

EFFECT OF MYOFUNCTIONAL THERAPY ON OROFACIAL FUNCTIONS AND QUALITY OF LIFE IN INDIVIDUALS UNDERGOING ORTHOGNATHIC SURGERY

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ABSTRACT

INTRODUCTION: Some proposals of myofunctional therapy directed to individuals undergoing orthognathic surgery have been presented which promote the orofacial myofunctional balance, enhancing the treatment stability. **OBJECTIVE:** To verify the effect of myofunctional therapy on orofacial functions and quality of life in individuals undergoing orthognathic surgery. **METHOD:** A total of 24 individuals, with mean age of 26.5 years, participated in the study. They were divided into two groups, namely with myofunctional therapy (N=12) and without myofunctional therapy (N=12). Breathing, chewing, swallowing, and speech were evaluated from tests established by the MBGR Orofacial Myofunctional Evaluation, using the scores specified in the protocol. The quality of life (QL) was evaluated using the Oral Health Impact Profile-OHIP-14 questionnaire, which comprises 14 questions that measure the individual's perception of the impact of their oral conditions on their well-being in recent months. The evaluations were carried out before and 3 months after orthognathic surgery. The myofunctional therapy was initiated 30 days after surgery, with exercises aimed at improving orofacial mobility, tone and sensitivity, as well as the training of normal physiological patterns of orofacial functions. The comparisons between orofacial functions and the study groups were verified by the Mann-Whitney test, using a significance level of 5%. **RESULTS:** After surgery, the individuals without myofunctional therapy presented with an improvement in breathing and oral health-related quality of life ($p < 0.05$), while in the group undergoing myofunctional therapy there was improvement in all aspects investigated ($p < 0.05$). Comparison between the study groups showed better performance in breathing ($p = 0.002$), chewing ($p = 0.012$), swallowing ($p = 0.002$) and speech ($p = 0.034$) in individuals who underwent myofunctional therapy. **CONCLUSION:** The orthognathic surgery alone improved breathing and quality of life. However, the surgical procedure associated with myofunctional treatment, besides improving all oral functions investigated and quality of life, provided better functional performance in breathing,

chewing, swallowing and speech. This study's participants demonstrated the effectiveness of the orofacial myofunctional intervention.

Keywords: Orthognathic surgery, Quality of life. Breathing, Speech. Chewing. Swallowing, Myofunctional Therapy.

INTRODUCTION

Dentofacial deformity (DFD) results in alterations of facial esthetics and harmony, and can cause psychological, social and professional problems for patients, with consequences in their quality of life (Ambrizzi, Franzi, Pereira Filho, Gabrielli, Gimenez, & Bertoz, 2007; Ribas, Reis, França, & Lima, 2005). In addition, DFD determines specific myofunctional characteristics, peculiar to the type of disproportion, such as alterations in the habitual posture of lips and tongue, muscle asymmetries, temporomandibular dysfunctions (TMD), deviations in chewing, swallowing, speech, and breathing (Egemark, Blomqvist, Cromvik, & Isaksson, 2000).

After surgical correction and correct tooth positioning, in some cases, the soft tissues restructure appropriately with a good functional response. However, for other individuals, after orthognathic surgery there is maintenance or onset of altered function patterns, which can negatively impact the dental treatment (Marchesan, & Bianchini, 1999; Ribeiro, 1999; Pacheco, 2000; Sígolo, Campiotto, & Sotelo, 2009). In this regard, studies have described

some intervention proposals aimed at individuals undergoing orthognathic surgery within interdisciplinary teams (Ribeiro, 1999; Varandas, Campos, & Motta, 2008), with the objective of promoting orofacial myofunctional balance, enhancing the stability of final treatment results.

Gallerano, Ruoppolo & Silvestri (2012) demonstrated the importance of a rehabilitation protocol for the orofacial functions after orthognathic surgery, aimed at achieving long-term success in 19 patients. Following rehabilitation of the functional parameters, 12 patients fully adapted the orofacial functions, 5 did it partially, and two had an inefficient treatment. The authors concluded that the interdisciplinary approach is necessary to adapt all functions that are not compatible with the structural changes and may lead to recurrence (Gallerano, Ruoppolo, & Silvestri, 2012).

