

Orthodontic-surgical retreatment of facial asymmetry with occlusal cant and severe root resorption: A 3-year follow-up

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Our objective was to report the orthodontic and surgical retreatment of a patient who had undergone a prolonged orthodontic treatment with extractions, but who had unsatisfactory results and persistent side effects. The man, aged 25 years 3 months, sought treatment with major complaints of facial and smile asymmetries. The clinical examination showed a mandibular deviation to the right and a maxillary occlusal cant. A Class II Division 1 subdivision right was observed. Radiographic examination showed extensive root resorptions in the maxillary second premolars and absence of the 4 first premolars. The maxillary midline was deflected 2 mm to the left, and the mandibular midline was shifted 5 mm to the right. Aligning and leveling were performed with orthodontic fixed appliances, with a standard edgewise system (0.022 × 0.028 in), followed by LeFort I maxillary impaction and bilateral sagittal split osteotomy with asymmetrical advancement. Retreatment showed outstanding results that remained stable after 3 years of follow-up. Root resorption in the second premolars did not seem to increase. Orthodontic-surgical intervention is the main choice for correcting esthetic and functional problems in facial asymmetry, particularly in cases of retreatment. (*Am J Orthod Dentofacial Orthop* 2017;152:268-80)

Facial asymmetry is characterized by an imbalance between the homologous parts that comprise the craniofacial complex.¹ It can be caused by skeletal disorders of genetic origin such as developmental hemifacial microsomia (arising during growth) or acquired hemifacial microsomias due to fractures, traumas, or injuries that compromise facial growth.²⁻⁴

The accurate diagnosis of asymmetries is fundamental and must be made through clinical examination, functional analysis, photographic analysis, and especially imaging tests, including frontal cephalograms or computed tomography.⁵

Small facial asymmetries, defined as slight differences between the right and left sides of the face, are common, and conventional orthodontic treatment is generally effective in correcting them.^{3,5-8} However, in more severe cases, orthodontic-surgical treatment is indicated to ensure better functional and esthetic results.⁷⁻⁹

We report a case of orthodontic-surgical retreatment performed in a man with considerable facial asymmetry and an occlusal plane cant.

DIAGNOSIS AND ETIOLOGY

This patient, aged 25 years 3 months, sought treatment in the Department of Orthodontics, Universidade Federal Fluminense, Niterói, Rio de Janeiro, Brazil, because he was dissatisfied with his previous orthodontic treatment. His major complaints were facial asymmetry, midline deviation, and unsatisfactory esthetic and functional results.

Upon clinical examination, restorations were found on several teeth with deficient aspects as well as the results of previous orthodontic treatment, which had involved extraction of the 4 first premolars.

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Fig 1. Pretreatment photographs.

The frontal face evaluation showed facial asymmetry, with the right side larger than the left, pronounced inclination of the occlusal plane, and unsatisfactory exposure of the teeth on smiling. Furthermore, there was a deviation in the mandibular closure pattern with occlusal interferences. The patient had a pleasant but slightly concave facial profile (Fig 1).

He presented a dental Class II Division 1 subdivision right relationship (Angle), 3.5-mm overjet, 4.5-mm overbite, maxillary midline diverted to the left by 2 mm, mandibular midline shifted to the right by 5 mm, and a marked inclination of the maxillary occlusal plane. A crossbite on the right second molar, and spaces of approximately 3.5 mm between the mandibular teeth and 1.5 mm between the maxillary teeth caused by relapse of extraction spaces were also observed (Fig 2).

The radiographic examination showed absence of the 4 third molars and 4 first premolars, extensive root

resorption primarily in the maxillary second premolars, and endodontic treatment of the mandibular left first molar (Fig 3).

Lateral cephalometric radiography and cephalometric tracings (Fig 4; Table) showed mandibular and maxillary retrusion (SNA, 78°; SNB, 79°), with a slight maxillomandibular discrepancy (ANB, -1°), increased vertical dimension (SN.GoGn, 39°; FMA, 29°; y-axis, 60°), and slight retraction of the lips (S-LS, -1 mm; S-LI, -1.5 mm).

Ricketts' frontal cephalometric analysis (Fig 4; Table) showed skeletal asymmetry of the mandible (8-mm deviation) and mandibular dental asymmetry (5-mm deviation).

TREATMENT OBJECTIVES

The treatment objectives were to (1) improve the frontal facial aspect with the correction of asymmetry,

