

Speech-Language and Hearing Sciences Analysis in orthognathic surgery: a case study with a ten-year follow up

Análise fonoaudiológica na cirurgia ortognática: estudo de caso uma década após procedimento

Análisis fonoaudiológica en la cirugía ortognática: estudio de caso una década de evolución posquirúrgica

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Abstract

Introduction: dentofacial deformities are seen as extreme cases of facial typology variation, characterized by major changes in occlusion associated with functional modifications. It requires an ortho-surgical treatment, in which the bone bases are reconstructed through orthognathic surgery. Treatment and monitoring are required after surgery with a Speech-language Pathologist (SLP) in order to assist patients in the recognition of their new faces and in the adjustments of orofacial functional patterns, avoiding negative interferences. **Purpose:** to report an orthognathic surgery clinical case in a 10-year longitudinal follow-up through the analysis of the SLP assessments. **Case report:** a prognathous 26-year-old woman with Class III craniofacial deformity, presenting aesthetic and chewing complaints with indication for orthognathic surgery. Five SLP's assessments were conducted, as follows: the first

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one, in the preoperative stage; the second, 19 days after the surgery; the third, after three months of SLP rehabilitation; the fourth, after four months of follow-up as maintenance of the results obtained; and the fifth, ten years after the surgical intervention. In the preoperative assessment, changes were recorded in the myofunctional pattern related to chewing, swallowing, speech and breathing functions. Improvements in the lip, cheek and masseter muscles were reported after SLP therapy, as well as in tongue posture and mandibular range of motion. After 10 years, favorable changes were observed in breathing pattern and tongue posture at rest, organization and stability of speech, articulation, and swallowing patterns, as well as in the patient's self-esteem. **Final considerations:** the SLP approach associated with orthognathic surgery and orthodontics procedure achieved evolutions and proved to be effective, leading this patient to satisfactory new adjustments of the myofunctional pattern.

Keywords: Orthognathic Surgery; Speech-Language and Hearing Sciences; Case Reports; Maxillofacial Abnormalities.

Resumo

Introdução: desproporções esqueléticas são consideradas casos extremos de variação da tipologia facial, caracterizadas por grandes alterações da oclusão associadas a modificações funcionais. O tratamento é orto-cirúrgico, com reconstrução das bases ósseas por meio de cirurgia ortognática. Após essa cirurgia, o acompanhamento fonoaudiológico auxilia o paciente no reconhecimento da nova face e nas readaptações das funções de respiração, fala, mastigação e deglutição. **Objetivo:** apresentar relato de caso clínico de cirurgia ortognática, em seguimento longitudinal de 10 anos, por meio de análise das avaliações fonoaudiológicas. **Relato do caso:** mulher, 26 anos, portadora de deformidade craniofacial do tipo Classe III, prognata, com queixa estética e de mastigação, com indicação de cirurgia ortognática. Foram realizadas cinco avaliações fonoaudiológicas, sendo: a primeira na fase pré-operatória, segunda no 19º dia de pós-operatório, terceira após três meses de reabilitação fonoaudiológica, quarta após quatro meses de manutenção dos resultados obtidos e a quinta após 10 anos da intervenção cirúrgica. Em avaliação pré-cirúrgica foi registrada alteração no padrão miofuncional relacionado às funções de mastigação, deglutição, fala e respiração. Após terapia fonoaudiológica observou-se melhora da musculatura de lábios, bochecha, masseter e postura de língua, bem como na amplitude dos movimentos mandibulares. Em 10 anos observa-se estabilidade nos padrões funcionais de respiração, posicionamento de língua em repouso, organização do padrão da fala, articulação, deglutição, assim como na autoestima da paciente. **Considerações finais:** o tratamento fonoaudiológico associado à cirurgia ortognática e à ortodontia mostrou evoluções e eficácia, para nesse caso, atingir satisfação da paciente aos novos ajustes do padrão miofuncional.

