

SPEECH RESONANCE IN ORTHOGNATHIC SURGERY IN SUBJECTS WITH CLEFT LIP AND PALATE

RESONÂNCIA DA FALA NA CIRURGIA ORTOGNÁTICA EM INDIVÍDUOS COM FISSURA LABIOPALATINA

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ABSTRACT

The main purpose of this study was to investigate the impact of maxillary advancement on speech resonance in subjects with cleft lip and palate. The study sample was composed of 42 subjects aged 16 to 41 years old with operated cleft palate ± lip submitted to maxillary advancement. Resonance was evaluated before and 3 to 12 months after surgery by perceptual analysis and graduated from absent to severe. It was observed that 47.5% of the subjects presented impairment of resonance after orthognathic surgery, with a confidence interval (at 95%) from 31.5% to 63.9%. These results suggest that orthognathic surgery in individuals with cleft palate may interfere in resonance, causing, or increasing the degree of hypernasality. Therefore, this highlights the importance of the orientation about the risks and benefits of maxillary advancement surgery and follow-up of these patients.

Uniterms: Cleft palate; Orthognathic surgery; Resonance.

RESUMO

O propósito deste estudo foi verificar o impacto do avanço de maxila na ressonância de fala em sujeitos com fissura labiopalatina. A amostra do presente estudo foi composta por 42 sujeitos, entre 16 e 41 anos de idade, com fissura de palato associada ou não à de lábio submetidos ao avanço da maxila. A ressonância foi avaliada entre 3 e 12 meses após a cirurgia por análise e perceptual e graduada de ausente a severa. Observou-se que 47.5% dos sujeitos apresentaram prejuízo da ressonância após a cirurgia ortognática, com um intervalo de confiança (a 95%) de 31.5% a 63.9%. Esses resultados sugerem que a cirurgia ortognática, em sujeitos com fissura palatina, pode interferir na ressonância, causando ou aumentando o grau de hipernasalidade. Portanto, isso elucida a importância da orientação sobre os riscos e benefícios da cirurgia de avanço da maxila e acompanhamento desses pacientes.

Unitermos: Fissura palatina; Cirurgia ortognática; Ressonância.

INTRODUCTION

Since their birth, subjects with cleft lip and palate face aesthetic and functional difficulties, which bear psychosocial problems^{5, 17, 18}, leading to discomfort and inhibition due to the scars⁷ and the speech disorders, such as hypernasality²⁴ and the compensatory articulation. Such factors compromise self-esteem^{5,7,17}, which may become even more serious because of the social and cultural values from their

environment²².

These subjects, in turn, undergo surgical interventions and intense treatment that accompanies them throughout their development⁷, yet the obtained results are not always totally satisfactory²³. Orthognathic surgery is among the treatments applied to subjects with cleft lip and palate. It is indicated in cases of dentofacial deformities that do not respond to isolated orthodontic treatment^{13,26}. It is known that these deformities occur in these subjects as a result of the handling of bone

tissue in a growth stage during cleft repair surgeries^{1,3,8,10,16,20,21,26}, giving rise to functional disorders of the stomatognathic system such as mastication, swallowing, and speech sound articulation¹³, as well as aesthetic harm to the face.

Thus, orthognathic surgery has an aesthetic, functional and potentially beneficial effect on speech articulation^{9,12} and breathing²⁶, resulting in improved self-esteem of the patient¹². However, by surgically advancing the maxilla, the nasopharyngeal space may be increased^{2,11,12,15}, compromising velopharyngeal closing^{12,15} and, consequently modifying speech resonance^{4,13,14,15,26,27}, which may even become more accentuated due to nasal permeability improvement^{26,28}. According to Mason, et al.¹⁵ (1980) and Dalston and Vig⁹ (1984), the majority of individuals without cleft have sufficient compensatory reserve so that even large advancements of the maxilla, over 10mm, do not affect velopharyngeal closing and speech. In a study on subjects with cleft lip and palate, Maegawa, et al.¹⁴ (1998) verified that advances over 10mm create a risk of worsening speech. However, as of yet, there is no precise ratio between the amount of advancement and the worsening in resonance.

Considering that hypernasality can represent a greater stigma than maxillomandibular discrepancy¹⁷, the objective of this study was to ascertain if speech resonance suffers modifications after maxillary advancement in subjects with cleft lip and palate who present dentofacial deformity.

