

Orthodontic-surgical treatment of skeletal facial asymmetry: Case report

Susiane Allgayer*, Fernanda Santos Mezzomo**, Waldemar Daudt Polido***, Gabriella Rosenbach****, Carlos Alberto Estevanell Tavares*****

Abstract

Introduction: Facial asymmetries consist of an imbalance between the homologous skeletal structures of the face. Most people present some degree of facial asymmetry, since a state of perfect symmetry is rare. This common asymmetry only becomes relevant when it is perceivable by the patient. In this situation, either orthodontic surgical correction or orthodontic treatment is normally chosen. **Objective:** This study, based on literature review, has been illustrated by a case report comprising Le Fort I orthognathic surgery for maxillary advancement and rotation, with conservative treatment for the mandible. **Conclusion:** Knowledge of the patient's chief complaint and expectations, as well as proper diagnostic exams, are important factors to decide the treatment plan and for the final treatment outcome.

Keywords: Facial asymmetry. Corrective orthodontics. Tooth extraction. Esthetics.

INTRODUCTION

Facial symmetry is a state of balance in which both sides of the face are perfectly related and therefore present the same size, shape and position. Conversely, the term asymmetry is used when there is imbalance between the homologous parts of the dentofacial complex, thereby affecting the proportion between structures.¹

The facial asymmetry may often be subclinical. In this condition, the skeletal disharmony exists yet it is masked by the overlying soft tissues.^{2,3}

Thus, the soft tissues superimposed to the bone structures, such as the masseter muscle, may minimize or even compensate an existing skeletal deformity. Therefore, when there is discrepancy between the skeletal measurements and facial appearance, the influence of soft tissues on the facial asymmetries should be considered.³

According to some authors,^{2,3} the clinical expression of asymmetry only occurs when the bone deviation is at least 4 mm. Below this value, the asymmetry is considered to be subclinical.

How to cite this article: Allgayer S, Mezzomo FS, Polido WD, Rosenbach G, Tavares CAE. Orthodontic-surgical treatment of skeletal facial asymmetry: Case report. *Dental Press J Orthod.* 2011 Nov-Dec;16(6):100-10.

» The authors report no commercial, proprietary, or financial interest in the products or companies described in this article.

* PhD student and MSc in Orthodontics, Pontifical Catholic University of Rio Grande do Sul, Brazil (PUC/RS). Specialist in Orthodontics and Endodontics, ABO/RS.

** Specialist in Orthodontics, ABO/RS.

*** PhD and MSc in Oral and Maxillofacial Surgery, PUC/RS. Head of Implant Specialization Course, ABO/RS.

**** PhD, University of Munich, Germany. MSc and Specialist in Orthodontics, State University of Rio de Janeiro. Professor, Specialization Course in Orthodontics, ABO/RS.

***** PhD and MSc in Orthodontics, Federal University of Rio de Janeiro. Professor, Specialization Course in Orthodontics, ABO/RS. Diplomat of the Brazilian Board of Orthodontics and Facial Orthopedics (BBO).

That is to say, human sensitivity to notice facial imbalances occurs more easily if the deformation is closer to or greater than 4 mm. However, the expression of asymmetry or its attenuation depend on individual characteristics, such as the soft tissue thickness over the imbalance region.

Within this context, this study conducted a literature review on the skeletal facial asymmetries, illustrating with a case report of asymmetry involving both the maxilla and the mandible, in which the treatment plan of choice was the association of surgical treatment on the maxilla and conservative treatment for the mandible.

