REVISTA CEFAC
SPEECH, LANGUAGE, HEARING SCIENCES AND EDUCATION JOURNAL
Rev. CEFAC. 2016 Maio-Jun; 18(3):581-587 doi: 10.1590/1982-0216201618318715

Artigos originais

# Orthognathic surgery effect of orofacial sensitivity in individuals with cleft lip and palate

## *Efeito da cirurgia ortognática na sensibilidade orofacial em indivíduos com fissura labiopalatina*

Andréia Fernandes Graziani[1]
Carla Franciele Souza Garcia[1]
Giédre Berretin-Felix[2]
Katia Flores Genaro[2]

[1] Hospital de Reabilitação de Anomalias Craniofaciais- Universidade de São Paulo, HRAC-USP, Bauru, SP, Brasil.
[2] Departamento de Fonoaudiologia da Faculdade de Odontologia de Bauru- Universidade de São Paulo, Bauru, SP, Brasil.

Funding source: RUSP- Reitoria da Universidade de São Paulo.

Conflict of interest: non-existent

Received on: November 10, 2015
Accepted on: March 30, 2016

**Mailing address:**
Katia Flores Genaro
Departamento de Fonoaudiologia da Faculdade de Odontologia de Bauru-USP
Alameda Dr. Octavio Pinheiro Brisolla 9-75,
Vila Universitária - Bauru - SP
CEP: 17012-901
E-mail: genaro@usp.br

## ABSTRACT

**Purpose:** to study changes in the orofacial sensitivity and the recovery time after the completion of this orthognathic surgery in individuals with cleft lip and palate.

**Methods:** after the approval of the Ethical Committee, began the study which analyzed the examination reports of orofacial myofunctional performed before and after orthognathic surgery from 2012 to 2014. Was selected the tests contained in 53 medical records of patients who underwent sensitivity testing, aged between 18 and 40 years,the both genders (57% male and 43% female). The sensitivity test was applied on the lips, tongue, incisive papilla and chin, from the extensiometer (Semmes-Weintein), prior to surgery (2 to 3 days) and after surgery (3 to 6 months / 9 to 12 months). The results were analyzed using descriptive statistics to verify of frequency the change of sensitivity, and comparisons were performed by Wilcoxon tests and Chi-square ($p<0.05$).

**Results:** before surgery all cases showed adequate sensitivity of the tongue, while in the remaining few tested structures have changed before and after orthognathic surgery. After surgery there was an increase of frequency the sensitivity of change of the incisive papilla ($p=0.004$). There was no association between the evaluation periods after surgery.

**Conclusion:** although the prevalence of adequacy of sensitivity after surgery was observed for the incisive papilla increased frequency of change and we found no difference between the cases evaluated before and after 6 months.

**Keywords:** Cleft Lip; Cleft Palate; Maxillofacial Abnormalities; Orthognathic Surgery; Evaluation

## RESUMO

**Objetivo:** verificar a ocorrência de alterações na sensibilidade orofacial e o tempo de recuperação desta após a realização da cirurgia ortognática, em indivíduos com fissura labiopalatina.

**Métodos:** após aprovação do Comitê de Ética em Pesquisa, iniciou-se o estudo o qual analisou os relatórios de exames miofuncionais orofaciais, realizados antes e após a cirurgia ortognática no período de 2012 a 2014. Foram selecionados 53 prontuários de pacientes que realizaram a prova de sensibilidade, com idade entre 18 e 40 anos, de ambos os gêneros (57% masculino e 43% feminino). A prova de sensibilidade foi aplicada nos lábios, na língua, na papila incisiva e mento, a partir do estesiômetro (Semmes-Weintein), antes da cirurgia (2 a 3 dias) e após a cirurgia (3 a 6 meses/9 a 12 meses). Os resultados foram analisados por meio de estatística descritiva para verificar a frequência de alteração da sensibilidade, e as comparações foram realizadas pelos testes de Wilcoxon e Qui-Quadrado ($p<0,05$).