The need to assess the quality of life of individuals with dental/skeletal malocclusion is related to the importance of facial and dental esthetics in people's lives and the way they

self-evaluate their facial condition (Feu, Oliveira, Oliveira Almeida, Kiyak, & Miguel, 2010). The same malocclusion can be perceived differently by different people, and their individual perception is probably the key to the search for orthodontic treatment, rather than related or not to the severity of the malocclusion (Oliveira, & Sheiham, 2004). In a literature review, 21 published papers were located, which showed that the individuals improved their quality of life after orthognathic surgery, and each individual presented different motivations and expectations regarding the treatment (Soh, & Narayanan, 2013). However, no research was located that investigated the impact of orofacial myofunctional conditions on the quality of life after surgery.

Alterations in orofacial functions, as well as on the quality of life in patients with dentofacial deformity, are reported in the literature.

All participants were assessed as to their orofacial myofunctional condition and quality of life, prior to and 3 months following orthognathic surgery. The orofacial functions were evaluated by the MBGR Orofacial Myofunctional Evaluation Protocol (Marchesan, Berretin-Felix, & Genaro, 2012) and the scores attributed are specified in the protocol itself, zero value being considered as appropriate

Nevertheless, few studies address the result of myofunctional treatment for such cases. Thus, this study aimed at verifying the effect of myofunctional therapy on the orofacial functions and quality of life of individuals undergoing orthognathic surgery.

METHOD

The research project was approved by the Institutional Review Board under process no. 049/2009. All individuals in the sample signed a Consent Form and their records were analyzed.

The study was conducted on 24 individuals (14 females and 10 males), in the age range 18-40 years (mean=26.38), divided into two groups, the myofunctional therapy group (n=12) and no myofunctional therapy group (n=12). Table 1 shows the data on gender, facial pattern, molar ratio and surgical procedure carried out for the participants.

and higher values as altered. Thus, the higher the score, the worse the performance. In breathing (scores 0-9), the mode, type, and possibility of nasal use was verified. In chewing (scores 0-10), using a wafer biscuit as food, the chewing pattern (alternate or simultaneous bilateral, chronic or preferentially unilateral), were verified. In addition the presence or absence of muscle contractions that were not

expected were noted. In swallowing (scores 0-50), the directed swallowing of solid food (wafer biscuit) and liquid (water) was verified. This included: lip seal, tongue posture, lower lip posture, food containment, orbicularis and mentalis muscle contraction, head movement, and swallowing coordination. In speech (scores 0-32), using a sample of spontaneous speech, counting numbers from zero to 20, and naming of pictures proposed by the protocol, the following characteristics were analyzed: mouth opening, tongue position, lip and mandibular movement, resonance, speed and pneumophonoarticulatory coordination, as well as omissions, substitutions, distortions or articulatory inaccuracy.

To assess the quality of life (QL), we used the Brazilian version of the Oral Health Impact Profile-OHIP-14 questionnaire (Appendix 1) (Oliveira, & Nadanovsky, 2005), translated and validated from the original protocol (Slade, 1997), which comprises 14 questions that measure the individuals' perception on the impact of their oral conditions on their well-being in recent months. The total score obtained corresponded to the sum of scores of all the questions; the maximum individual answer was represented by 56 points. The higher the scores obtained, the worse the orofacial functions and the QL.

The orofacial myofunctional therapy was initiated 40 days after the surgical procedure. Meetings were held every week, totaling between 8 and 15 sessions. The following aspects were addressed: tactile-kinesthetic and thermal stimulation in the lower facial third; exercises of lips, tongue and mandible mobility; exercises to adjust the tone of tongue, lips, cheeks and mentum, as well as to improve the morphological aspects of the lips (shortened upper lip and everted lower lip); functional training to adjust the habitual position of the mandible, lips and tongue, as well as breathing functions (improvement in sinus aeration, stimulation of nasal breathing, medium lower respiratory tract training); chewing (alternate or simultaneous bilateral chewing pattern); swallowing (regarding the function of lips and tongue); phonetic aspects of speech (regarding the function of tongue and articulatory pattern); as well as the expressiveness during oral communication, aiming at maintenance of the orofacial and esthetic functional balance. The results obtained in the evaluations were written in specific protocols and transcribed into the EXCEL software. Comparisons between the orofacial functions and the study groups were verified by the Mann-Whitney test, using a significance level of 5%.

