alone and those who also had genioplasty. Sensory disturbances are not a main determinant of patients' satisfaction. There was disagreement between patients' records and questionnaire in which symptoms of long lasting NSD were underestimated by the surgeon. Only 1% had permanent NSD following EVRO although resultant scar tissue was of concern to 30% of patients involved. The regenerative process is faster and/or more complete in the facial nerve (motor function) than it is in the mental nerve (sensory function). There were an increased number of regenerating axons after perioperative treatment with Betamethasone in both facial and mental nerves indicating that Betamethasone enhanced nerve regeneration in both motor and sensory nerves.

Keywords: Neurosensory disturbance, Orthognathic surgery, Nerve healing

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