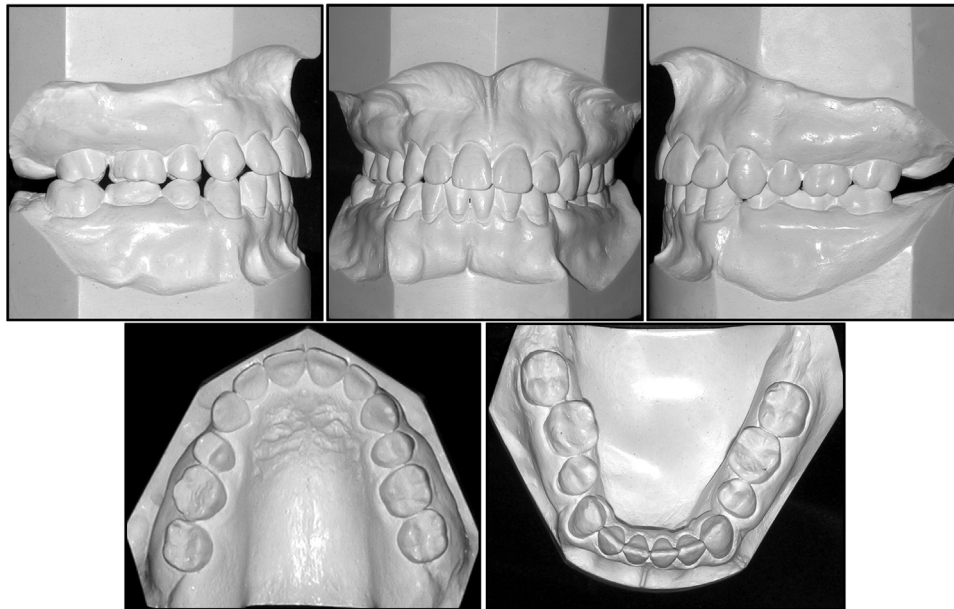


Fig 2. Pretreatment dental casts.

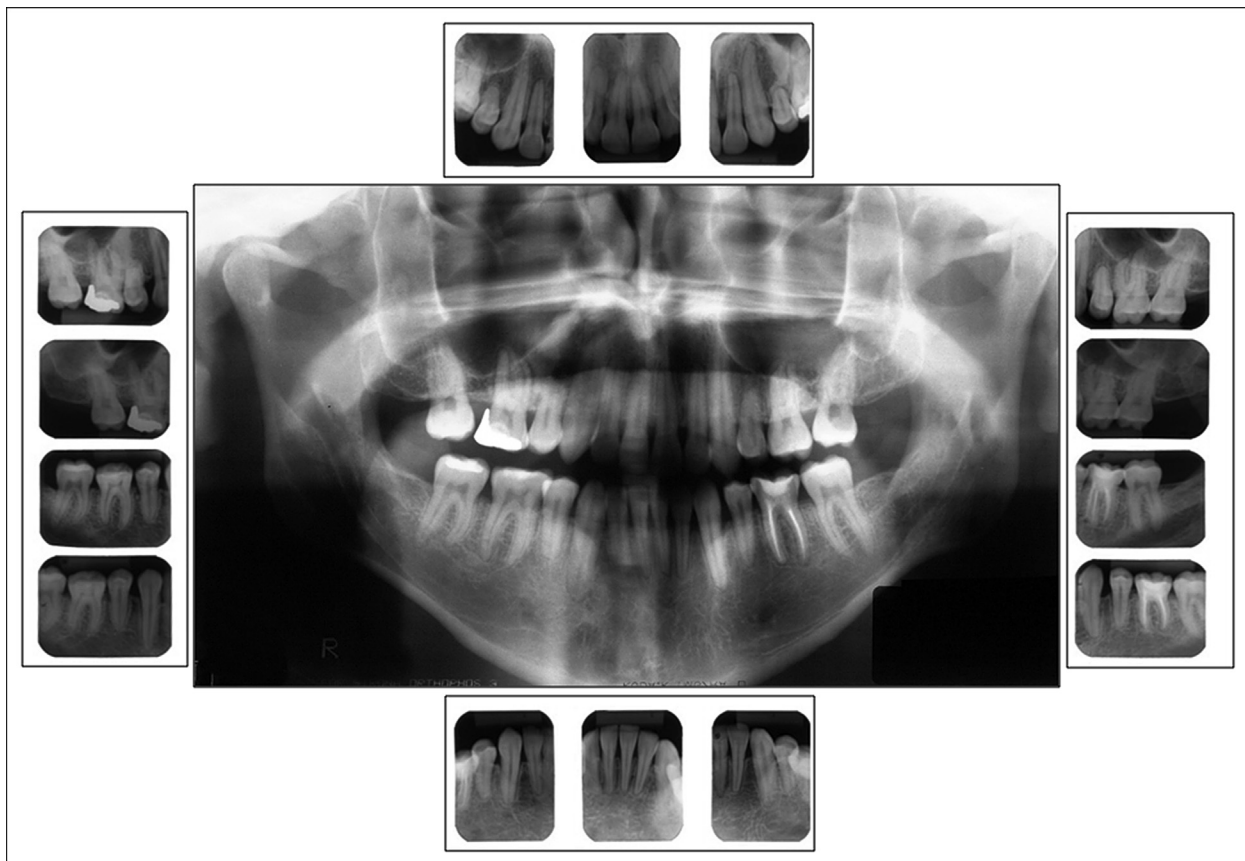


Fig 3. Pretreatment panoramic and periapical radiographs.