Table 1. Distribution of individuals according to gender and facial pattern of the DFD Group and Control Group

Variable	Group without treatment	Group with treatment
	n (%)	n (%)
Individuals	12	12
Gender		
Male	5	5
Female	7	7
Facial pattern		
I	0	0
II	5	5
III	7	7
Facial Type		
Short	0	1
Medium	4	3
Long	8	8
Molar Relationship		
Class I	0	0
Class II	5	5
Class III	7	7
Surgical Procedure (PC)		
Maxilla		
Retrusion	4	3
Advancement	7	9
Impaction	1	0
Mandible		
Advancement		
Counterclockwise turn	4	2
Retreat	4	7
Laterognathism correction	2	1
	2	2

RESULTS

Analysis of the effect of orthognathic surgery after three months revealed that individuals without myofunctional therapy showed improvement in breathing function ($p=0.044$) and quality of life ($p=0.003$). Otherwise, no changes in chewing, swallowing and speech were verified, as shown in Table 2. Significant difference ($p\leq 0.05$) was observed in

all orofacial functions (breathing, chewing, swallowing and speech) and in oral health-related quality of life for individuals submitted to myofunctional therapy, when comparing the results before and after orthognathic surgery (Table 3). This indicated that the orofacial myofunctional therapy brought benefits to all orofacial functions studied.

Table 2. Minimum and maximum values, mean, standard deviation and p values of scores obtained for the orofacial functions (MBGR protocol), and scores of quality of life (OHIP-14 protocol) before and 3 months after orthognathic surgery for the group without myofunctional therapy

	Pre-orthognathic surgery				Post-orthognathic surgery				p value
	Min	Max	Mean	SD	Min	Max	Mean	SD	
Breathing	2.00	4.00	3.91	1.08	1.00	6.00	2.75	1.54	0.044*
Chewing	1.00	4.0	3.50	1.78	1.00	6.00	3.25	1.91	0.757
Swallowing	1.60	6.80	6.18	2.50	1.33	6.30	4.14	1.42	0.060
Speech	0.30	2.00	1.83	0.95	0.00	3.30	1.60	1.16	0.539
OHIP-14	0.00	21.50	19.83	10.71	0.00	11.00	19.83	3.79	0.003*

* Statistically significant values ($p \leq 0.05$)

Table 3. Minimum and maximum values, mean, standard deviation and p values of scores obtained for the orofacial functions (MBGR protocol) and scores of quality of life (OHIP-14 protocol) before and 3 months after orthognathic surgery for the group receiving orofacial myofunctional therapy

	Pre-orthognathic surgery				Post-orthognathic surgery				Value of p
	Min	Max	Mean	SD	Min	Max	Mean	SD	
Breathing	1,00	6,00	2,93	1,49	0,00	2,00	0,91	0,66	0,005*
Chewing	1,00	4,00	2,69	1,10	0,00	3,00	1,41	0,90	0,006*
Swallowing	1,00	6,60	4,47	1,52	0,60	3,00	1,83	0,83	0,003*
Speech	0,30	3,00	1,37	0,75	0,00	2,60	0,50	0,81	0,012*
OHIP-14	0,00	40,00	10,38	11,14	0,00	16,00	3,17	4,49	0,018*

* Statistically significant values ($p \leq 0.05$)

Comparison between the different study groups for the postoperative results is presented in Table 4. A significant reduction in scores was obtained for all orofacial functions (breathing, chewing, swallowing and speech),

with better performance for individuals undergoing the orofacial myofunctional therapy, in comparison to individuals without myofunctional intervention. The quality of life scores showed no difference between groups.

Table 4. Minimum and maximum values, mean, standard deviation and p values of scores obtained for the orofacial functions (MBGR protocol) and scores of quality of life (OHIP-14 protocol) 3 months after orthognathic surgery for the different study groups (with and without myofunctional therapy)

	Without Myofunctional Therapy				With Myofunctional Therapy				Value of p
	Min	Max	Mean	SD	Min	Max	Mean	SD	
Breathing	1	6	2.7	1.5	0	2	1	0.6	0.002*
Chewing	1	6	3.2	1.9	0	3	1.4	1	0.012*
Swallowing	1.3	6.3	4.1	1.4	0.6	3	2	0.8	0.002*
Speech	0	3.3	1.1	1.1	0	2.6	0.5	0.8	0.034*
OHIP-14	0	11	5.0	3.8	0	16	3.1	4.5	0.128

* Statistically significant values (p≤0.05)

DISCUSSION

This research considered the impact of myofunctional therapy associated with orthognathic surgery in the performance of orofacial functions, as well as in the oral health-related quality of life in individuals with DFD.