Palavras-chave: Cirurgia Ortognática; Fonoaudiologia; Relatos de Casos; Anormalidades Maxilofaciais.

Resumen

Introducción: Desproporciones esqueléticas son consideradas casos extremos de variaciones de la tipología facial, caracterizadas por grandes alteraciones de la oclusión asociadas a las modificaciones funcionales. El tratamiento es echo con ortodoncia y cirugía ortognática, con reconstrucción de las bases óseas y estabilización oclusal. Después de esa cirugía, acompañamiento fonoaudiólogo auxilia el paciente en el reconocimiento facial y en las readaptaciones de las funciones estomatognáticas. **Objetivo:** Presentar relato de caso clínico de cirugía ortognática, en seguimiento longitudinal de 10 años, por medio de análisis de las evaluaciones fonoaudiológicas. **Relato del caso:** Mujer, 26 años portadora de deformidad cráneo facial del tipo clase III, prognata, con queja estética y de masticación, con indicación de cirugía ortognática. Fueron realizadas cinco evaluaciones fonoaudiológicas, siendo: la primera en la fase pre-operatorio, segunda en el 19º día de post operatorio, tercera después de tres meses de rehabilitación fonoaudiológica, cuarta después de cuatro meses de mantención de los resultados obtenidos y la quinta después de 10 años de la intervención de cirugía. En la evaluación preoperatorio fue registrada alteración en el patrón miofuncional relacionado a las funciones de masticación, deglución, habla y respiración. Después terapia

fonoaudiológica se observó mejora en la musculatura de labios, mejillas, masseter (musculo masetero) y postura de la lengua, bien como en el patrón de oclusión. En 10 años se observa el cambio favorable en el patrón de respiración y posicionamiento de la lengua en reposo, organización y estabilidad del patrón de habla, articulación, deglución, así como en el auto estima de la paciente. **Consideraciones Finales:** El tratamiento fonoaudiológico asociado a la cirugía ortognática y la ortodoncia mostro evoluciones y eficacia, para en ese caso, alcanzar satisfacción de la paciente a los nuevos ajustes del patrón miofuncional.

Palabras clave: Cirugía Ortognática; Fonoaudiología; Informes de Casos; Anomalías Maxilofaciales

Introduction

The stomatognathic system consists of hard and soft tissues, nervous, lymphatic and vascular systems, which relate in a complex and harmonic way to provide the performance of breathing, sucking, chewing, swallowing and speech functions, in addition to the head posture and usual position of the tongue and lips¹⁻⁴.

When there are changes in occlusion and facial typology associated with skeletal disproportions, the correction includes an orthognathic surgery to restore a harmonious facial pattern⁴⁻⁶.

Orthognathic surgery corrects dentofacial deformities (DFD) and is regarded as an efficient method to balance stomatognathic functions and provide harmony between anatomical structures^{2,3,5-8}. Since structural changes in the face impacts the temporomandibular joint (TMJ), breathing, chewing, swallowing and speech production, the speech-language pathologists are involved in the care of patients referred to this surgical procedure, with an assisting role for a good prognosis⁶⁻⁸.

Skeletal classifications and three-dimensional reconstructions of the face made it possible to analyze and classify more precisely the position of the maxillomandibular bone bases, as well as facial asymmetries, and the upper airway. High-definition imaging exams made it possible to determine the degree and exact location of the deformity⁹.

Patients with these structural changes may have significant functional difficulties, such as changes in breathing pattern, difficulty in chewing, reduction and organization of the bolus; in addition, those with severe malocclusions have worse chewing performance^{1,3,4,6,8-12}.

Patients also have a larger mandible in relation to the upper jaw in the Class III dentoskeletal pattern, due to mandibular prognathism (greater growth of the mandible in relation to the jaw) and maxillary deficiency (flattening of the middle third of the face), or both^{2,3,6,8,11}.