**Resultados:** antes da cirurgia todos os casos apresentaram sensibilidade adequada da língua, enquanto nas demais estruturas testadas poucos apresentaram alteração, antes e após a cirurgia ortognática. Após a cirurgia houve aumento da frequência de alteração da sensibilidade da papila palatina ($p=0,004$). Não houve associação entre os períodos de avaliação após a cirurgia.

**Conclusão:** apesar da prevalência de adequação da sensibilidade, após a cirurgia foi observado para a papila incisiva aumento da frequência de alteração e não foi constatada diferença entre os casos avaliados antes e após 6 meses.

**Descritores:** Fenda Labial; Fissura Palatina; Anormalidades Maxilofaciais; Cirurgia Ortognática; Avaliação

## INTRODUCTION

Cleft lip and palate is a malformation with great frequency in the human species[1]. This malformation changes the stomatognathic system, the morphology and the orofacial functions, which requires surgery to correct it[2]. Among the changes related to orofacial functions, we can mention: occlusion problems, feeding, swallowing, speech and breathing[3].

Studies have shown that dental anomalies are prevalent in individuals with cleft lip, the most common dental agenesis is the presence of supernumerary teeth in the permanent dentition[4]. In addition, changes related to malocclusion are directly related to issues involving size, shape and position of teeth[5]. In many cases, the patient does not treat the occlusion disorders during childhood and reaches adulthood with those changes. In other cases, even when the patient performs orthodontic treatment in childhood, this is not sufficient to correct these changes. In both cases, it is not possible to fix the skeletal changes with orthodontic treatment, there is the need for orthognathic surgery for dentofacial deformity correction[6].

The role of speech-language pathologist in cases undergoing orthognathic surgery occurs in two stages: pre-surgery, in which anamnesis, evaluation, orientation and speech therapy is performed and are related to working with the perioral muscles, global posture and proprioception[7], and after surgery, in addition to involving all the items mentioned above, it also includes working with chewing, swallowing, speech and orofacial sensitivity[8].

The orthognathic surgery is a procedure that aims to correct maxillomandibular and facial changes[9]. Patients with masticatory alteration, respiratory, speech and even esthetic difficulties, resulting from occlusion or jaw positioning irregularities, can benefit from this procedure[10]. Thus, the surgery for dentofacial deformity correction (DDC) leads to improvement of the functional aspects and facial appearance, which makes the individual happier and satisfied[11-14].

According to the literature, complications after orthognathic surgery[15] are not common but they can occur, and the loss of sensitivity is one of the complications[16-18]. This change is due to the osteotomy site, close to the peripheral branches of the maxillary and mandibular nerve[19], which can lead to trauma in this structure. Thus, the sensitivity of orofacial structures, as well as its recovery should be assessed[20]. Several studies on sensory changes after orthognathic surgery have revealed loss of orofacial sensitivity[9,21,22]. In general, this change is transitory[23,24]; however, the recovery period can be variable[23,25]. The change in orofacial sensitivity can cause discomfort to the patient and affect the orofacial functions, causing difficulty in controlling saliva, feeding and speech[17].

According to some authors[19], there is no standard method to assess changes in sensitivity and it can be performed through electrophysiological and sensory testing and evaluation from the patient's perception that reports the degree of commitment. A useful tool to assess the sensitivity is the esthesiometer[25,26], originally proposed for evaluating the tactile sensitivity in Hansen's disease and diabetes[27]. This is a set of monofilaments[27] able to identify changes in sensitivity from a light touch in the region to be tested[25,26]. Regarding oral cavity, some studies have used this tool to assess sensitivity[18,22,24].

Individuals with cleft lip presenting dentofacial deformity require surgical procedure for the correction, which in turn may affect the orofacial sensitivity and consequently the performance of orofacial functions. It is believed that before the orthognathic surgery, sensitivity is preserved and in the first months after surgery, this would be changed, which would return later. Once the orofacial functions are already affected due to functional changes, due to the structural condition, the change in sensitivity is another aggravating factor.

Thus, the evaluation of this aspect will enable a better understanding of the functional changes and allow the development of guidelines to the stimulation of sensitivity and preventive actions in the field of orofacial disorders.