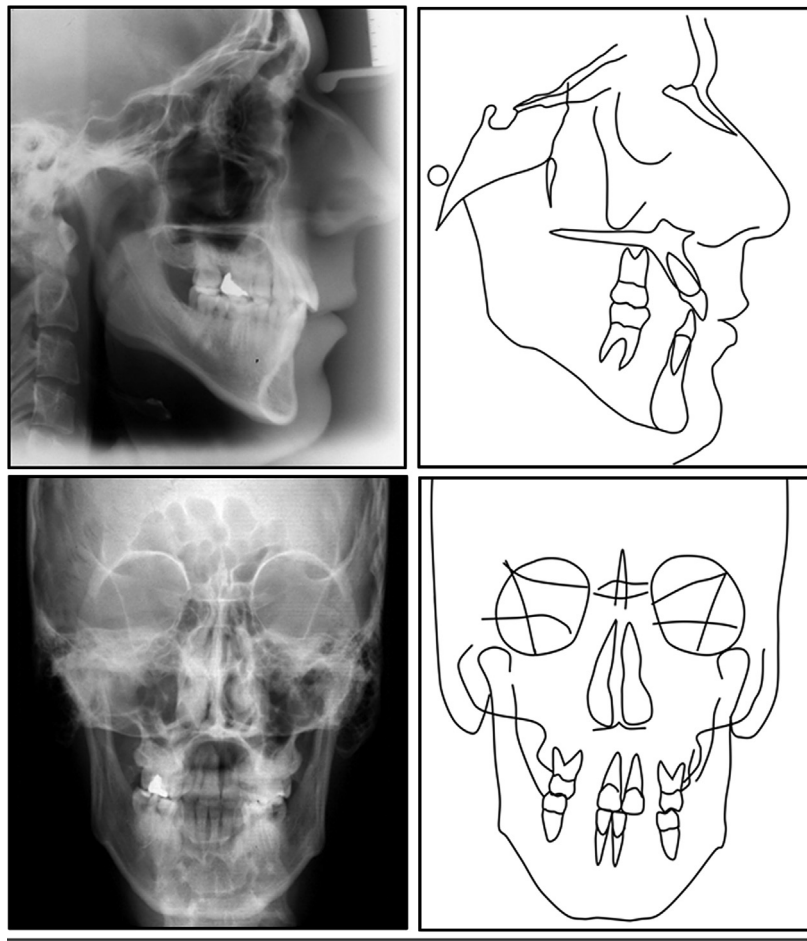


Fig 4. Pretreatment lateral and posteroanterior cephalograms and tracings.

Table. Cephalometric measurements

Measurement	Normal	Pretreatment	Preoperative	Posttreatment	Retention
Skeletal pattern					
SNA (°)	82	78	77	79	79
SNB (°)	80	79	78	80	80
ANB (°)	2	-1	-1	-1	-1
y-axis (°)	59	60	60	61	61
SN.GoGn (°)	32	39	40	40	40
FMA (°)	25	29	30	30	31
Dental pattern					
1.NA (°)	22	29	26	28	28
1-NA (mm)	4	9	7	8	8
1.NB (°)	25	15	15	14	14
1-NB (mm)	4	4	3	3.5	3.5
IMPA (°)	90	78	77	78	78
Profile					
Upper lip to S-line (mm)	0	-1	-2	-4	-4
Lower lip to S-line (mm)	0	-1.5	-2	-2	-3
Skeletal symmetry					
Maxillary (mm)	0 ± 2	3	3	0.5	0.5
Mandibular (mm)		8	7	1	1
Dental symmetry					
Maxillary (mm)	0 ± 1	2	1	0.5	0.5
Mandibular (mm)		5	5	0.5	0.5