Given these deformities, a class III patient is expected to have myofunctional changes, such as: half-open lip posture, with predominant oral breathing, changes in lips tone, pressure and tongue resistance with resting posture on the floor of the mouth due to the greater size and depth of the jaw^{6,8,10,12}.

Regarding chewing, the ideal pattern reported in the literature is the bilateral alternation, with sealed lip movements and rotation of the jaw, without moving the head or other parts of the body, allowing the distribution of masticatory forces with functional and muscular balance, but depending on factors of occlusal balance¹⁴⁻¹⁷. This chewing can be adapted according to the orofacial structures. However, Class III patients show a greater predominance of vertical movement, without lateral movements of the mandible. There may be little or no action of the buccinator muscles during chewing due to the discrepancy of the bone bases and occlusal changes¹⁵⁻¹⁷.

Class III patients also show a direct functional relationship between head and neck posture during chewing and possible changes in muscles and mandibular posture^{15,18}, as well as with pain symptoms, especially when they open their mouths to yawn, drink, smile and talk^{19,20}.

Speech changes may occur according to the severity of the structural problem, as in cases of people who have prognathism, who may have with a previous lisp associated with the protrusion of the lower bone base in relation to the upper bone base¹².

Acceptance with facial appearance is another predominant aspect that consequently impairs self-esteem^{21,22}.

Therefore, orthodontic treatment alone may not restore an ideal occlusion in these cases, requiring surgical intervention²³ to improve the deformity, approaching as much as possible to the functional and aesthetic alignment expected by the patient^{1,5,9,24}.

Class III patients undergoing the procedure may have changes in lip sensitivity and paresthesia²⁵, which impair chewing pattern.

Although the recovery of the functionality of the stomatognathic system may occur over time, studies show the effectiveness of speech-language pathology intervention in the postoperative period to assist, accelerate and organize tone, mobility and orofacial functionality, in addition to encouraging the reduction of paresthesia and resumption of mandibular movements in its total amplitude^{15,20,26,27}.

A treatment involving the orthodontist and the maxillofacial surgeon is required before surgery for this procedure to be successful, as orthodontic preparation is essential for the correction of dental compensations in the preoperative period, in order to allow the accommodation of the occlusion at the time of proper bone positioning during orthognathic surgery²⁷.

Considering these implications, the intervention of the speech-language pathologist is essential before and after surgery, offering a careful clinical evaluation to understand the anatomical and functional conditions of the stomatognathic system and follow the clinical reasoning¹³.

After surgery, speech-language pathology monitoring assists the patient in recognizing the new face, as well as improving or correcting breathing, speech, chewing and swallowing functions. However, an evaluation before surgery is recommended for prior knowledge of the myofunctional speech-language patterns to be addressed after the surgical intervention^{1,3,4,6-8,10,28}.

Although descriptions and studies referring to aspects obtained with orthognathic surgery are widely disseminated in the literature, long-term follow-up of cases is rarely addressed. Given such a thorough procedure with structural and psychological aspects involved^{11,15, 24}, this study used a case study and aimed to retrieve the pre- and post-surgical evaluation files and repeat them after 10 years in order to verify the progress of speech-language pathology aspects after this intervention period.

Therefore, the objective of this study is to present a case report of orthognathic surgery in a 10-year longitudinal follow-up through the analysis of speech-language evaluations.

Method

This is a longitudinal case study approved by the Research Ethics Committee under CAAE no.: 04717218.2.0000.5482, after relevant ethical processes.

The analysis included the participant's history consisting of relevant personal data, clinical history data and the description of multidisciplinary medical records: dental, medical, and speech-language pathology before and after the procedures performed.

As for the dental tests analyzed in particular, the study analyzed the photographic records made at the beginning and during the treatment, as well as the panoramic radiographs, teleradiography and respective cephalometric tracings.