SKELETAL FACIAL ASYMMETRIES

Dentofacial deformities affect approximately 20% of the population, and patients with these discrepancies may present several degrees of functional and esthetic involvement,⁴ being classified as isolated mandibular asymmetries or maxillomandibular asymmetries. However, there are no isolated maxillary asymmetries, because a deformed maxilla simultaneously causes mandibular disorders.⁵

The mandibular asymmetries may be caused by excessive or deficient growth of the mandibular body and ramus, or the mandible may be deviated due to asymmetric growth of other structures. These conditions cause mandibular laterognathism, i.e., mandibular deviation to one side of the facial midline.⁵ Some studies explain that the higher prevalence of mandibular asymmetries may be related to the longer period of mandibular growth when compared to the maxilla, thus increasing the chances of deviations. Also, the mandible is a mobile bone, while the maxilla is rigidly connected to other bone structures through sutures and synchondroses.^{3,6} The condyle is the main growth center of the mandible; for this reason, injuries to this area during the growth period may cause disturbances in mandibular growth.^{7,8}

Even though the studies conducted by H. Peck and S. Peck⁹ did not reveal significant difference in the side of mandibular deviation, in cases of

mandibular skeletal asymmetry, according to Haraguchi et al,⁶ the lateral deviation is more common on the lower facial third, and 85% of dentofacial deformities present lateral deviations to the left side, a tendency that is corroborated by other studies.^{2,6,10} In addition, Bell, Proffit and White¹¹ related skeletal asymmetries to Class III malocclusion observing that 40% of these malocclusions cases presented some degree of facial asymmetry.

During the anamnesis, it is important to establish the chief complaint of the patient, identify if the facial imbalance is perceived and if this condition causes discomfort and dissatisfaction. The history of traumas, ankylosis or lesions such as osteochondromas affecting the temporomandibular joint, intra-articular disorders, birth by forceps, condylar fractures, ear infections, inadequate use of orthopedic appliances,^{11,13} besides lesions to facial nerves, are possible causes of asymmetries.¹²

During the clinical examination, the extraoral analysis is fundamental in the diagnosis of asymmetries, since analysis of the facial proportions or of the degree of imbalance between the facial thirds and homologous facial structures usually indicates the site of imbalance.¹¹ Analysis of facial proportions allows evaluation of the harmony between facial thirds, which should have a 1:1 ratio. In the lateral evaluation, if one lip is behind or beyond the Steiner's S line, there may be a disproportion between the maxilla and mandible, consequently causing an imbalance between the facial structures.¹¹

In the intraoral examination, dental evaluation in centric relation should include the analysis of dental midlines, their relation to the facial midline, existence of crossbite or inclination of the occlusal plane.¹⁴ If the dental midlines are coincident, a deviation of up to 4 mm to one side of the facial midline may not be detected by laypersons; however, if the crowns of incisors are tipped, deviations above 2 mm may be perceptible.^{15,16,17}

The radiographic examination plays an important role in this type of deformity and may aid the orthodontist in defining the site, nature and

magnitude of asymmetry.¹³ The posteroanterior radiograph (PA) is a valuable tool to compare structures between the right and left sides of the face.⁶ If the dental midlines are coincident and deviated up to nearly 2 mm from the facial midline, this will still be considered a harmonious situation, since the aforementioned degree of deviation is not perceptible to the layperson and may be attenuated by the soft tissues of the face.^{3,6,18} The lateral cephalometric radiograph provides information on the anteroposterior component of the deformity.⁵

When the treatment options are mentioned, it is important to evaluate the efficacy of these. In case of skeletal imbalance, in which the professional must decide between surgical or non-surgical treatment, it should be clear the amount of esthetic, dental and facial improvements provided by the selected treatment plan.¹³ Even though the surgical correction may be preferable for severe cases and after completion of bone growth, camouflage is a conservative treatment option indicated for correction of mild asymmetries.^{16,19,20} The treatment for skeletal asymmetries may comprise an association between conservative treatment and orthognathic surgery.^{21,22} Thus, the imbalance may be surgically corrected in one jaw and by dental compensation in the other one. Following the alignment and leveling stage, the final objective is to achieve adequate occlusion with coincidence of maxillary and mandibular midlines.²⁰

CASE REPORT

A Caucasian female patient, 17 years and 4 months old, searched for orthodontic treatment with the chief complaint of "crossbite". The patient reported a history without dental and/or skeletal traumas to the facial structures and did not present any systemic alteration or history of previous pathologies.