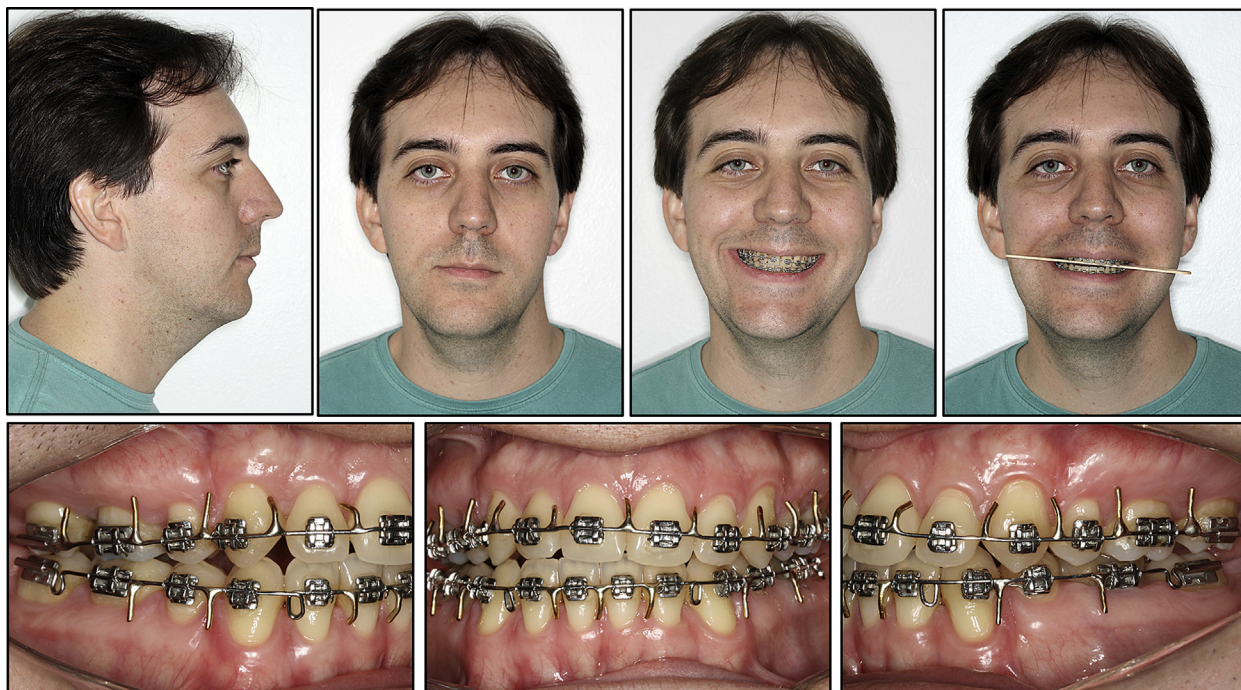


Fig 5. Preoperative facial and intraoral photographs.

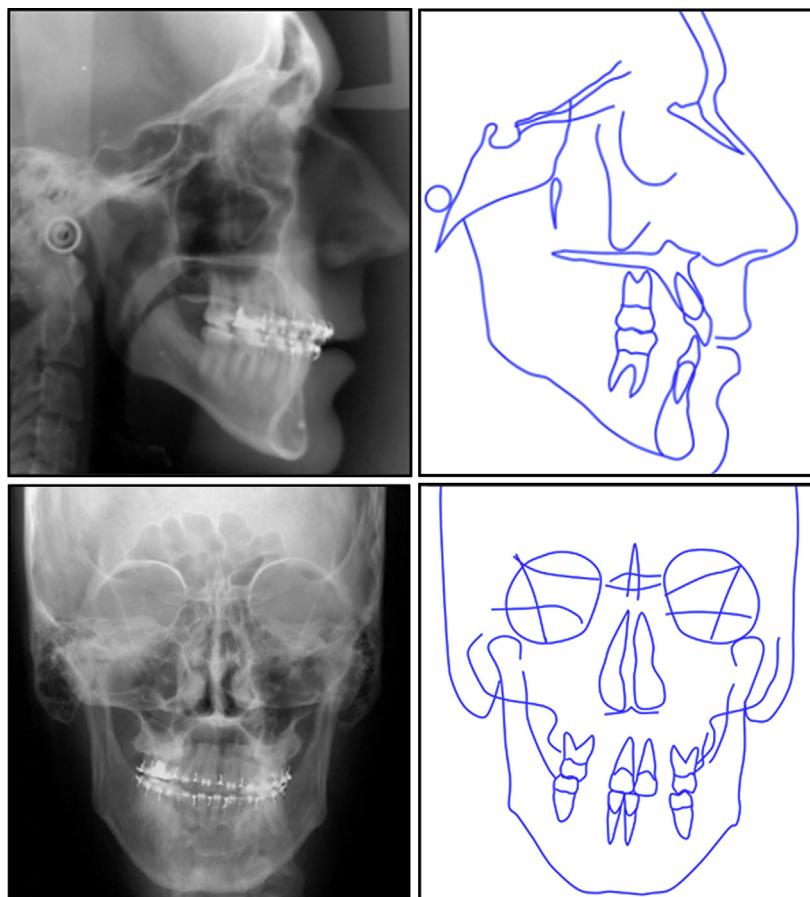


Fig 6. Preoperative lateral and posteroanterior cephalograms and tracings.



Fig 7. Posttreatment facial and intraoral photographs.

(2) level the occlusal plane, (3) obtain dental midlines coincident with each other and with the face, (4) establish the molars in a Class I relationship with proper overjet and overbite, (5) correct the crossbite, and (6) achieve a mutually protected functional occlusion with stable and simultaneous occlusal contacts of all teeth in centric and eccentric contacts guided by the anterior teeth.

TREATMENT ALTERNATIVES

Two treatment options were considered, both combining orthodontic and surgical approaches. The first treatment option involved orthodontic leveling of the occlusal plane of the mandible with specific bracket placement and mini-implant anchorage, and preparation for orthognathic surgery with asymmetrical rotation of the mandible.

The second treatment option consisted of aligning and leveling with no regard for occlusal plane inclination, preparation for orthognathic surgery with

combined impaction of the maxilla (LeFort 1) with increased intrusion of the left side of the maxilla to correct the occlusal plane cant, and asymmetric mandibular rotation to correct the mandibular asymmetry. The second treatment option was considered to be more appropriate, since orthodontic leveling of the occlusal plane would require a longer treatment time and increase the risk of resorption, especially because the patient had previously had a lengthy orthodontic treatment with unfavorable results.