The medical exams surveyed consisted of photos of the face and occlusion before and after surgery, image records of the surgery and description of the surgical procedures performed.

The static records of the speech-language pathology record were also included, such as: photos of the face, teeth and occlusion; in addition to the functional records recorded on video: mandibular movements: opening, laterality and protrusion, habitual oral posture and the functional aspects of breathing, chewing, swallowing and articulation of spontaneous and directed speech for possible comparison. The speech-language pathology assessment data were analyzed through the assessment tool of the institution²⁹. The speech-language pathology records also made it possible to identify the complaints and impressions of the patient about the problem and the surgery.

The speech-language evaluations were conducted at five different times, namely: 1st - in the preoperative phase; 2nd - on the 19th day after the surgery; 3rd - three months, followed by the speech-language pathology assessment (109 days after surgery); 4th - four months after completion of treatment (229 days after surgery); and, 5th 10 years after the surgical intervention.

As a complementary follow-up, the fifth assessment also included data from surface electromyography of the masticatory muscles.

Finally, an analysis was carried out associating all the previously described records.

Case report

A woman who was 26 years old at the beginning of the process, had a Class III bilateral craniofacial deformity: maxillary deficiency and mandibular excess; with aesthetic complaints and difficulty in chewing.

As for family history, it was found that the father had the same facial and occlusion pattern and the mother had cleft palate.

The patient used an orthodontic appliance for eight years, with a therapeutic limit to improve occlusion.

Decided to perform orthognathic surgery, the patient sought a dental team: orthodontist and buccomaxillofacial surgeon to perform the procedure.

The preparation of occlusion was performed during the preoperative period, in order to organize the position and inclination of the teeth in relation to the position of the bone bases. The extraction of the two premolar teeth of the upper arch and the four third molars was necessary in this process. After three years of orthodontic preparation, the patient was able to undergo a surgical procedure. The discrepancy between the maxillomandibular bone bases was even more evident as a result of the correction of the inclination of the teeth, making surgical correction and occlusal organization feasible in the trans-surgical period.

On her own initiative, the patient sought a speech-language pathology care prior to surgery for preoperative speech evaluation and guidance.

Initial complaints included: difficulty in articulating some speech sounds and chewing and holding food. The patient also reported the presence of headache and pain in the region of the temporomandibular joints (TMJ), usually at the end of the day or after long periods of speech. In addition, the patient reported dissatisfaction regarding aesthetics, with dissatisfaction with the mandibular protrusion and the presence of dark circles.

First speech-language pathology evaluation - preoperative phase:

In a myofunctional examination in the preoperative phase, the patient had a head posture slightly turned to the right, half-open lips at rest with sealing hampered by bone base discrepancy and intense occlusal modification.

Predominant mouth breathing, flabby lower lip with eversion and slender upper lip indicating functional hypotonia of the orbicularis oris muscle were also noticed. As well as an asymmetrical upper lip with hyperfunction on the right during smile and speech articulation. Usual tongue posture was recorded in anterior interdental position.

The evaluation of the musculature showed: mental muscles in functional hypertonia, especially

during lip occlusion; very flaccid buccinator muscles and with reduced force bilaterally; masseter and temporalis with signs of bilateral hyperfunction, with pain on palpation.

Mouth opening and closing movements were recorded, with mandibular deviation to the right at maximum opening and joint noise during directed movement. Regarding the measurements, a 6mm negative overjet was observed; as well as 1.5mm overbite; and non-central dentoskeletal midline (2mm to the left). The mandibular movements recorded a maximum opening of 58.5 mm, a mandibular laterality of 10 mm for both sides and a protrusion of 7 mm. Thus, a corrected mandibular deviation to the right at the end of the opening and joint crackling noise on the left side, in the opening and closing of the mandible, were evidenced.

Chewing showed disorganized jaw movements, deficiency in the preparation of the bolus and interdental tongue pressure during swallowing.