Diagnosis

The extraoral examination revealed facial asymmetry of the lower facial third, with

mandibular skeletal laterognathism to the left side and mild maxillary skeletal laterognathism to the right side. The deficiency in anteroposterior direction in the mid facial third was easily identified by the deep paranasal and infraorbital regions, deep nasogenian grooves, lack of support to the upper lip and thin nasal base. The lower lip was protruded in 4 mm in relation to the S line (Figs 1A-E).

The intraoral examination revealed molar Class III relationship on both sides and canine Class III relationship on the right side and Class I relationship on the left side, as well as absence of third molars and mandibular right first premolar. The maxillary dental midline was dislocated 2 mm to the right side, and the mandibular dental midline was deviated 2.5 mm to the left side. The premature contact caused by the maxillary left central incisor led to a forward mandibular deviation, generating crossbite at the region of maxillary left central and lateral incisors and canine, and left posterior region (Figs 1F-J).

The cephalometric analysis (Figs 3B, 3C and Table 1) presented a skeletal Class III pattern with an important vertical component, as displayed by these cephalometric measures: ANB= -2°, WITTS= -6,5 mm, SN.GoGn= 35° and FMA= 29°. Analysis of the posteroanterior radiograph (Figs 3D, E) revealed mild maxillary deviation of 0.5 mm to the right side and mandibular deviation of 3 mm to the left side. The panoramic radiograph (Fig 3A) revealed the presence of impacted third molars, except for the maxillary right and left third molars, which were absent.

Treatment options

The following treatment options were presented to the patient:

1) Orthodontic treatment associated with combined orthognathic surgery in the maxilla and mandible, with extraction of three premolars, followed by maxillary advancement with rotation to the left side and mandibular rotation to the right side.



FIGURE 1 - Extraoral (A, B, C, D, E) and intraoral (F, G, H, I, J) initial photographs.

The orthodontic treatment should be finished in Class I molar and canine relationship and dental midlines coincident to each other and to the facial midline.

2) Orthodontic treatment associated to orthognathic surgery only in the maxilla, with extraction of three premolars, followed by maxillary advancement with rotation to the left side. The orthodontic treatment should be finished with

Class I molar and canine relationship and the dental midlines coincident to each other, yet deviated to the left side in relation to the facial midline.

Based on the diagnostic data and according to the patient decision, the second treatment plan was performed with maxillary advancement and rotation to the left side. In the mandible the treatment comprised only correction of tooth positioning, thus maintaining the mandibular lateral deviation.

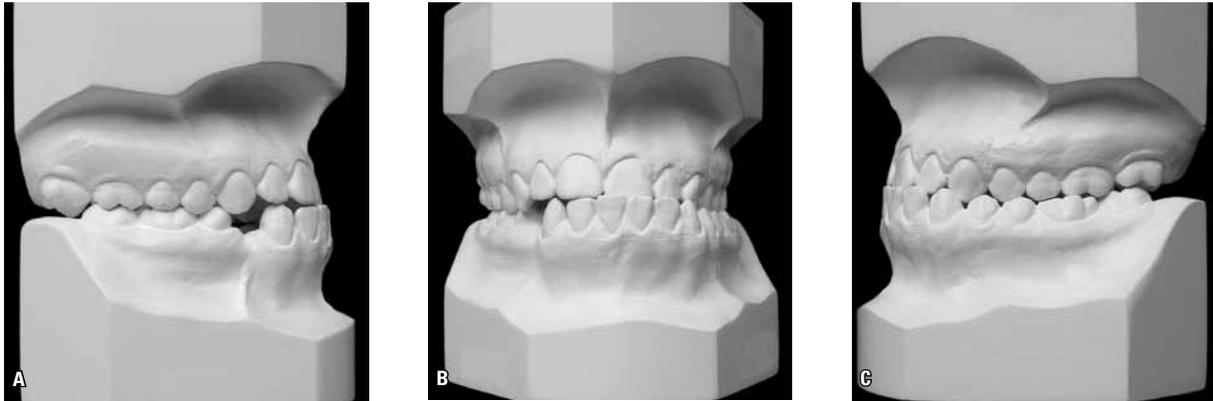


FIGURE 2 - Photograph of initial dental casts.