TREATMENT PROGRESS

Treatment involved bonding standard edgewise, 0.022×0.028 -in slot fixed orthodontic appliances on all teeth. Orthodontic aligning and leveling of the maxillary and mandibular dental arches were performed with 0.014-in and 0.019×0.025 -in heat-activated wires. Subsequently, a mandibular stainless steel 0.019×0.026 -in archwire was fabricated with

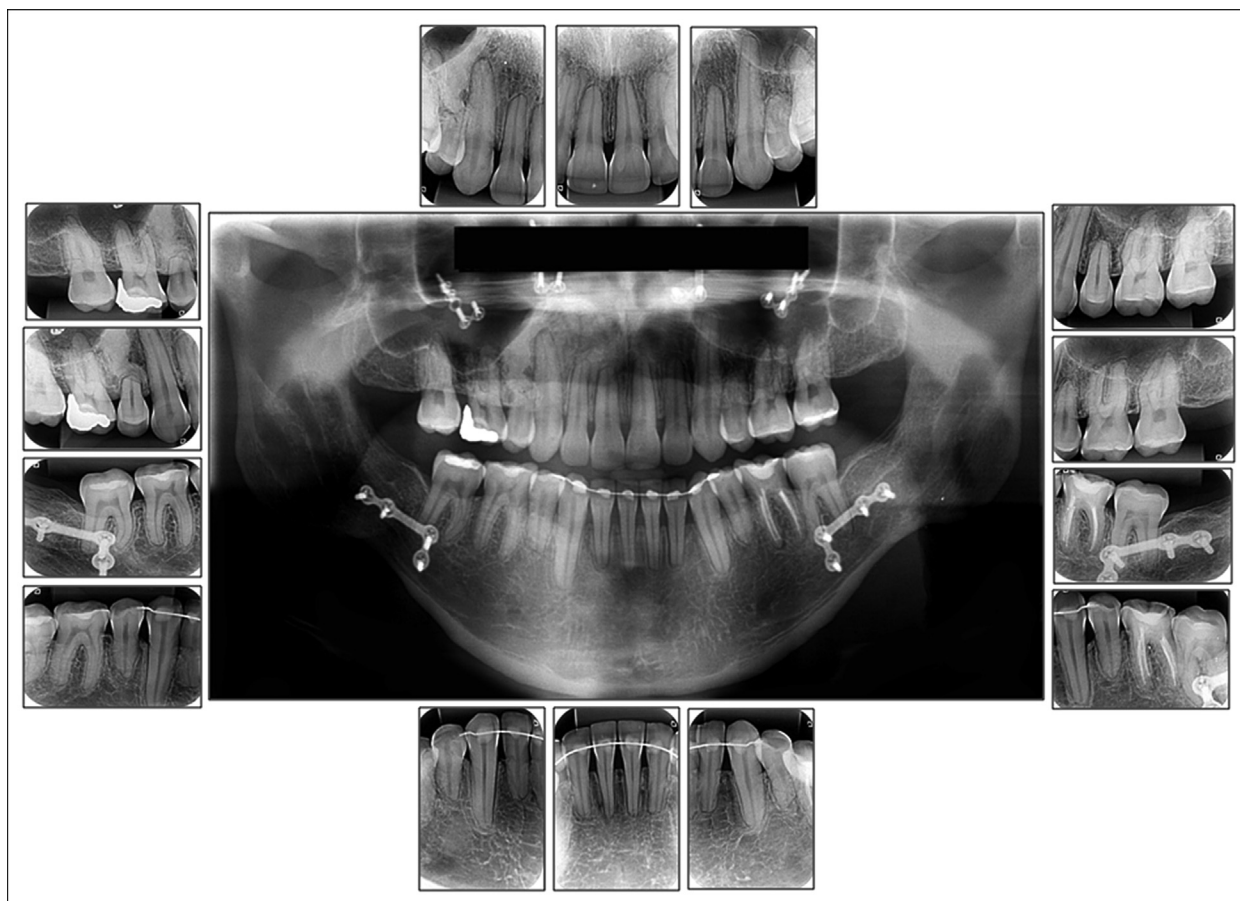


Fig 8. Posttreatment panoramic and periapical radiographs.

teardrop loops and omegas and placed at a distance from the second molar tubes to close the remaining spaces. Moreover, a 0.019 × 0.026-in maxillary stainless steel archwire was fabricated with stops in the form of omegas and individualized first-, second-, and third-order bends. The archwires were coordinated to preserve the original form of the mandibular dental arch.

The inclinations of the posterior teeth, especially on the right side, were corrected by individual twists in the stainless steel arches (buccal root torque) to allow the teeth to be properly positioned relative to the jaws, irrespective of the occlusal plane inclination. Thereafter, several impressions were taken of the dental arches to assess dental intercuspation. When the preparation was considered appropriate, hooks were welded in the interproximal spaces to the brackets and tubes, and the patient was referred for orthognathic surgery (Fig 5). Pretreatment lateral and posteroanterior cephalograms and tracings were similar to the pretreatment analysis (Fig 6; Table).