MATERIAL AND METHODS

This retrospective study was conducted by analysis of the records of patients assisted at the Physiology Laboratory of the Hospital for Rehabilitation of Craniofacial Anomalies, University of São Paulo (HRAC/USP), in the period May 2001 to February 2003. A total of 42 records were assessed, being 24 males and 18 females aged 16 years 8 months to 41 years 9 months, with previously repaired cleft lip and palate, being 23 with unilateral cleft lip and palate (54.76%), 10 with bilateral cleft lip and palate (23.81%), 3 with incomplete cleft palate (7.14%), 1 with incomplete cleft lip associated to cleft palate (2.38%), 1 with cleft lip associated to incomplete cleft palate (2.38%), 1 with incomplete cleft lip associated to incomplete cleft palate (2.38%) and 3 with unilateral cleft lip and palate associated to incomplete unilateral cleft lip (7.14%).

These individuals presented dentofacial deformity characterized by anterior crossbite associated or not to posterior crossbite (Figure 1).

Evaluation was performed following the protocol of the Physiology Laboratory of HRAC/USP, comprising evaluation of the orofacial structures as to the anatomical conditions, posture, mobility and tonicity of the stomatognathic system, and breathing, chewing, swallowing and speech functions. This protocol is applied in all cases submitted to orthognathic surgery at the Hospital, before and after surgery, always by two experienced speech therapists (both present upon evaluation) who reach a consensus as to the aspects analyzed. The records analyzed in the present study involved the results of evaluations performed 2 to 3 days before

orthognathic surgery (presurgical stage) and 3 to 12 months after surgery (postsurgical stage); analysis included only the items related to overjet measurement and speech resonance, being the first measured with a millimeter ruler adapted for intraoral examination (Teixeira²⁵ 2000). Speech resonance was classified by perceptive-auditory analysis. This is a subjective voice analysis specifically related to nasalization of speech sounds. Thus, depending on the nasalization of the patient's voice, resonance may be scored in different grades. In the present study, the degree of hypernasality of individuals was analyzed according to the following scale: absent (1), mild (2), mildly moderate (3), moderate (4), moderately severe (5) and severe (6). The postsurgical outcome was assessed by comparison of the hypernasality scores of each individual before and after surgery, by subtracting the postsurgical score from the presurgical score, yielding a grade of 0, 1, 2 or 3, thus referring to the worsening of resonance after surgery, which may not have occurred (0) or may have occurred at 1, 2 or 3 grades.

Analysis was combined in two large groups: the group of individuals without hypernasality or with mild hypernasality (whose impact after surgery would be larger with the worsening in resonance), and those with mildly moderate, moderate, moderately severe or severe hypernasality (whose impact would be smaller, due to the preexisting evident hypernasality).

From the 42 patients evaluated, 2 declined to undergo surgery after being informed on the possibility of alteration in speech resonance after it. Thus, the final sample comprised 40 patients.

Statistical analysis was performed as to the amount of cases with resonance disturbances in the postsurgical stage by the confidence interval. Moreover, in an attempt to achieve a value close to the amount of advancement, the difference between presurgical and postsurgical overjet was assessed to verify whether there was correlation between the overjet preoperatively and the alteration in resonance postoperatively, by the Spearman coefficient of correlation (Zar, 1996)³⁰.

RESULTS

With regard to overjet, it varied from 0 to -15mm, with an average of -5.88mm at pre-surgery and from -5 to 4mm, with an average of 1.95mm at post-surgery, as can be seen in Figure 2.

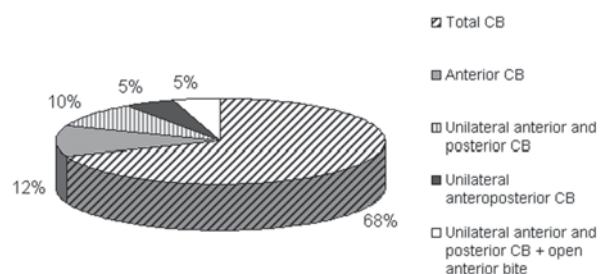


FIGURE 1- Distribution of patients according to type of crossbite (CB) at the presurgery phase