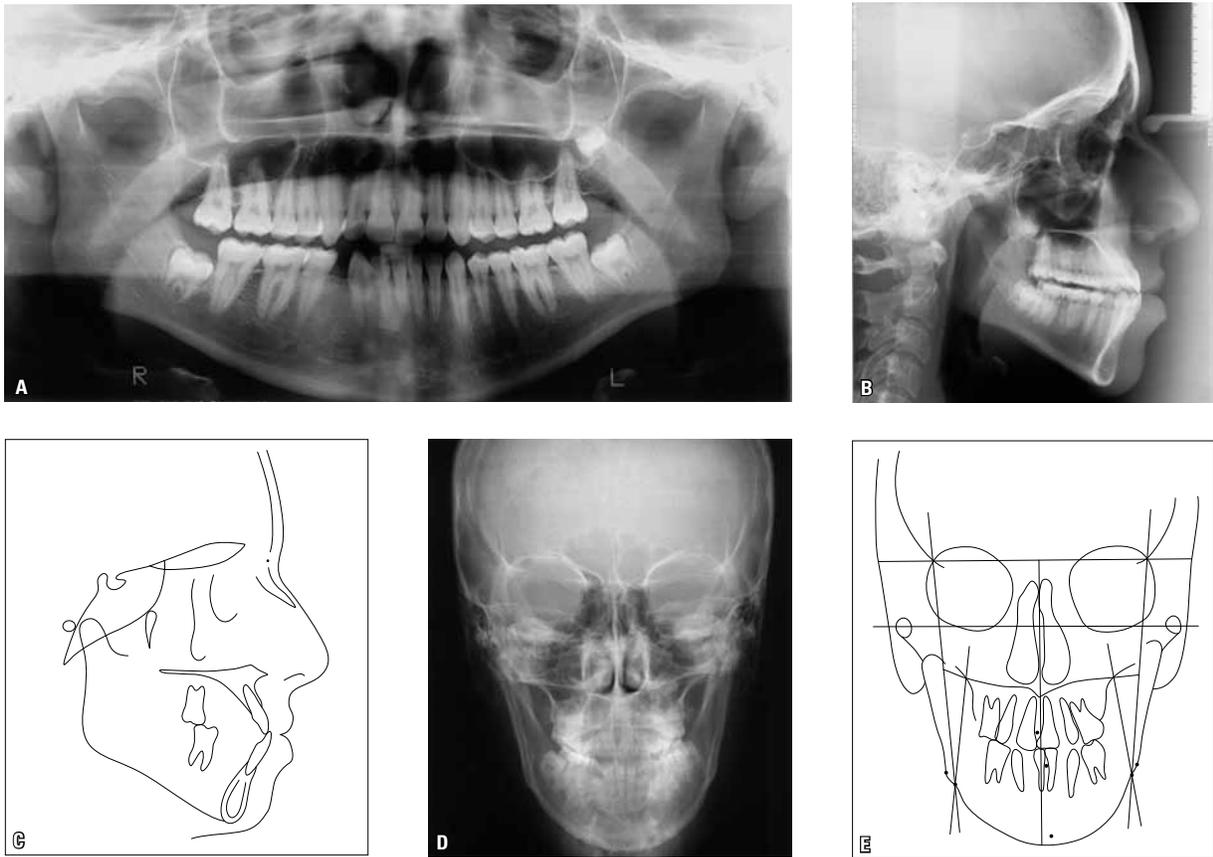


FIGURE 3 - **A)** Initial panoramic radiograph, **B)** initial lateral cephalometric radiograph, **C)** initial cephalometric tracing, **D)** initial posteroanterior radiograph, **E)** initial cephalometric tracing.