The surgical procedure included maxillary impaction with differential intrusion of the left side (LeFort I) that aimed to level the occlusal plane. Furthermore, a bilateral sagittal split ramus osteotomy was performed with asymmetric advancement for proper relationship and leveling with the maxilla.

In the postoperative orthodontic treatment, brackets were rebonded to enable improved leveling of the occlusal plane. The patient was instructed to use Class II elastics on the right side and Class III elastics on the left to optimize midline correction and establish correct intercuspation. The applied force ranged from 250 to 300 g and was maintained at all times. Selective grinding and reshaping were needed to eliminate premature contacts and occlusal interferences.

After the fixed orthodontic appliance was removed, a mandibular fixed retainer was fabricated with 0.0175-in coaxial wire and bonded from the left second premolar to the right second premolar, and the maxillary arch was retained with a wraparound type of removable appliance.

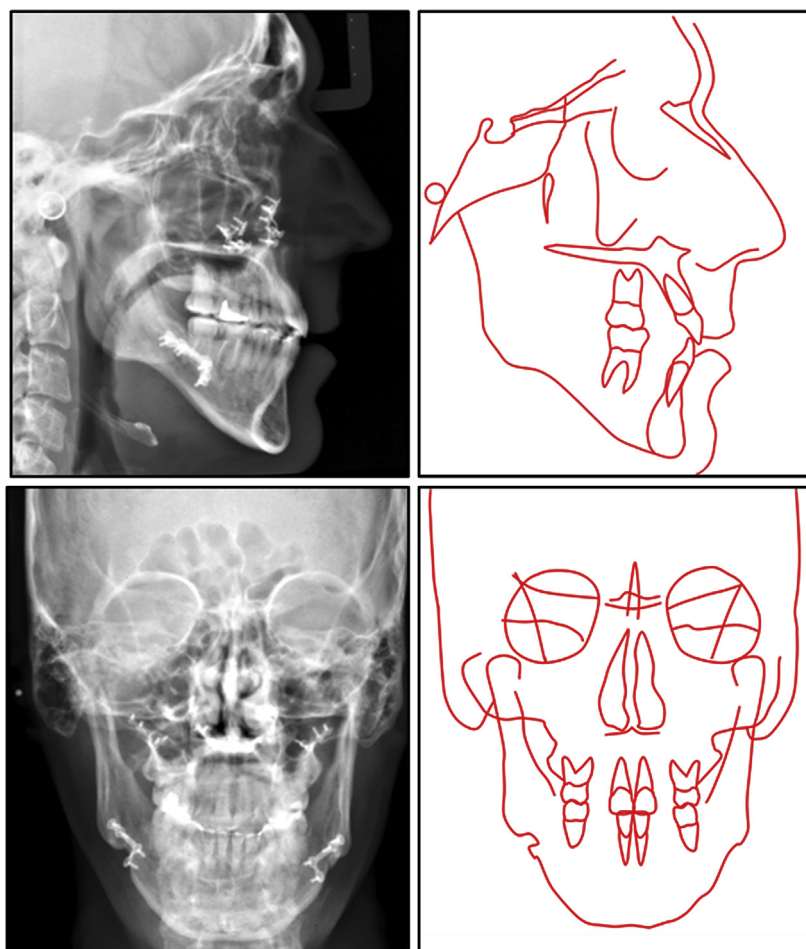


Fig 9. Posttreatment lateral and posteroanterior cephalograms and tracings.

TREATMENT RESULTS

The posttreatment photographs of the face and dental arches (Fig 7), the dental and facial x-rays (Figs 8 and 9), and the cephalometric superimpositions (Fig 10) highlight the remarkable results achieved with this retreatment, which ultimately proved to be the best treatment option.

The results include good facial esthetics; facial asymmetry has been corrected and the occlusal plane leveled, with appropriate relationships and proper occlusal contacts. Moreover, ideal molar and canine relationships were achieved, with ideal overjet and overbite, and coincident and correct midlines. Stable and simultaneous occlusal contacts were obtained, whereas in the eccentric movements of the mandible, appropriate guidances of the anterior teeth were obtained.

When we analyzed the lateral radiographs and superimposed tracings (Figs 9 and 10; Table), mild advancements of the maxilla and the mandible were observed,

although the relationship between them was preserved (ANB, -1°); the anterior maxillary and mandibular teeth were well positioned (1-NA, 8 mm; 1-NB, 3.5 mm); and the mandibular plane inclination was maintained (SN.GoGn, 40°). In the frontal view, the cephalometric analysis showed that both the dental and skeletal asymmetries were corrected (Fig 9). The panoramic and periapical radiographs (Fig 8) show good root parallelism, and the root resorption in the second premolars seen at the beginning of treatment did not increase, thus confirming the effectiveness of the mechanics performed with light forces. These favorable results further justify our decision to adopt this retreatment plan. The orthodontic records 3 years later show that the results remain stable (Figs 11-15).