In particular, speech showed audible distortion in sibilant fricative phonemes [s] and [z] and visible distortions in previous linguodental phonemes [t], [d], [n].

The procedure for correcting the disproportion occurred through bimaxillary surgery and chin repair as follows: Le Fort I maxillary osteotomy with maxillary advancement and rotation, sagittal mandibular osteotomy with reduction and rotation of the mandibular segment, associated with advancement mentoplasty of the segment. Rigid fixation was performed using monocortical and transcortical plates and screws.

During the first eight days of the postoperative period, the patient used orthodontic elastic bands with minimal mouth opening and liquid feeding. After that date, the patient started a pasty diet, with greater mouth opening, still using elastic bands that were removed only for food and hygiene. Three sessions of facial lymphatic drainage were performed, with a physiotherapist, between the 5th and 12th days after surgery, prior to the speech-language pathology intervention.

The patient used a fixation plate and palatal stabilization until the 18th postoperative day.

Second speech-language pathology assessment - post-operative phase (on the 19th day after the surgery):

After surgical intervention, the patient underwent speech-language pathology reevaluation, with

complaints of difficulties in nasal breathing and to open her mouth. This reassessment found: habitual posture, posture directed by lips occluded at rest, movements directed at the facial mimic muscles, mandibular movements and functionality as expected for this stage.

Spontaneous recovery was observed on examination, with residual edema in the paranasal region, lips, mandibular body and chin, paresthesia in the chin region and gums with signs of recovery in the chin.

The evaluation also reported much reduced mobility of the muscles of the lips and cheeks, hypomobility and significant asymmetry in the upper lip in a half smile, inadequacy of the usual tongue posture keeping it on the floor of the mouth as a pattern prior to surgery, resulting in support and lingual pressure on dental arches.

In this evaluation, it was possible to observe a bilateral Class I dentoskeletal occlusal pattern, with positive overlap of 1mm, overbite of 0.5mm, non-central dentoskeletal midline (2mm to the left).

As for the mouth opening movements, there was a restriction of amplitude, typical of the post-surgical stage, but with an important deviation of the mandible to the right side. Very limited mandibular movements were found, with a maximum opening of 11 mm, laterality absent on both sides, and a protrusion of only 0.5 mm. The following data were obtained after initial guidance on the same date: maximum opening of 16mm, laterality to the left of 2mm, to the right of 4mm and protrusion of 1mm.

As for functionality, there was hypomobility in speech, oronasal breathing requiring oral supplementation, swallowing with still inverted lingual movement - posteroanterior - ending with support and anterior pressure against the dental arches. At this stage, the patient could not yet perform a functional assessment of chewing.

A myofunctional speech-language pathology rehabilitation was performed weekly for three months considering the following steps^{8, 12, 17, 30}

- Explanation of the new myofunctional posture and guidelines for creating new habits;
- Manual drainage on remaining edema to maximize movement;
- Sensitivity stimulation with eventual touch and use of ice;

- Specific manipulation inducing movements of compromised muscle groups;
- Myotherapy with isotonic exercises to assist in the process of releasing muscles involved, as well as oxygenation and fiber coordination;
- Speech training;
- Breathing exercises;
- Functional swallowing exercises;
- Specific work to direct mandibular and TMJ movements;
- Functional chewing training according to the release of food texture.

Third speech-language pathology assessment: post-speech-language pathology therapy (109 days after surgery):

A reassessment session after systematic speech-language pathology treatment consisting of 12 sessions in three months recorded: remission of complaints and organization of functional patterns, stability of the orofacial muscles and improvement in breathing pattern. Paresthesia still present in the lower central mental region, normalized in the lower lip region.

Measurements at that session were as follows: positive overjet of 4mm, overbite of 2mm. The mandibular movements recorded a maximum opening of 47mm, a mandibular laterality of 9mm for both sides and a protrusion of 8mm. There was also a mandibular deviation to the left at the end of the maximum opening, without significant joint noise.