TABLE 1 - Summary of cephalometric measurements.

	MEASURES	NORMAL	INITIAL	FINAL
			(A)	(B)
Skeletal pattern	SNA (Steiner)	82°	77°	79°
	SNB (Steiner)	80°	75°	79°
	ANB (Steiner)	2°	- 2°	0°
	Facial conv. angle (Downs)	0°	- 3°	0°
	Y axis (Downs)	59°	62°	60°
	Facial angle (Downs)	87°	85°	86°
	SN-GoGn (Steiner)	32°	35°	35°
	FMA (Tweed)	25°	29°	29°
Dental pattern	IMPA (Tweed)	90°	89°	81°
	1-NA (°) (Steiner)	22°	33°	34°
	1-NA (mm) (Steiner)	4 mm	9.5 mm	7 mm
	1-NB (°) (Steiner)	25°	24°	17°
	1-NB (mm) (Steiner)	4 mm	8 mm	4 mm
	Interincisal angle (Downs)	130°	125°	129°
	LI-to-AP (Ricketts)	1 mm	10 mm	5 mm
Profile	S line - Upper lip (Steiner)	0 mm	- 2 mm	- 2 mm
	S line - Lower lip (Steiner)	0 mm	4 mm	1 mm

Treatment stages

In the maxillary arch, a transpalatal bar with Nance button was anchored on the maxillary second molars, and the mandibular first and second molars were banded. The patient was referred to extraction of the maxillary right second premolar, maxillary left first premolar and mandibular left second premolar. After bonding of Edgewise standard brackets on the other teeth, alignment and leveling were performed using 0.014-in to 0.020-in up to 0.019 x 0.025-in stainless steel archwires. Elastomeric chains were used to retract the premolars and canines mesial to the extraction spaces, for distal movement of the maxillary left central and lateral incisors, and mesial movement of the maxillary right central and lateral incisors until the midline coincided with the center of the maxilla, as well as for distal movement of the mandibular right canine, central and lateral incisors, and for mesial movement of mandibular left central and lateral incisors.

The remaining spaces were closed using 0.019 x 0.025-in rectangular archwires with loops. In the immediate preoperative period, the transpalatal bar was removed and a 0.020 x 0.025-in rectangular archwire with hooks was installed.

Subsequent impressions were taken to evaluate the intercuspation and simulate the movement for maxillary advancement and rotation to the left side (Fig 4).

In collaboration with the bucomaxillofacial surgeon, a Le Fort I osteotomy was planned for maxillary advancement and rotation to the left side (Fig 5). One month after surgery, the patient underwent orthodontic detailing and the appliances were removed.

After treatment completion, the dental midlines were coincident to each other, yet deviated to the left side in relation to the facial midline, without compromising esthetic or functional aspects, since the deviation was within the limits that are not noticeable to a layperson.



FIGURE 4 - Preoperative extraoral (A, B, C, D) and intraoral (E, F, G, H, I) photographs.



FIGURE 5 - Postoperative extraoral photographs.

Regarding function, the patient exhibited lateral and protrusive mandibular movements. Furthermore, the facial profile was more harmonious, considering the improved relationship between the lips (Figs 6, 7 and 8).

The final radiographs demonstrate orthodontic finishing with correct root position and absence of root resorptions. The cephalometric analysis revealed significant changes, presenting a final skeletal Class I pattern (ANB= 0°, WITTS= -4mm) (Fig 9 and Table 1).

DISCUSSION

In an ideal face, all structures of the craniofacial complex at one side should be perfectly equal to the structures on the opposite side.¹⁰ However, even pleasant faces exhibited mild degrees of asymmetry between the two sides, and total symmetry is not a common condition.^{13,23,24,25} Even though some studies report a tendency that the left side of the face is dominant,^{24,26,27} others state that skeletal facial structures are larger on the right side compared to the left side, with statistically significant difference.^{2,6,10,28,29}



FIGURE 6 - Extraoral (A, B, C, D, E) and intraoral (F, G, H, I, J) final photographs.



