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Original Research Article

Subjective analysis of sensitivity perception in patients submitted to orthognathic surgery

Camila Rockenbach Nascimento[1]
Maria Anita de Queiroz Arlant[1]
Katheleen Miranda dos Santos[1]
Bernardo Olsson[2]
Nelson Luis Barbosa Rebellato[2]
Delson João da Costa[2]
Paola Fernanda Cotait de Lucas Corso[1, 2]
Rafaela Scariot[1, 2]

Corresponding author:
Rafaela Scariot
Rua Prof. Pedro Viriato Parigot de Souza, n. 5300 – Campo Comprido
CEP 81280330 – Curitiba – PR – Brasil
E-mail: rafaela_scariot@yahoo.com.br

[1] School of Health Sciences, Department of Oral and Maxillofacial Surgery, Positivo University – Curitiba – PR – Brazil.
[2] Department of Stomatology, Department of Oral and Maxillofacial Surgery, Federal University of Paraná – Curitiba – PR – Brazil.

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Abstract

Introduction: Bilateral sagittal split osteotomy is the best-established orthognathic surgical technique for mandibular dentofacial deformities correction. Some technique-related complications may occur, being paresthesia the most common. **Objective:** To subjectively evaluate postoperative sensitivity of individuals who underwent orthognathic surgery. **Material and methods:** A two-part questionnaire was answered by thirty subjects in different post-operative periods: 48 hours (T1), 7 days (T2), 14 days (T3), 30 days (T4), 60 days (T5) and 90 days (T6). Significance level was set at 0.05. **Results:** In part one, the Nature of Altered Sensation evaluation was performed in chin and lips. There was an improvement from T1 to T6 in regarding locations of the altered sensation ($p < 0.001$), moments of the altered sensation ($p = 0.001$), and in pain or other unpleasant sensation ($p = 0.003$). Other variables regarding the Nature of the Altered Sensation did not show statistically significance difference over time ($p > 0.05$). Regarding part two, functional impairment, it was noted that there was an improvement in T6 in relation to all variables ($p < 0.05$). There is a decrease in pain, lip bites, burning sensation and drooling sensation ($p < 0.05$). Also, there was a decrease in the difficulty for oral care. **Conclusion:** There is an improvement in the Nature of Altered Sensation as well as functional impairment over time.

Introduction

Bilateral sagittal split osteotomy (BSSO) is best-established orthognathic surgical technique for mandibular dentofacial deformities correction [5]. It was developed by Shuchardt in 1942 [20], later modified by Trauner and Obwegeser in 1957 [22] and Dal Pont in 1961 [5]. Although there are other techniques for mandible osteotomy, BSSO has advantages such as the possibility of asymmetrical movements, intraoral approach with little or no external scar and possibility of mandible advancement or retraction [5, 16, 22].

Like every surgical procedure, mandibular corrections have complications such as bad split, infection, improper dislocation of the mandible head and sensorineural changes [12, 15, 24]. Regarding the latter, due to injury to the inferior alveolar nerve fibers, patients may experience tingling, shock and/or burning sensation, either paresthesia (when there is an abnormal sensation without stimulation) or dysesthesia (unpleasant sensation to non-harmful or unpleasant stimulus) [7]. Paresthesia and dysesthesia may be permanent or transient [7, 18]. About 32% of the patients remain with some sensitive alteration in lower lip region after 18 months period of the BSSO [23]. The main complaints of patients due to loss of sensation are taste deficiency, bites on the tongue, lips and difficulty to eat and talk [24].

Patient's age, dentist skills, range of motion, type of fixation and soft tissue detachment level are factors that are associated both with possible damage to the inferior alveolar nerve and the determination neurosensory change recovery [3, 23]. Few studies have assessed the patient's perception of these changes. Therefore, the objective of this study was to subjectively evaluate the postoperative sensitivity of patients who underwent orthognathic surgery.