The improvement in breathing function after orthognathic surgery, for both groups, can be justified by the increase of the nasal air space due to the surgical procedure performed. In this research, the surgeries for correction of DFD were bi-maxillary, maybe involving

maxillary advancement, mandibular advancement and mandibular counterclockwise rotation, besides other procedures. The literature showed that maxillary expansion produced an increase in nasal permeability, which did not persist over time, and the changes related to the respiratory pattern varied (Berretin-Felix, Yamashita, Nary Filho, Gonçalves, Trindade, & Trindade, 2006). Studies which assessed three-dimensionally changes occurring in the pharyngeal air space after maxillary and mandibular advancement showed a significant increase in air space after

orthognathic surgery, reducing the risks of respiratory disorders (Abramson, Susarla, Lawler, Bouchard, Troulis, & Kaban, 2011; Fairburn, Waite, Vilos, Harding, Bernreuter, Cure, & Cherala, 2007; Hernández-Alfaro, Guijarro-Martínez & Mareque-Bueno, 2011; Marşan, Vasfi Kuvat, Öztaş, Süsal, & Emekli, 2009).

The lack of change in orofacial functions of chewing, swallowing and speech, in the group without myofunctional therapy after orthognathic surgery, can be attributed to maintenance of the presurgical adaptive functional patterns, due to the skeletal malocclusion presented by individuals (Berwig, Ritzel, Silva, Mezzomo, Côrrea, & Serpa, 2015; Coutinho, Abath, Campos, Antunes, & Carvalho, 2009; Egemark, Blomqvist, Cromvik, Isakson, 2000; Migliorucci, Sovinski, Passos, Bucci, Salgado, Nary Filho, Abramides, & Berretin-Felix, 2015; Zupo, Benedicto, Kairalla, Miranda, Cesar, & Paranhos, 2011). Thus, although the corrections of skeletal disproportions are successful, there are cases of bone and/or functional relapse due to reduced time of blockage, and subsequent lack of adaptation of the oral muscle and structures to the new intraoral configuration (Marchesan, & Bianchini, 1999).

On the other hand, for individuals who received orofacial myofunctional therapy, the statistical analysis showed lower scores in breathing, chewing, swallowing and speech, beyond the quality of life, after orthognathic surgery.

Although there are few published studies on the effectiveness of myofunctional therapy for the orofacial functions in the literature, in general, researchers have reported that the orofacial myofunctional intervention has shown to be efficient for rehabilitation in cases of oral breathing (Corrêa, & Bérzin, 2007; Gavishi, & Winocur, 2006; Guisti Braislín, & Cascella, 2006; Hellmann, Giannakopoulos, Blaser, Eberhard, & Schindler, 2011; Smithpeter, & Covell, 2010; Marson, Tessitore, Sakano, & Nermr, 2012; Saccomanno, Antonini, Alatri, D'Angelantonio, Fiorita, & Deli, 2012), as well as in masticatory dysfunction (Corrêa, & Bérzin, 2007; Hellmann, Giannakopoulos, Blaser, Eberhard, & Schindler, 2011; Kijak, Lietz-Kijak, Sliwinski, & Fraczak, 2013; Maffei, Garcia, Biase, Souza Camargo, Vianna-Lara, Grégio, & Azevedo-Alanis, 2014), Marson, Tessitore, Sakano, & Nermr, 2012; Richardson, Gonzalez, Crow, & Sussman, 2012; Shibuya, Ishida, Kobayashi, Hasegawa, Nibu, & Komori, 2013); atypical swallowing (Degan, & Pyppin-Rontani, 2005; Richardson, Gonzalez, Crow, & Sussman, 2012) and phonetic speech disorders (McAuliffe, & Cornwll, 2008), corroborating the present study.

Specifically regarding the masticatory function, the present results are similar to those shown in the literature, since one study also verified the effectiveness of a rehabilitation program for chewing in individuals undergoing orthognathic surgery, with significant improvement in

mandibular mobility and functional performance (Mangilli, 2012). In the study carried out by Pereira & Bianchini (2011), after surgical correction and myofunctional therapy, adjustment of chewing was verified in 68% of the sample, similar results as the present study. Besides, the morphological characteristics of the masticatory muscles which may also be influenced by the surgical-orthodontic treatment associated with myofunctional therapy, another study published by Trawitzki (2011) found an increase in the thickness of masseter muscles in individuals with skeletal Class III, three years after orthognathic surgery. However, such aspects were not considered in the present study, hindering comparisons.

This study also observed improvement in swallowing for individuals who had myofunctional therapy, as reported by Pereira & Bianchini (2011), who observed adequate function in 92% of the sample following post-surgical myofunctional treatment. This study also supported findings that corroborate with another study, in which the association of surgical and speech therapy treatments resulted in the adjustment of functional patterns, and swallowing which demonstrated an improvement of the functions and presented better results with myofunctional therapy (Pereira, & Bianchini, 2011).