Maintenance treatment was carried out in sporadic, biweekly and monthly sessions.

Fourth speech-language pathology assessment: after speech-language pathology maintenance (229 days after surgery):

After the completion of the systematic speech-language pathology treatment, a sporadic monitoring was carried out to verify the maintenance of the results obtained for four months. Sequential functional records were made during these sessions and an observation of posture and functionality was requested as a therapeutic direction. After these four months, a new speech-language reassessment was performed. This stage was equivalent to seven months after surgery, and the patient was discharged from speech-language pathology therapy due to the myofunctional stability found.

The patient’s discharge presupposed the maintenance of postural observation and the correct patterns of chewing and swallowing, as well as the performance of tongue coupling exercise on the palate aiming at the continuous stimulation of the new postural pattern.

Orthodontic treatment was completed 1 year and 4 months after surgery with the removal of the fixed appliance.

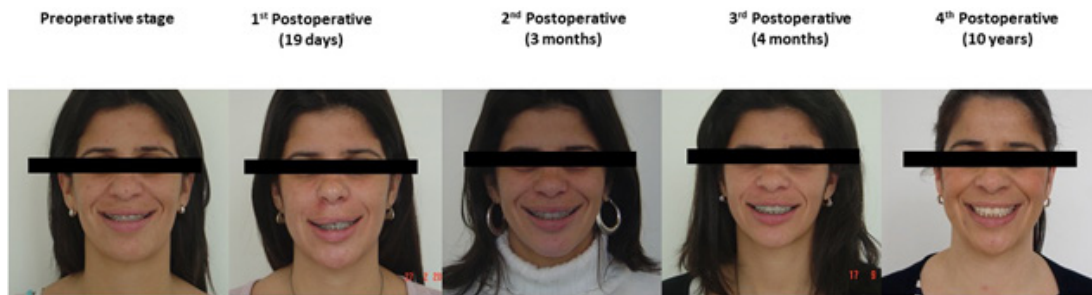
Fifth speech-language pathology assessment: 10 years after surgical intervention:

Ten years after the surgical intervention, the participant contacted the speech-language pa-

thologist for a new comparative evaluation out of curiosity, since at this moment she also works in the speech-language pathology field.

In the new myofunctional examination, the patient had a linear head posture to the body, lips occluded at rest, maintaining slight asymmetry in the upper lip and small eversion in the lower lip, with gain unrelated to the initial assessment. An improvement in balance for smile function and speech articulation was recorded.

This progressive improvement is shown in the sequential records in figures 1,2 and 3 illustrated with the evaluation records, considering the resting position, smile and lateral resting position.



Legend: Comparison of the smile in the preoperative assessments, and 19 days, 3 months, 4 months and 10 years after surgery.

Figure 1. Comparison of smile in the five evaluations



Legend: Comparison of the resting position in the preoperative assessments, and 19 days, 3 months, 4 months and 10 years after surgery.

Figure 2. Comparison of resting position in the five evaluations



Legend: Comparison of the lateral rest in the preoperative assessments, and 19 days, 3 months, 4 months and 10 years after surgery.

Figure 3. Comparison of lateral rest in the five evaluations

Dentition alignment was also analyzed in the evaluation 10 years after the procedure, now without the orthodontic appliance, allowing comparison

with the preoperative period and after 4 months of surgical intervention, as shown in Figure 4.