The degree of hypernasality, in pre-surgery as well as post-surgery, varied from absent to severe. At pre-surgery, 25% of the subjects presented no hypernasality and 75% presented hypernasality, mild in 25%, mildly moderate in 12.5%, moderate in 22.5%, moderately severe in 12.5% and severe in 2.5%. Meanwhile, at post-surgery, 12.5% of the patients presented no hypernasality, and 87.5% presented hypernasality, mild in 25%, mildly moderate in 2.5%, moderate in 30%, moderately severe in 20% and severe in 10%. In Figure 3, it can be observed that almost half of the subjects presented resonance modification after orthognathic surgery. Statistical analysis revealed a 31.5% to 63.87% confidence interval (at 95%). In 10% of the cases, hypernasality went from absent to mild (1 degree), in 2.5% from absent to moderate (3 degrees), in 10% from mild to moderate (2 degrees), in 5% from mildly moderate to moderate (1 degree), in 5% from mildly moderate to moderately severe (2 degrees), in 7.5% from moderate to moderately severe (1 degree), in 2.5% from moderate to severe (2 degrees) and in 5% from moderately severe to severe (1 degree).

In Figures 4 and 5, it is possible to visualize the effect of orthognathic surgery on speech resonance in subjects without hypernasality and subjects with mild hypernasality (Figure 4), and those who had already presented evident resonance alterations (Figure 5). The difference in pre- and post-surgical overjet was compared to resonance modification after surgery and, using the Spearman correlation coefficient, no statistically significant correlation ($p>0.05$) was ascertained (Table 1).

DISCUSSION

An important concern involved in the indication of maxillary advancement surgery is the possibility of modification in the velopharyngeal function, resulting in speech alterations^{2,4,11,12,15}. This study examined modifications in speech resonance after conducting maxillary advancement surgery where alterations were verified, that is, a worsening in 47.5% of the cases, thereby agreeing with the studies conducted by Haapanen, et al.¹¹ (1997) and Trindade, et al.²⁶ (2003), who found a worsening in speech, estimated by means of the nasalance measurement, in 20% and 62% of the cases, respectively. Likewise, Schwarz and Gruner¹⁹ (1976) showed a worsening in hypernasality in 65% of the evaluated patients. As we grouped the subjects in this study as to their pre-surgical resonance classification into three distinct categories: normal resonance, mild hypernasality and other degrees of hypernasality, we can observe that, on average, 50% of the subjects in each group presented a worsening in resonance after surgery.

Analyzing the results of those patients who presented normal resonance and mild hypernasality (Figure 4) and, reflecting on the speech stigma of the subject with cleft lip and palate, we are faced with the question concerning the psychosocial impact of hypernasality on the quality of life. The subjects in this study, even those who presented a mild alteration in resonance prior to surgery, did not have any

voice complaints. Thus, the impact generated by the worsening in resonance becomes evident, especially due to the importance of oral communication in social insertion, including the labor market, brought about by the demands of society itself¹⁷. On the other hand, for those subjects who already presented evident hypernasality prior to surgery, the impact of a worsening in speech quality was smaller since they already carried that stigma.

Furthermore, analysis of the data did not reveal any direct relationship between the amount of maxillary advancement, inferred by the difference in overjet, and any modification in

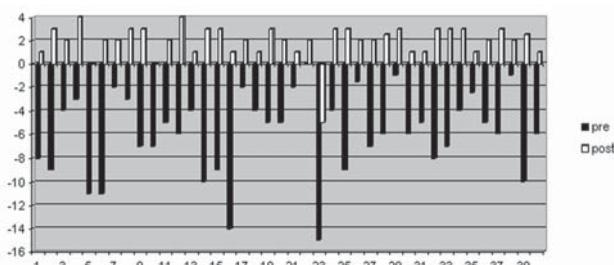


FIGURE 2- Pre-and post-surgical overjet (mm) of the 40 patients who underwent maxilla advancement

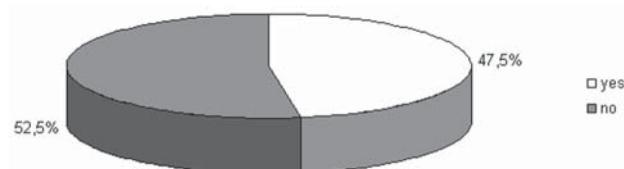


FIGURE 3- Patient distribution as to resonance modification after orthognathic surgery