Thus, the objective of this research was to analyze the orofacial sensitivity in individuals with cleft lip and palate, to verify the occurrence of changes and the recovery time after orthognathic surgery.

## METHODS

The study was approved by the Research Ethics Committee of Craniofacial Anomalies Rehabilitation Hospital (HRAC), from University of São Paulo where the study was conducted (No. 543621). This is a retrospective study that analyzed orofacial myofunctional tests performed before and after orthognathic surgery.

First, we analyzed the evaluation records of all patients undergoing myofunctional examination prior to performing orthognathic surgery, and also after this surgery in the 2012-2014 period; of these, we selected those who carried out the sensitivity test.

In orofacial myofunctional test, the sensitivity test of the lips, tongue, incisive papilla and the mental region is performed through the esthesiometer, consisting of a set of six monofilaments (Semmes-Weinstein) of colored nylon and different diameters, which touch the area to be tested and generates a pressure (Figure 1).

| Color | Weight | Esthesiometer (sensitivity measure) | Score |
|---|---|---|---|
| Green | 0.05g | Normal | 0 |
| Blue | 0.20g | Light change | 1 |
| Violet | 2g | Light to moderate change | 2 |
| Dark red | 4g | Moderate change | 3 |
| Orange | 110g | Moderate to severe change | 4 |
| Red magenta | 3300g | Severe change | 5 |

*Adapted SORRI- Bauru

**Figure 1.** Esthesiometer score as the color and weight of the filaments

In the analysis, we considered the result of each of the tested areas before and after surgery: between 2 to 3 days before surgery (pre) as well as in two other moments after surgery: between 2 to 5 months and between 6 to 12 months. Each monofilament was assigned a score, in which zero (0) corresponded to the thinner filament and which represents the best sensitivity and five (5) corresponded to the thicker filament, indicating worse sensitivity. In this study, the scores 0 and 1 were considered as appropriate outcome, and changed outcomes, the scores higher or equal to 2.

The data obtained were stored in an Excel spreadsheet and analyzed using descriptive statistics and verified the sensitivity change frequency. The individual scores before and after surgery for each region were compared using the t test for paired samples, and comparing the occurrence of adaptation and changes between stages and between the evaluation time after surgery was investigated by Chi-square test, which were considered significant the values of $p<0.05$.

## RESULTS

A total of 53 patients met the inclusion criteria and were enrolled in the institution between 2012 and 2014. The description of the cases studied, according to gender, age and type of cleft lip and palate is shown in Table 1, in which there is a predominance of males (59.09%) in cases with cleft lip and palate, females in isolated cleft palate (66.67%), gender balance in the cleft lip and a single case that had other anomalies was male. The minimum age of the sample was 18 years and the maximum 40 years, with a median of 23 years.

Table 2 shows the result of sensitivity assessment in both study moments. All cases had adequate tongue sensitivity before surgery, while some showed changes in the lip (2%) in the incisive papilla (4%), and in the mental region (4%). After surgery there was a predominance of adequacy, with changes in some cases of lip (2%), tongue (2%), in the incisive papilla (24%), and in the mental region (2%). Through the comparison of the frequencies of adequacy and changes in sensitivity between the moments, there was a difference only to the incisive papilla ($p = 0.004$), which showed an increase number of cases after surgery.

The minimum and maximum values, and the median, referring to the sensitivity assessment scores obtained in the pre and post-surgery tests are shown in Table 3. Of the cases that showed changes before surgery, the maximum obtained score was 2 (lip, incisive papilla and mental region) and after surgery, it was 5 (incisive papilla and mental region). The comparison of scores between moments showed difference to the incisive papilla, with worsening of sensitivity after surgery ($p=0.003$).

To analyze the changes that occurred after surgery in each tested structure, it was considered that sensitivity remained adequate or changed, as well as if modification occurred (Table 4).

The frequency of change and adequacy of the sensitivity observed in post-surgical evaluation, according to the time between surgery and evaluation are shown in Table 5. It can be verified predominance of cases with adequate sensitivity in all structures and periods assessed (2 to 5 months, $n=30$; and 6 to 12 months, $n=23$), the incisive papilla structure had the largest number of cases changed in both moments. There was no significant difference between the moments for the analyzed structures.