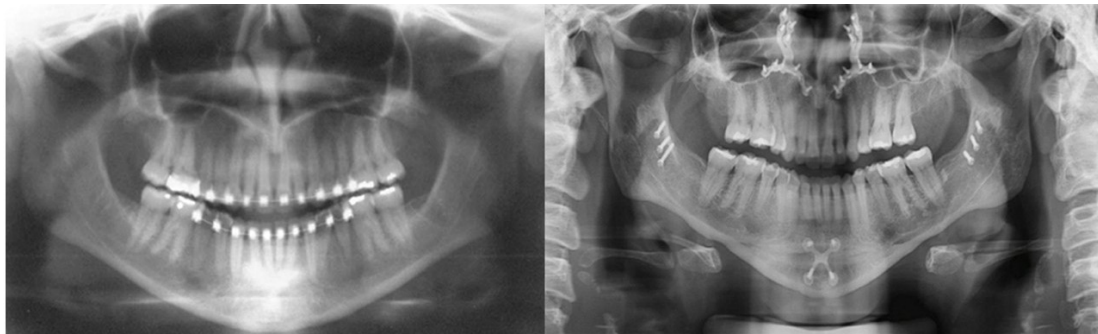


Legend: Comparison of the dental arch in the preoperative assessments, and 4 months and 10 years after surgery.

Figure 4. Comparison of dental arch in the preoperative assessments and 4 months and 10 years after surgery

New radiographs were taken in this period: panoramic and teleradiography, to compare the craniofacial structure

The breathing pattern was predominantly nasal, and habitual tongue posture was predominant on the floor of the mouth, with contact of the median region on the palate.



Legend: Preoperative and postoperative panoramic radiography showing the regions of osteotomies and fixations.

Figure 5. Comparison of radiographs in the preoperative assessments and 10 years after surgery

The intra and extra-oral sensitivity that was recorded in the immediate postoperative period as impaired²⁵, 10 years after the procedure was reported as without detriment. The new assessment also found a uvula asymmetry, which was not identified in previous tests.

The range of mandibular movements remained stable with values compatible with the normal range. In this final evaluation, the maximum mandibular opening showed a deviation to the right corrected at the end of the movement, which was similar to that obtained in the first speech-language assessment, in the pre-surgical period.

It is worth noting that the evolution of mandibular movements is linked to the musculature and TMJs, being a cause of concern mainly regarding joint responses after the repositioning of the bone bases^{18,19}. In this case report, it was understood that the myofunctional direction provided the rapid and satisfactory evolution of these movements in 12 weeks of therapy, without any painful and/or restrictive symptoms, remaining stable for a decade.

There was a greater predominance of activation of the musculature on the right in clinical and electromyographic evaluation of chewing and swallowing functions, despite bilateral chewing. According to the findings of studies observed in the short postoperative period of the intervention, the organization of swallowing was shown^{15,16,18,30}. Regarding speech, there was an improvement in production, mainly with sibilant fricatives,¹³ without complaints regarding this function.

In the last evaluation, the patient reported satisfaction with the procedure, especially with regard to aesthetic improvement, referring to the change in prognathism, reduction of dark circles and changes in the smile pattern, now with an apparent upper arch. These changes are related to the quality of life studies of patients undergoing this type of procedure in which the image becomes the great incentive for surgical intervention^{7,22,23,29}.

Speech-language pathology therapy allowed observing gains in the adequacy of the usual postures of the lips, tongue and jaw^{2,7,8}, with an increase in postural tone and mobility^{18,19}, despite the apex posture of the tongue remaining on the floor. According to the literature, this item refers to the most difficult point of treatment due to the reduction of lower space and previous habit⁸.

The perception focused on the stomatognathic system, as well as the adequacy of breathing, chew-

ing, swallowing and speech functions were also aspects to be developed in therapy, as reported in the literature as necessary for patients undergoing orthognathic surgery to reduce the mandible and advance the jaw^{2,3,7,8}.

The absence of pain in the temporomandibular joint (TMJ) was also observed, as reported in the literature⁸, as well as an improvement in sleep quality.

Final Considerations

Speech-language pathology therapy associated with orthosurgical treatment proved to be an important rehabilitation procedure after orthognathic surgery to, in this case, achieve patient satisfaction with new adjustments of the myofunctional and aesthetic pattern, which were maintained and even improved 10 years after the intervention.

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