FIGURE 7 - Photographs of excursive movements. Canine disocclusion of all teeth during mandibular movements. PROTRUSIVE: **A)** right side view, **B)** frontal view, **C)** left side view. RIGHT LATERAL MOVEMENT: **D)** right side view, **E)** left side view. LEFT LATERAL MOVEMENT: **F)** right side view, **G)** left side view.

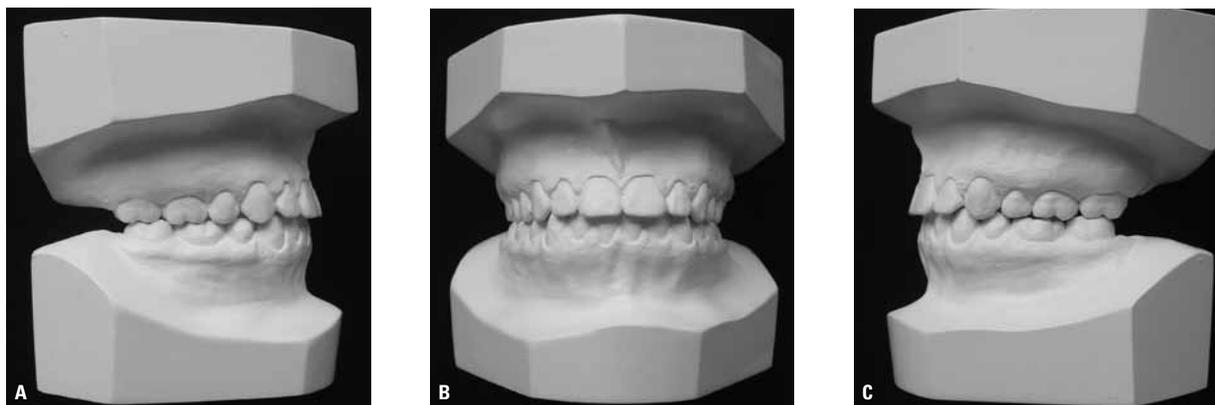


FIGURE 8 - Photographs of final dental casts.