**Table 1.** Distribution of the sample according to gender, age and type of cleft lip and palate

| Type of cleft lip | N | Gender | | Age Median (minimum- maximum) |
|---|---|---|---|---|
| | | Male | Female | |
| Lip | 3,77% (n=2) | 50,00% (n=1) | 50,00% (n=1) | 29a5m (24a11m-34a) |
| Lip and palate | 83,02% (n=44) | 59,09% (n=26) | 40,91% (n=18) | 23a2m (18a2m-40a2m) |
| Palate | 11,32% (n=6) | 33,33% (n=2) | 66,67% (n=4) | 23a4m (21a8m-34a6m) |
| Others | 1,89% (n=1) | 100,00% (n=1) | 0,00% (n=0) | 20a5m (20a5m-20a5m) |
| TOTAL | 100,00% (n=53) | 56,06% (n=30) | 43,04%(n=23) | 23a3m (18a2m-40a2m) |

Legend: y=year; m=months

**Table 2.** Comparison of pre- and post-surgical evaluation of sensitivity

| Structure | Moment | Adequate | Altered | P-value |
|---|---|---|---|---|
| Lip | Pre | 98% (n=52) | 2% (n=1) | 1.00 |
| | Post | 98% (n=52) | 2% (n=1) | |
| Tongue | Pre | 100% (n=53) | 0% (n=0) | 0.315 |
| | Post | 98% (n=52) | 2% (n=1) | |
| Papilla | Pre | 96% (n=49) | 4% (n=2) | 0.004✦✧ |
| | Post | 76% (n=39) | 24% (n=12) | |
| Ment | Pre | 96% (n=51) | 4% (n=2) | 0.558 |
| | Post | 98% (n=52) | 2% (n=1) | |

✦ Significant difference by Chi-square test
✧2 cases were not considered, no rating post (n=51)

**Table 3.** Evaluation scores of sensitivity obtained in the studied phases

| Structure | Moment | Scores Median (minimum- maximum) | P-value |
|---|---|---|---|
| Lip | Pre | 0 (0 - 2) | 0.568 |
| | Post | 0 (0 -2) | |
| Tongue | Pre | 0 (0 – 0) | 0.321 |
| | Post | 0 (0 – 2) | |
| Papilla | Pre | 0 (0 – 2) | 0.003✦ |
| | Post | 0 (0 – 5) | |
| Ment | Pre | 0 (0 – 2) | 0.863 |
| | Post | 0 (0 – 5) | |

✦ Significant difference by t test
✳ 2 cases were not considered, excluded in the post intervention (n=51)

**Table 4.** Changes of sensitivity after surgery

| Results | Structure | | | |
|---|---|---|---|---|
| | Lip | Tongue | Papilla | Mental region |
| Kept adequate | 94% (n=50) | 98% (n=52) | 72% (n=38) | 94% (n=50) |
| Kept changes | 0% (n=0) | 0% (n=0) | 2% (n=1) | 0% (n=0) |
| Became changed | 2% (n=1) | 2% (n=1) | 20% (n=11) | 2% (n=1) |
| Became adequate | 4% (n=2) | 0% (n=0) | 2% (n=1) | 4% (n=2) |
| Not assessed after surgery | 0% (n=0) | 0% (n=0) | 4% (n=2) | 0% (n=0) |
| TOTAL | 100% (n=53) | 100% (n=53) | 100% (n=53) | 100% (n=53) |