The impact of orofacial myofunctional therapy on speech after orthognathic surgery, in the present study, was similar to the study of

Pereira & Bianchini (2011), which verified an adjustment of speech in 88% of the sample. Similarly, they also found a significant improvement in the speech function in 83% of individuals studied, with correction of anterior and lateral mandibular deviation, phonetic distortions, anterior tongue interposition and hyperfunction of the perioral muscles, following the myofunctional intervention post-surgery. Comparison between groups with and without myofunctional treatment, three months after orthognathic surgery, showed lower scores for the orofacial functions in the group submitted to myofunctional treatment, i.e. better functional performance for breathing, chewing, swallowing and speech. Thus, this result shows the importance of myofunctional therapy for the integration of oral functions, considering the need of muscle re-education after orthognathic surgery, as described in the literature (Trawitzki, Dantas, Elias-Junio, & Mello-Filho, 2011).

The presence of better oral health-related quality of life scores after orthognathic surgery in both groups studied, regardless of the myofunctional therapy intervention, agrees with many authors who demonstrated the positive effects of orthognathic surgery on the quality of life (Dantas, Neto, Carvalho, Martins, Souza, & Sarmento, 2015; Miguel, Palomares, & Feu, 2014; Naini, Cobourne, McDonald, & Wertheim, 2015; Raffaini, & Pisani, 2015; Sho, & Narayanan, 2013). The results revealed that the facial reconstructive and esthetic surgical

interventions improved the perception of body image and self-esteem with positive effects on the emotional, social and mental aspects, being efficient in improving the self-confidence and quality of life of these individuals. The performance of orofacial functions was expected to impact the quality of life in oral health, although this hypothesis was not confirmed. A possible explanation for this finding can be attributed to the characteristics of the protocol applied, which includes few questions that address aspects associated with others, related to feeding or communication. This was the first study to compare the orofacial functions in two groups of participants with and without myofunctional therapy after orthognathic surgery. The findings showed that the orofacial myofunctional therapist plays an important role in the orthognathic surgery

team, seeking the reorganization of muscle activity, which is necessary for the integration of orofacial functions following dentofacial adjustment. Further research must be developed with a larger sample using controlled and randomized, blind studies which includes longitudinal follow-up of patients.

CONCLUSION

Orofacial myofunctional therapy yielded better results in breathing, chewing, swallowing and speech for the individuals who underwent orthognathic surgery than the surgical procedure alone, which was associated with improved breathing and the oral health-related quality of life. This demonstrated the effectiveness of orofacial myofunctional therapy for the participants in this study.

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APPENDIX 1

Oral Health Impact Profile – 14
Oliveira BH, Nadanovsky P. Psychometric properties of the Brazilian version of the Oral Health Impact Profile-short form. Community Dent Oral Epidemiol 2005; 33:307-14

Nome: _____ Nº Prontuário: _____

Data: ____ / ____ / ____ Aluno: _____ *Escore* *Final:*

Limitação Funcional Você teve problemas para falar alguma palavra por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre Você sentiu que o sabor dos alimentos tem piorado por causa de problemas com os seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre <i>Escore parcial:</i> _____
Dor Física 1. Você já sentiu dores fortes em sua boca? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre Você tem se sentido incomodado ao comer algum alimento por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre <i>Escore parcial:</i> _____
Desconforto Psicológico Você tem ficado pouco à vontade por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre Você se sentiu estressado por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre <i>Escore parcial:</i> _____
Limitação Física Sua alimentação tem sido prejudicada por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre Você teve que parar suas refeições por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre <i>Escore parcial:</i> _____
Limitação Psicológica Você tem encontrado dificuldades para relaxar por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre Você já se sentiu um pouco envergonhado por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre <i>Escore parcial:</i> _____
Limitação Social Você tem estado um pouco irritado com outras pessoas por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre Você tem tido dificuldade em realizar suas atividades diárias por causa de problemas com seus dentes, sua boca ou dentadura? ☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre <i>Escore parcial:</i> _____

Incapacidade

Você já sentiu que a vida em geral ficou pior por causa de problemas com seus dentes, sua boca ou dentadura?

☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre

Você tem estado sem poder fazer suas atividades diárias por causa de problemas com seus dentes, sua boca ou dentadura?

☐ 0. Nunca ☐ 1. Quase nunca ☐ 2. Às vezes ☐ 3. Quase sempre ☐ 4. Sempre

Escore parcial: _____