Material and methods

This study was approved by the Research Ethics Committee of UFPR, under the number 38267714.5.0000.0102, and followed the Declaration of Helsinki. The subjects were asked to complete a two-part questionnaire for evaluation of the Nature of Altered Sensation and function impairment overtime [24]. The inclusion criteria were patients who were submitted to orthognathic surgery by the BSSO technique alone or in combination to Le Fort I osteotomy, with stable internal fixation by miniplates and 2.0 mm titanium screws. In addition, the subject should attend to all expected returns. Individuals who had some type of previous sensorineural alteration or performed BSSO associated with genioplasty were excluded. This study was designed as a prospective longitudinal study.

Data collection

An initial assessment was performed to determine if the patient met the inclusion and exclusion criteria. The research did not influence decision or surgery planning. Data such as gender and age were also collected.

Surgical technique

Patients underwent orthognathic surgery performed by the same team of surgeons. For every surgery, the protocol started with 5 ml infiltration of bupivacaine 0.5% with 1:200.000 epinephrine as an inferior alveolar nerve local anesthetic, used bilaterally. When maxilla was also operated, Le Fort I osteotomy was first performed. In the mandible, the incision was made in the mucosa of inferior first molar region, following to posterior, parallel to the external oblique line. Osteotomy cuts were continued from reciprocating saws, chiseling and separation of osteotomized segments. The proximal and distal segments were fixed with 2.0 mm monocortical plates and screws. The suture was performed with resorbable polyglactin thread.

The hospital stay was 24 hours after surgery, in which the patient received 1 g cefazolin every 8 hours, 10 mg dexamethasone every 24 hours, 100 mg ketoprofen every 12 hours and 1 g dipyrone every 6 hours. After hospital discharge, corticotherapy was discontinued and antibiotic, anti-inflammatory and analgesic medications were maintained for 7, 5 and 5 days, respectively.

Evaluation protocol

A two-part questionnaire based on Zuniga *et al.* studies was applied [24]. Part one refers to the Nature of Altered Sensation, while part two refers to Functional Impairment. The questionnaire was applied 5 times post-operatively by the same operator as follows: 48 hours (T1), 7 days (T2), 14 days (T3), 30 days (T4), 60 days (T5) and 90 days (T6).

Four major questions were answered in part one regarding (1) where the patient felt the altered sensation: lips, chin or both locations; (2) what

the patient was feeling: anesthetized sensation or tingling and itching sensation; (3) in which moments they felt the altered sensation: always or only in function (i.e. chewing, speaking or touching); and (4) if they were feeling pain or other unpleasant sensation.

Questions regarding part two referred to functional impairment, such as changes in performing a function, nibbling, lip burn, hypersalivation, difficulty for oral care, and continuous interference. Questions regarding the satisfaction about the procedure were also asked in this part of the questionnaire.

Data analysis

Cochran's Q test was performed to verify the association between paired variable over the time. A descriptive and inferential analysis was performed using IBM SPSS v.24.0® (Statistical Package for Social Science) software, with a significance level set at 0.05.

Results

Thirty individuals met the inclusion criteria, being 12 (40%) men and 18 (60%) women, with an average age of 30 years old. Five patients were excluded of the survey for not returning at the correct postoperative follow-up appointment. Regarding the surgical procedure, 18 surgeries (60%) were bimaxillary, while 12 (40%) were in the mandible alone.

Regarding part one of the questionnaire, it was found statistically significance difference in questions 1, 3 and 4. In question 1, patients reported to have less regions affected by altered sensations at T6 in comparison to T1 ($p < 0.001$). According to the answers of question 3, the moments of altered sensations switched from "always" to "during function" over time ($p = 0.001$). When patients were asked if they were feeling pain or other unpleasant sensation (question 4), it can be seen that as the time passes, less patients report to have pain or unpleasant sensations ($p = 0.003$). Results are shown in table I.