**Table 5.** Results of the evaluation of the sensitivity of the structures according to the evaluation time after surgery

| Structure | Postoperative time | Sensitivity | | P-value |
|---|---|---|---|---|
| | | Adequate | Altered | |
| Lip | 2 months – 5 months | 97% (n=29) | 3% (n=1) | 0.376 |
| | 6 months – 12 months | 100% (n=23) | 0% (n=0) | |
| Tongue | 2 months – 5 months | 97% (n=29) | 3% (n=1) | - |
| | 6 months – 12 months | 97% (n=22) | 3% (n=1) | |
| Papilla | 2 months – 5 months | 86% (n=24) | 14% (n=4) | 0.085 |
| | 6 months – 12 months | 65% (n=15) | 35% (n=8) | |
| Ment | 2 months – 5 months | 97% (n=29) | 3% (n=1) | 0.376 |
| | 6 months – 12 months | 100% (n=23) | 0% (n=0) | |

✦Chi-square test ($p<0.05$)

## DISCUSSION

Orthodontic treatment, in many cases, is not enough to correct major maxillomandibular disproportions, justifying the performance of orthognathic surgery. In this study, we analyzed the speech therapy evaluations of 53 patients with cleft lip and palate submitted to orthognathic surgery. In the sample studied predominated complete cleft lip and palate, corroborating the findings[28,29] referring to this type of cleft lip and palate with increased demand for orthognathic surgery. Although the literature reports that postoperative complications[15] are not common, impaired orofacial sensitivity has been reported after orthognathic surgery[16-22], which can affect the functional recovery process.

In the assessment performed before surgery, there was predominance of adequacy of the structures sensitivity, but some cases had changes considered mild (score 2) to lip, incisive papilla and mental region. The lip and incisive papilla are regions handled during surgery to correct the cleft lip and palate, and result in scars[29], which may influence the sensitivity; however, it does not apply to the mental region.

After surgery, we also observed predominance of sensitivity adequacy condition, but some cases with change were also found. In relation to the incisive papilla, this structure was the most changed one, with increased number of cases mild and more pronounced changes (scores 3 and 5). In the mental region, we found the score 5 in a single case, and for tongue score 2. Comparing the scores, there was significant difference after surgery only for the incisive papilla. According to some reports[21] in mandibular osteotomy, both in vertical as in the sagittal technique, patients had altered sensation in the postoperative period, with the mental region being the most affected. However, according to other authors[24], sagittal technique has greater influence on the tactile feeling of the lip and mental region, one week after surgery, compared to the vertical technique.

In this study, when mandibular osteotomy was performed this occurred through the sagittal technique, which would justify the result in relation to mental region. In another study[30], the authors found that after surgery the most affected structures were mental region, as well as the hard and soft palate; similar to the findings of this sample, which found greater change in sensitivity in the incisive papilla and in mental region.

With regard to the time between surgery and evaluation of sensitivity, there was no significant difference between the two periods for the studied structures. However, when analyzing the distribution of relative frequencies in both periods, it is observed sensitivity adequacy predominance, although more cases of changes were shown for the incisive papilla. One hypothesis for this finding is that patients with cleft lip and palate can have consequences in the jaw region resulting from surgical procedures which they were submitted, besides suffering the influence of bone and tissue manipulation in this region due to maxillary advancement procedure.

For individuals without craniofacial malformations, some autors[21-25] observed variability in sensitivity recovery time after surgery, and that can be transitory[23,24] and range from 30 days to a period greater than 6 months until total recovery[23,25,26]. For some authors[20], the sensitivity of the lip and mental region showed significant recovery of sensitivity after 30 days of surgery and at 6 months the results resemble those observed before surgery. According to other authors[30], from 3 to 6 months of surgery, 40% of cases still have altered sensitivity in one or more structures.

After surgery, individuals were in the process of adaptation to the new functional condition and thus, identifying and monitoring changes of sensitivity favors the establishment of appropriate therapeutic targets in the pursuit of faster functional recovery and without compromising the stability of the surgical outcome. It is worth noting that the patient should be informed about the possible risks of temporary change of sensitivity, which also contributes to face a more favorable postoperative recovery.

In this study, it was expected that the sensitivity was preserved before orthognathic surgery, however, in some cases changes were found. It was also hoped that changing the sensitivity only occurred in the first months after surgery, with decreased frequency of changed cases after 6 months, which was not found. Thus, new longitudinal studies are useful to better understand the results, as well as a more representative sample, and a comparative study related to the evaluation of orofacial sensitivity with the use of nylon monofilaments, and other types of instrument to check results.