DISCUSSION

Orthodontic retreatments are usually more complex than conventional treatments. This occurs

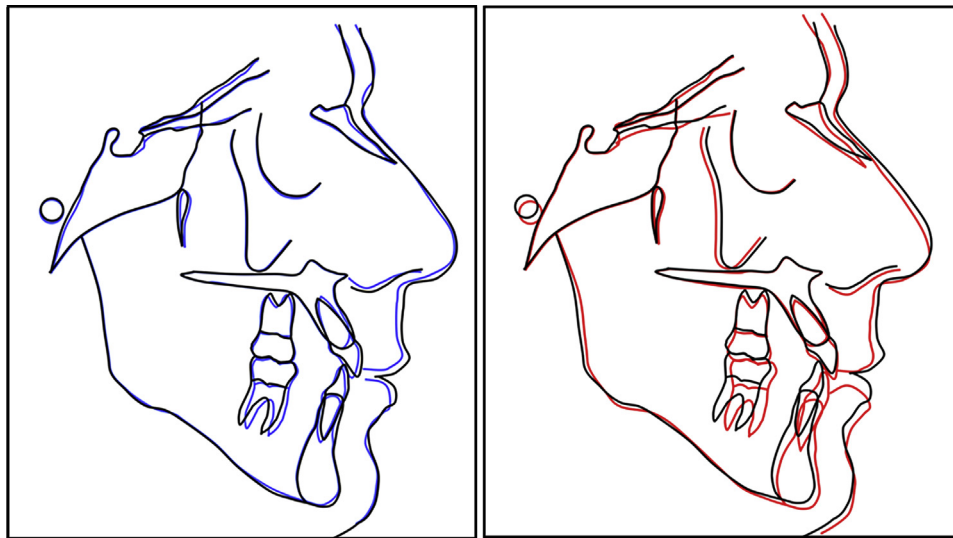


Fig 10. Initial vs preoperative lateral tracing superimposition, and initial vs posttreatment lateral tracing superimposition.



Fig 11. Follow-up photographs.

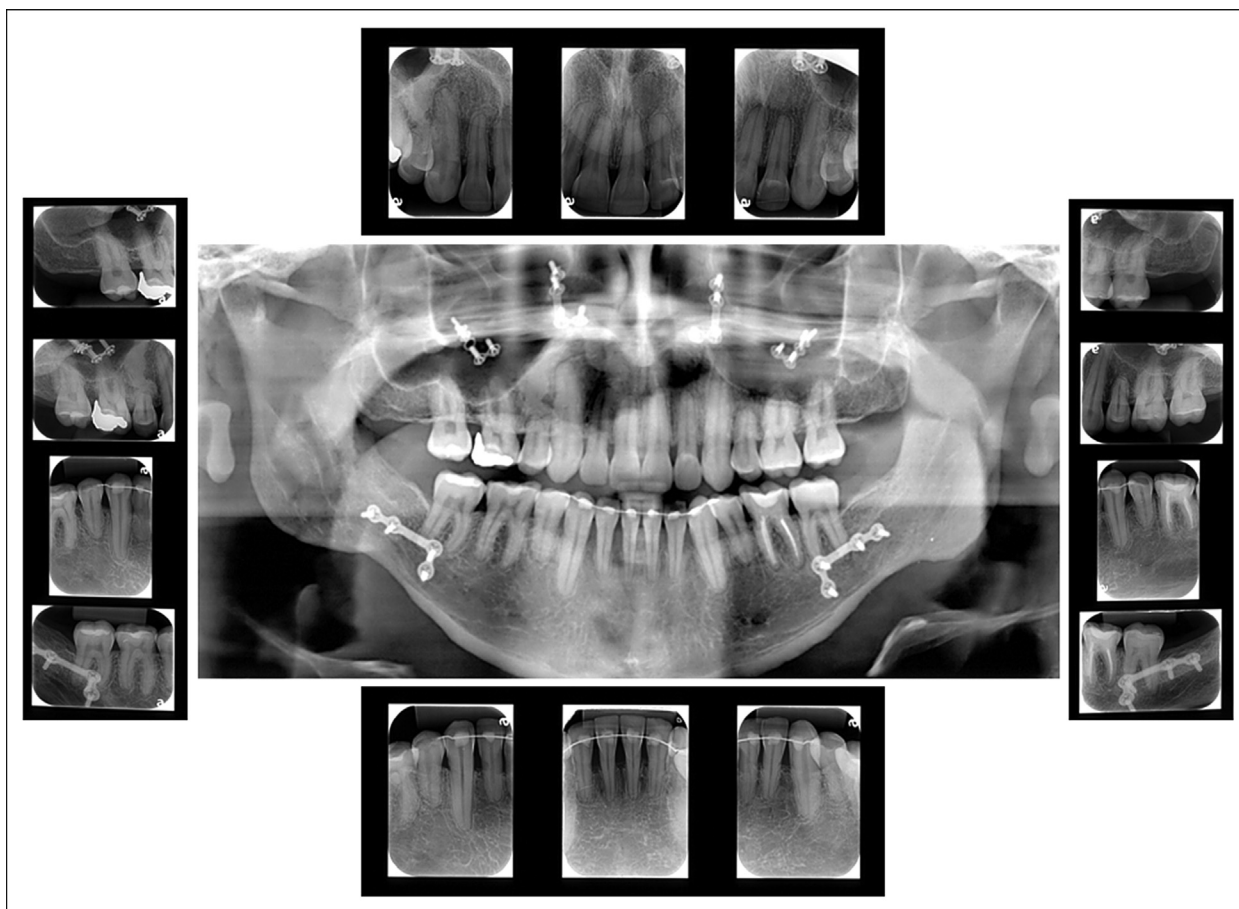


Fig 12. Follow-up panoramic and periapical radiographs.