Table I – Self-reported Altered Sensation profile over time

		T1 N (%)	T2 N (%)	T3 N (%)	T4 N (%)	T5 N (%)	T6 N (%)	p value
Altered sensation in both lip and chin	No	0 (0)	1 (3.3)	1 (3.3)	0 (0)	7 (23.3)	9 (30.0)	**< 0.001**
	Yes	30 (100)	29 (96.7)	29 (96.7)	30 (100)	23 (76.7)	21 (70.0)	
Anesthetized sensation/do not feel	No	18 (60.0)	20 (66.7)	25 (83.4)	23 (76.7)	18 (60.0)	18 (63.3)	0.218
	Yes	12 (40.0)	10 (33.3)	5 (16.6)	7 (23.3)	12 (40.0)	11 (36.7)	
Tingling and itching sensation	No	22 (73.4)	19 (63.4)	18 (60.0)	18 (60.0)	20 (66.7)	24 (80.0)	0.365
	Yes	8 (26.6)	11 (36.6)	12 (40.0)	12 (40.0)	10 (33.3)	6 (20.0)	
Moments of altered sensation	Always	21 (70.0)	15 (50.0)	16 (53.4)	10 (33.3)	9 (30.0)	12 (40.0)	**0.001**
	During function	9 (30.0)	15 (50.0)	14 (46.6)	20 (66.7)	21 (70.0)	18 (60.0)	
Pain or other unpleasant sensation	No	21 (70.0)	26 (86.7)	30 (100)	23 (76.7)	27 (90.0)	29 (96.7)	**0.003**
	Yes	9 (30.0)	4 (13.3)	0 (0)	7 (23.3)	3 (10.0)	1 (3.3)	

* *p* value for Cochran Q test, with significance level of 0.05; Bold means statistically significance difference

The data regarding Functional Impairment can be seen in table II. There was an improvement at T6 in relation to all variables. There is a decrease in the pain, lip bites, burning and drooling sensation. Also, there is an improvement in difficulty for oral care. Finally, it is observed that 96.7% of the patients are satisfied with the surgery at T6. Similarly, 93.3% would recommend the procedure.

Table II – Self-reported Functional Impairment profile overtime

		T1 n (%)	T2 n (%)	T3 n (%)	T4 n (%)	T5 n (%)	T6 n (%)	p value*
Changes in performing a function	Single place	10 (33.3)	15 (50.0)	14 (46.7)	20 (66.7)	21 (70.0)	18 (60.0)	0.004
	both locations	20 (66.7)	15 (50.0)	16 (53.3)	10 (33.3)	9 (30.0)	12 (40.0)	
Pain or another sensation	No	21 (70.0)	22 (73.3)	11 (36.7)	14 (46.7)	18 (60.0)	25 (83.3)	0.003
	Yes	9(30.0)	8 (26.7)	19 (63.3)	16 (53.3)	12 (40.0)	5 (16.7)	
Nibbling	No	9 (25.7)	8 (22.9)	19 (54.3)	16 (45.7)	12 (34.3)	5 (14.3)	0.001
	Yes	21 (60.0)	22 (62.9)	11 (31.4)	14 (40.0)	18 (51.4)	25 (71.4)	
Lip burn	No	0	0	24 (80.0)	25 (83.3)	27 (90.0)	29 (96.7)	0.007
	Yes	30 (100)	30 (100)	6 (20.0)	5 (16.7)	3 (10.0)	1 (3.3)	
Hypersalivation	No	11 (36.7)	15 (50.0)	19 (63.3)	26 (86.7)	27 (90.0)	24 (80.0)	< 0.001
	Yes	19 (63.3)	15 (50.0)	11 (36.7)	4 (13.3)	3 (10.0)	6 (20.0)	
Difficulty for oral care	No	0	10 (33.3)	10 (33.3)	16 (53.3)	24 (80.0)	22 (73.3)	< 0.001
	Yes	30 (100)	20 (66.7)	20 (66.7)	14 (46.7)	6 (20.0)	8 (26.7)	
Continuous interference	No	23 (76.7)	25 (83.3)	27 (90.0)	29 (96.7)	30 (100)	30 (100)	0.003
	Yes	7 (23.3)	5 (16.7)	3 (10.0)	1 (3.3)	0	0	
Satisfaction with the surgery	No	8 (26.7)	5 (16.7)	3 (10.0)	2 (6.7)	1 (3.3)	1 (3.3)	0.001
	Yes	22 (73.3)	25 (83.3)	27 (90.0)	28 (93.3)	29 (96.7)	29 (96.7)	
Would you recomend this procedure?	No	3 (10.0)	3 (10.0)	1 (3.3)	1 (3.3)	1 (3.3)	2 (6.7)	0.005
	Yes	27 (90.0)	27 (90.0)	29 (96.7)	29 (96.7)	29 (96.7)	28 (93.3)	

* *p* value for Cochran Q test, with significance level of 0.05; Bold means statistically significance difference

Discussion

The main objective of this study was to subjectively evaluate the patient's perception of postoperative sensitivity in orthognathic surgery. In general, it is observed that both Nature of Altered Sensation, and Functional Impairment have positively changed over time.