## CONCLUSION

In this sample, the results showed a predominance of adequate sensitivity to all tested structures, with few cases changed to lip, incisive papilla and mental region, both before and after orthognathic surgery; we did not find difference in sensitivity change among the cases evaluated up to 5 months after surgery and those evaluated after 6 months.

## REFERENCES


1. Murray JC. Gene/environment causes of cleft lip and/or palate. Clin Genet. 2002;61:248-56.
2. Bertier CE, Trindade IEK, Silva Filho OM. Cirurgias primárias de lábio e palato. In: Fissuras Labiopalatinas: Uma abordagem interdisciplinar. Trindade IEK, Silva Filho OG, organizadores. São Paulo: Santos; 2007. p. 73-86.
3. Figueiredo MC, Pinto NF, Faustino-Silva DD, Oliveira M. Fissura bilateral completa de lábio e palato: alterações dentárias de má oclusão - relato de caso clínico. UEPG: Ciências Biológicas e da Saúde. 2008;14(1):7-14.
4. Montandon EM, Duarte RC, Furtado PGC. Prevalência de doenças bucais em crianças portadoras de fissuras labiopalatinas. J. Bras. Odontopediatr. Odontol. Bebê. 2001;4(17):68-73.
5. Neves ACC, Patrocínio MC, Leme KP, UI TR. Anomalias dentárias em pacientes portadores de fissuras labiopalatinas: revisão de literatura. Rev. Biociênc Taubaté. 2002;8(2):75-81.
6. Lurentt K. Cirurgia ortognática em paciente portador de fissura lábiopalatina. Relato de caso. Rev. Cir. Traumatol. Buco-Maxilo-Fac. 2012;12(1):47-52.
7. Bianchini EMG. Desproporções maxilomandibulares: atuação fonoaudiológica com pacientes submetidos à cirurgia ortognática. In: Marchesan IQ e colaboradores. Tópicos em Fonoaudiologia. São Paulo: Lovise; 1995. p. 129-45.
8. Berretin-Felix G, Jorge TM, Genaro KF. Intervenção fonoaudiológica em pacientes submetidos à cirurgia ortognática. In: Fernandes FDM, Mendes BCA, Navas ALPGP (Org.). Tratado de Fonoaudiologia. 2ªed.São Paulo: Roca; 2009. p. 545-57.
9. Lima Júnior N, Moro MA, Tanaka FY, Fattah CMRS, Renon MA. O que significa cirurgia ortognática? Arq Ciênc Saúde UNIPAR. 1999;3(3):273-6.
10. Ribas MO, Reis LFG, França BHS, Lima AAS. Cirurgia ortognática: orientações legais aos ortodontistas e cirurgiões bucofaciais. Rev Clin Ortod Dental Press. 2005;10(6):75-83.
11. Alanko OM, Svedström-Oristo AL, Tuomisto MT. Patients' perceptions of orthognathic treatment, well-being, and psychological or psychiatric status: a systematic review. Acta Odontol Scand. 2010;68(5):249-60.
12. Choi WS, Lee S, McGrath C, Samman N. Change in quality of life after combined orthodontic-surgical treatment of dentofacial deformities. Oral Surg, Oral Med, Oral Pathol, Oral Radiol and Endod. 2010;109(1):46-51.
13. Khadka A, Liu Y, Li J, Zhu S, Luo E, Feng G et al. Changes in quality of life after orthognathic surgery: a comparison based on the involvement of the occlusion. J. Cleft Palate Craniofac. 2011;112(6):719-25.
14. Soh CL, Narayanan V. Quality of life assessment in patients with dentofacial deformity undergoing orthognathic surgery - A systematic review. Int J Oral Maxillofac Surg. 2013;42(8):974-80.
15. Lannetti G, Fadda TM, Riccardi E, Mitro V, Filiaci F. Our experience in complications of orthognathic surgery: a retrospective study on 3236 patients. Rev Med Pharmacol Sci. 2013;17(3):379-84.