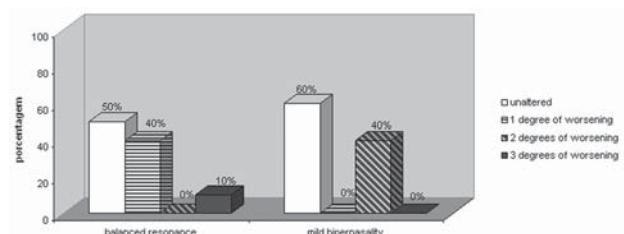


FIGURE 4- Patient distribution with balanced resonance and with mild hypernasality with regard to post-surgical resonance modification

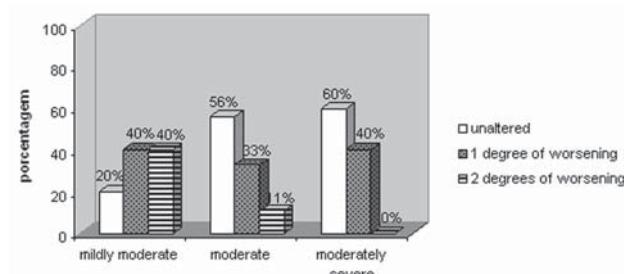


FIGURE 5- Patient distribution that presented evident hypernasality as to resonance modifaciton after surgery

resonance. These results suggest that there is no way to foresee the risk for resonance alteration based on the overjet measurement at pre-surgery, disagreeing with Bradley⁴(1997), who believed it was possible to establish a risk parameter for resonance worsening after orthognathic surgery, and suggested studies on this matter. What seems to happen is for there to be the involvement of other causal factors, besides the overjet, that may increase the risk for resonance alterations, such as extension and mobility of the soft palate, pharyngeal wall mobility, and nasal surgery concomitant with maxillary advancement. This is a matter that is currently under investigation.

Thus, all patients indicated for orthognathic surgery should be evaluated and oriented as to the possibility of speech modification, and as to resonance, which is suggested by Witzel and Munro²⁹ (1977), Mason, et al.¹⁵ (1980) and Vallino²⁷ (1990). And, if necessary, there is the recourse of

corrective surgery by means of pharyngoplasty¹⁴. On the other hand, this can only be performed at least 6 months after orthognathic surgery^{12,15} due to the structural changes that take place, the musculature adaptations, and the extension of these two surgeries, besides being a procedure that, because it involves other variables, there is no way to guarantee total success in the correction of hypernasality.

With regard to the two patients who decided against surgery, we can reflect on the issue of aesthetics in detriment of speech, for in such cases, the patients opted to maintain voice quality, prioritizing it over aesthetics and oral functions, as occurred with a patient in the Mason, et al.¹⁵ (1980) study. According to Pereira¹⁷ (2000), speech can be considered the foundation for all communication, being an important factor, in the subject with cleft's insertion into society^{5,6}, the fact of being understood and accepted in his speech, and for Tavano²⁴ (2000), he also needs to overcome the psychological

TABLE 1- Relation between pre and post-surgical overjet difference and resonance modification after surgery

Subject	Resonance (pre-surgical)	Pre and post overjet difference (mm)	Modification in resonance
01	1	12	No
02	1	9	No
03	1	7	No
04	1	7	No
05	1	6	No
06	1	6	Yes
07	1	10	Yes
08	1	7	Yes
09	1	7	Yes
10	1	10	Yes
11	2	6	No
12	2	4	No
13	2	3	No
14	2	3.5	No
15	2	11	No
16	2	4	No
17	2	10	Yes
18	2	5	Yes
19	2	2	Yes
20	2	3.5	Yes
21	3	4	No
22	3	7	Yes
23	3	7	Yes
24	3	12	Yes
25	3	9	Yes
26	4	9	No
27	4	13	No
28	4	5	No
29	4	8	No
30	4	7	No
31	4	10	Yes
32	4	12	Yes
33	4	8.5	Yes
34	4	3	Yes
35	5	11	No
36	5	7	No
37	5	15	No
38	5	7	Yes
39	5	12.5	Yes
40	6	13	No

restraints, such as: introversion, inhibition, uncertainty, fear, humiliation, feelings of impotence, and so many others that interfere in their interpersonal relationships.

CONCLUSION

These results suggest that orthognathic surgery in individuals with cleft palate may interfere in resonance, causing, or increasing the degree of hypernasality. Therefore, this highlights the importance of the orientation about the risks and benefits of maxillary advancement surgery and follow-up of these patients.

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