One of the points that deserves attention is the persistence of sensorineural alterations, as it still one of the most negative factors contributing to resistance of orthognathic surgery by patients [11]. It is known that the trauma and injures caused to the inferior alveolar nerve (IAN) can occur in one or more stages during the surgical procedure, affecting the sensibility of lips and chin [4]. The nerve can be distended, lacerated or severed during osteotomy and fracture mobilization [3]. Establishing the degree of the nerve fiber injury is crucial in determining neural regeneration capacity [13]. Technical factors such as the use of modern saws and electric piezo can help to maintain soft tissue integrity, and help to decrease the paresthesia index [19]. It could be considered a bias in this study, although we do not have this equipment in our service. Another associated factor is related to each individual's particular causes, for example each person's intrinsic ability to heal, whether or not associated with age. Younger patients are known to have superior repair and regeneration potential than older patients, and the average age of our research was 30 years old.

With regard to Functional Impairment, it is worth mentioning the changes perceived in T1 and T6. For "changes in performing a function" in a single place, the resulting value of patients who had this alteration went from 33% to 60% in T6. In more than one location, there was a decrease from 67% to 40%. The evaluated sites were lip and chin, because these are regions that can show altered sensation resulting in functional impairment due to manipulation of IAN during osteotomies [12].

Regarding hypersalivation, there was also a decrease in T1, from 63% of individuals reporting this change to 20% in T6. It is noted that hypersalivation may be an effect resulting from paresthesia due to injury of the IAN and lingual nerve during surgical manipulation [1, 4]. Paresthesia may also be associated with infiltration, concentration and toxicity of local anesthetics [9, 10], which we doubt to be the case in this study, since the manipulation of the IAN have a higher potential for disturbing the nerve [7, 14]. Interestingly, general anesthesia can increase changes in inferior alveolar caused by prolonged anesthesia time [24]. However, it is observed that once edema and healing time have reached their peak, there is also a tendency to return to normal salivation [6]. These finding in the literature corroborates with our results because it was found a decrease in hypersalivation overtime.

Another point to be explored is that when injured, the nerve can recover within 2 years [13, 24] and our work follows up participants for 6 months. However, this may be one of the studies with the largest sample size which evaluate neurosensory alteration over 90 day follow-up period. The difficulty of long-term follow-up could be justified by the fact that individuals are from different cities, states and depend on public transportation, often difficult, to return to public health system appointments.

With regard to oral care difficulties, limited mouth opening is a result of postoperative edema, which results in chewing impairment and thus difficulty in oral hygiene [6]. Edema can be caused by metabolic factors, types of fracture, amount of bone loss, amount of soft tissue detached, type of incision, surgical time, professional skill, habits and addiction among others [3, 14]. However, postoperative edema peaks within 48 hours, decreasing on subsequent days, and disappearing around the fifth to seventh day depending on each individual [1]. Theses finds are in accordance with what has been seen in this study, because there was a decrease in oral care difficulties from T1 (100% of cases) to T6 (27%).

Although the rate of change function is 66.7% at T1, 90% of the patients would do the procedure again and would recommend it to another person. Regarding satisfaction with the procedure, 73.3% of patients were satisfied with the results in the first 48 hours after surgery. In another satisfaction survey after orthognathic survey [2] a large amount patients were satisfied [17], showing a similarity with the result of our work. The recommendation probably happens because orthognathic surgery positively impacts quality of life [8, 21].

In conclusion, there was an improvement in the Nature of Altered Sensation as well as Functional Impairment over time, and this does not interfere with satisfaction with the procedure.

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