16. Blomqvist JE, Alberius P, Isaksson S. Sensibility following sagittal split osteotomy in the mandible: a prospective clinical study. Plast Reconstr Surg. 1998;102(2):325-33.
17. Marchesan IQ, Bianchini EMG. A Fonoaudiologia e a cirurgia ortognática. In: Araújo A. Cirurgia ortognática. São Paulo: Santos; 1999. p. 353-62.
18. Alves TCNV. Análise da produção de fala nas correções cirúrgicas da deformidade dentofacial [tese]. Bauru (SP): Hospital de Reabilitação de Anomalias Craniofaciais, Universidade de São Paulo; 2008.
19. Phillips C, Essack G. Inferior alveolar nerve injury following orthognathic surgery: a review of assessment issues. J Oral Rehabil. 2011;38(7):547–54.
20. Monazzi MS. Avaliação clínica do grau de sensibilidade cutânea, na região mentoniana e de lábio inferior, em pacientes tratados por meio de Osteotomia Sagital Bilateral da Mandíbula [tese]. Campinas (SP): Faculdade de Ciências Medicas, Universidade Estadual de Campinas; 2011.
21. Oliveira SR, Santos P, Roberto TN, Grechi TH, Travit LV. Alterações da sensibilidade orofacial em pacientes pós-operatório de cirurgia ortognática. Anais do 16° Congresso Brasileiro de Fonoaudiologia; 2008 set; Campos do Jordão, SP. Campos do Jordão: SBFA; 2008. p. 1142.
22. Passos DCBOF, Alves MM, Zanferrari EO, Berretin-Félix G. Efeitos da Cirurgia ortognática sobre a sensibilidade e a mobilidade mandibular. Anais da XVI Jornada Fonoaudiológica de Bauru; 2009 ago; Bauru, SP. Bauru; 2009. p 64.
23. Geha HJ, Gleizal AM, Nimeskern NJ, Beziat JL. Sensitivity of the inferior lip and chin following mandibular bilateral sagittal split osteotomy using Piezosurgery. Plast Reconstr Surg. 2006;118(7):1598-607.
24. Trawitzki LVV, Germano KS, Picinato-Pirola MNC, Silva JB, Grechi TH, Mello-Filho FV. Sensibilidade orofacial em pacientes com deformidades dentofaciais três meses após cirurgias de mandíbula. Anais 39th Annual Convention International Association of Orofacial Myology – IAOM; São Paulo; 2011.
25. Kobayashi A,. Yoshimasu H, Kobayashi J, Amagasa T. Neurosensory alteration in the lower lip and chin area after orthognathic surgery: bilateral sagittal split osteotomy versus inverted L ramus osteotomy. J Oral Maxillofac Surg. 2006;64(5):778-84.
26. Lemke RR, Clark GM, Bays RA, Rugh JD. Effects of hypesthesia on oral behaviors of the orthognathic surgery patient. J Oral Maxillofac Surg. 1998;56(2):153-7.
27. Lehman LF, Orsini MB, Nicholl AR. The development and adaptation of Semmes-Weinstein monofilaments in Brazil. J Hand Ther. 1993;6(4):290-7.
28. Raposo-do-Amaral CA, Raposo-do-Amaral CE, Carone DR, Pinheiro AF, Braga EVB, Guidi MC et al. Estudo do avanço maxilar e das complicações em pacientes fissurados e não-fissurados submetidos a cirurgia ortognática. Rev. Bras. Cir. Plást. 2008;23(4):263-7.
29. Freitas RS, Canan Junior LW, Roça GB, Busato LS, Alonso N, D'oro U. Cirurgia ortognática nos portadores de fissuras lábio-palatais: experiência e desafios. Rev. Soc. Bras. Cir. Craniomaxilofac. 2009;12(3):89-93.
30. Zanferrari EO, Berretin-Félix G. Efeitos da cirurgia ortognática sobre a sensibilidade e motricidade orofacial. Anais do 15º Simpósio Internacional de Iniciação Científica- SIICUSP; Ribeirão Preto; 2007 nov; Ribeirão Preto, SP; 2007.