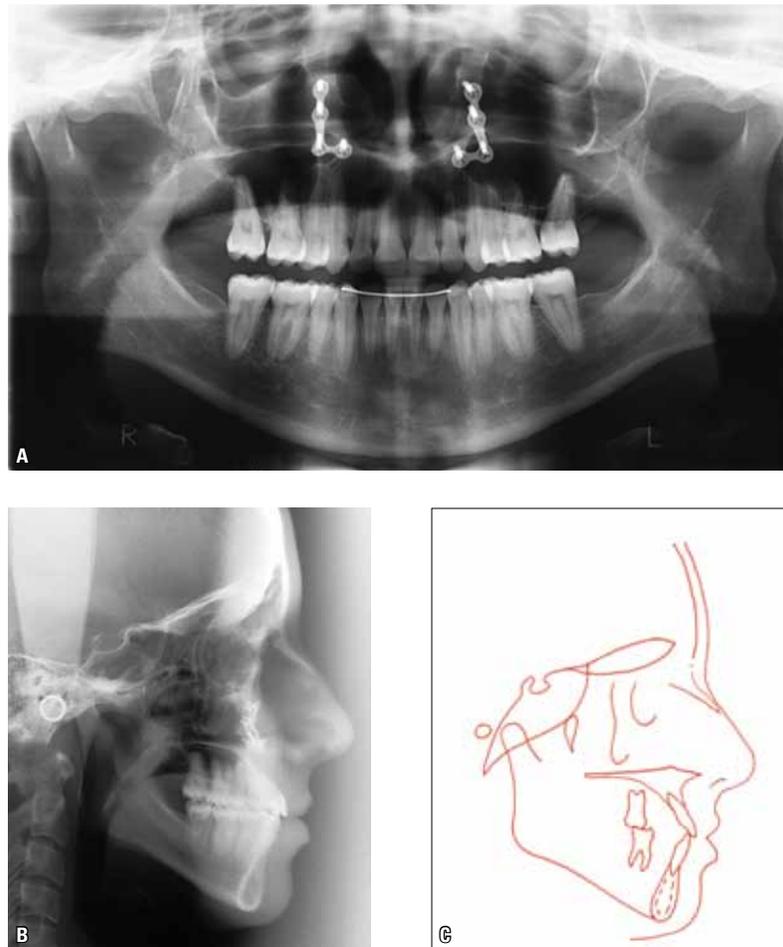


FIGURE 9 - **A)** Final panoramic radiograph, **B)** final lateral cephalometric radiograph, **C)** final cephalometric tracing.

The surgical approach for correction of severe facial skeletal asymmetries is usually the treatment of choice.^{21,30} However, milder or developing cases may be treated by less invasive techniques.^{16,19,20,22} In the present case, the extent of improvement of facial appearance from correction by orthognathic surgery on both jaws was carefully considered. Thus, considering that the anteroposterior maxillary deficiency had the greatest negative impact on the facial esthetics and that the mandibular lateral deviation was not the main cause of facial imbalance — which could be masked by coinciding the dental midlines —, it was decided to perform

surgery on the maxilla associated with conservative treatment in the mandible. Therefore, the surgery comprised maxillary advancement and rotation to the left side and there was the need for extraction of three maxillary premolars and one mandibular premolar, considering that the patient had one mandibular right premolar missing, so that the dental midlines would be coincident to each other, though deviated to the left side. However, there was no esthetic influence on the smile, since when the tipping of incisors is correct, nearly 4 mm is the limit of deviation of the dental midline that is esthetically acceptable for the patient.^{15,16,17}

CONCLUSION

By analysis of the treatment outcomes, it may be concluded that the technique employed in the present case, namely surgical treatment in the maxilla associated to conservative therapy in the mandible, allowed successful results. Even though

the patient presents mandibular deviation to the left side and deviation of the dental midlines to the left side in relation to the facial midline, the final result exhibited perfect compensation, with pleasant smile and facial esthetics in both frontal and lateral views.

REFERENCES

- Fischer B. Asymmetries of the dentofacial complex. *Angle Orthod.* 1954;24(4):179-92.
- Peck S, Peck L, Kataja M. Skeletal asymmetry in esthetically pleasing faces. *Angle Orthod.* 1991;61(1):43-8.
- Masuoka N, Momoi Y, Ariji Y, Nawa H, Muramatsu A, Goto S, et al. Can cephalometric indices and subjective evaluation be consistent for facial asymmetry? *Angle Orthod.* 2005;75(4):651-5.
- Silva EDO, Laureano Filho JR, Rocha NS, Annes PMR, Tavares PO. Tratamento cirúrgico de assimetria mandibular: relato de caso clínico. *Rev Cir Traumat Buco-Maxilo-Fac.* 2004;4(1):23-9.
- Medeiros JP, Medeiros PP. Cirurgia ortognática para o ortodontista. 2nd ed. São Paulo: Ed. Santos; 2004.
- Haraguchi S, Takada K, Yasuda Y. Facial asymmetry in subjects with skeletal Class III deformity. *Angle Orthod.* 2002;72(1):28-35.
- Yamashiro T, Okada T, Takada K. Case report: facial asymmetry and early condylar fracture. *Angle Orthod.* 1998;68(1):85-90.
- Duthie J, Bharwani D, Tallents RH, Bellohusen R, Fishman L. A longitudinal study of normal asymmetric mandibular growth and its relationship to skeletal maturation. *Am J Orthod Dentofacial Orthop.* 2007;132(2):179-84.
- Peck H, Peck S. A concept of facial esthetics. *Angle Orthod.* 1970;40(4):284-318.
- Shah S, Joshi M. An assessment of asymmetry in the normal craniofacial complex. *Angle Orthod.* 1978;48(2):141-8.
- Bell WH, Proffit WR, White RP. Surgical correction of dentofacial deformities. Hardcover: Saunders; 1980. v. 1.
- Legan HL. Surgical correction of patients with asymmetries. *Semin Orthod.* 1998;4(3):189-98.
- Carlini JL, Gomes KU. Diagnóstico e tratamento das assimetrias dentofaciais. *Rev Dental Press Ortod Ortod Facial.* 2005;10(1):18-29.
- Burstone CJ. Diagnosis and treatment planning of patients with asymmetries. *Semin Orthod.* 1998;4(3):153-64.
- Kokich VO, Kiyak HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. *J Esthet Rest Dent.* 1999;11(6):311-24.
- Anhoury PS. Nonsurgical treatment of an adult with mandibular asymmetry and unilateral posterior crossbite. *Am J Orthod Dentofacial Orthop.* 2009;135(1):118-26.
- Janson G, Camardella LT, Freitas MR, Almeida RR, Martins DR. Treatment of a Class II subdivision malocclusion with multiple congenitally missing teeth. *Am J Orthod Dentofacial Orthop.* 2009;135(5):663-70.
- Joondeph DR. Mysteries of asymmetries. *Am J Orthod Dentofacial Orthop.* 2000;117(5):577-9.
- Shroff B, Siegel SM. Treatment of patients with asymmetries using asymmetric mechanics. *Semin Orthod.* 1998;4(3):165-79.
- Mucha JN. As limitações do tratamento ortodôntico não-cirúrgico. In: Medeiros PJ, Medeiros PP. Cirurgia ortognática para ortodontista. São Paulo: Ed. Santos; 2004. p. 29-56.
- Rizzatto SM, Menezes LM, Farret MM, Lima EM, Belle R, Lanes MA. Surgically assisted rapid maxillary expansion combined with maxillary protraction in an adult: a patient report. *World J Orthod.* 2009;10(4):334-44.
- Lima EMS, Farret MM, Araújo LL. Tratamento ortodôntico-cirúrgico da má-oclusão de classe III: relato de caso. *Rev Clín Ortod Dental Press.* 2010 dez-jan 2011;8(6):61-70.
- Kurt G, Uysal T, Sisman Y, Ramoglu SI. Mandibular asymmetry in Class II subdivision malocclusion. *Angle Orthod.* 2008;78(1):32-7.
- Letzer GM, Kronmam JH. A Posteroanterior cephalometric evaluation of craniofacial asymmetry. *Angle Orthod.* 1967;37(3):205-11.
- Sutton PRN. Lateral facial asymmetry: methods of assessment. *Angle Orthod.* 1968;38(1):82-92.
- Williamson EH, Simmons MD. Mandibular asymmetry and its relation to pain dysfunction. *Am J Orthod.* 1979;76(6):612-7.
- Chebib FS, Chamma AM. Indices of craniofacial asymmetry. *Angle Orthod.* 1981;51(3):214-26.
- Woo TL. On the asymmetry of the human skull. *Biometrika* 1931;22(3-4):324-41.
- Lundström A. Some asymmetries of the dental arches, jaws and skull, and their etiological significance. *Am J Orthod.* 1961;47(2):81-106.
- Villegas C, Uribe F, Sugawara J, Nanda R. Expedited correction of significant dentofacial asymmetry using a "surgery first" approach. *J Clin Orthod.* 2010;44(2):97-103.

Submitted: August 29, 2010
Revised and accepted: January 20, 2011

Contact address
Susiane Allgayer
ABO/RS
R. Furriel Luiz Antônio de Vargas, 134 – Mont'Serrat
Zip code: 90.470-130 – Porto Alegre/RS, Brazil
E-mail: susianeallgayer@gmail.com