because of a combination of factors: (1) biologic wear resulting from previous treatment, such as root resorption and periodontal changes; (2) impact of decisions made in the previous planning, such as extractions or no extractions, and unwanted movement of the applied mechanics, especially in compensatory treatment; and (3) psychological and financial impacts on the patient, who must undergo a second treatment.

Facial asymmetries are characterized clinically by deviations to either side of the face, dentoskeletal discrepancies of the midline, and crossbites.¹⁰ The most severe cases involve orthodontic-surgical treatment, and may include combined surgery of the mandible and the maxilla. Several factors may indicate the need for orthognathic surgery, such as chewing difficulties, temporomandibular joint dysfunction, and the psychosocial impact of the deformity.

In this patient, it was possible to diagnose—by clinical examination and facial and cephalometric analyses—that this was a severe skeletofacial asymmetry requiring

correction with orthodontic-surgical treatment. Treatment lasted 40 months, including preoperative and postoperative treatments.

The occlusal plane cant was significant; it directly affected the patient's own perception and consequently the attractiveness of his smile.¹¹ An anterior occlusal plane inclination can be corrected with just the orthodontic approach.¹² However, this option would require a longer treatment time and probably a greater impact on many teeth that showed severe root resorption. The patient reported having a lengthy orthodontic treatment (7 years) with unsatisfactory results. A LeFort I osteotomy is a widely used procedure to correct changes in the midface, since it allows corrections to be made in the 3 planes of space.¹³

Good vertical stability can be observed after surgical impaction of the maxilla, with only 6.5% of patients experiencing 2 mm or more relapse 1 year after surgery.¹⁴ In a study that assessed stability of maxillary impaction after a 5-year follow-up, it was found that long-term stability is assured.¹⁵ Moreover, according

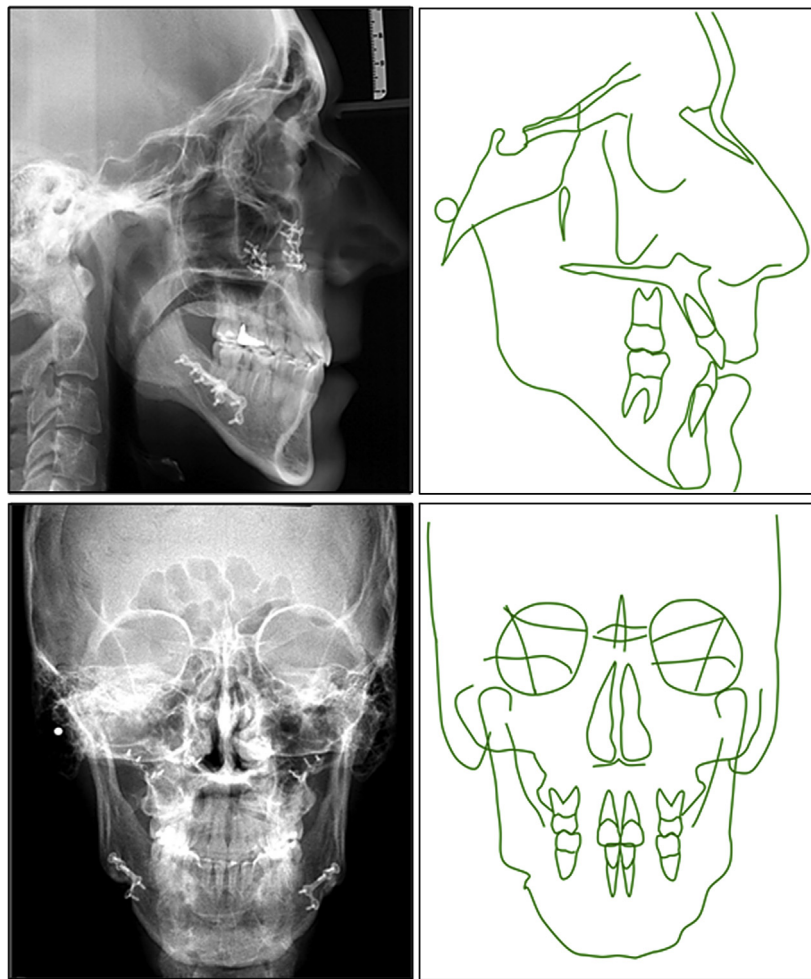


Fig 13. Follow-up lateral and posteroanterior cephalograms and tracings.

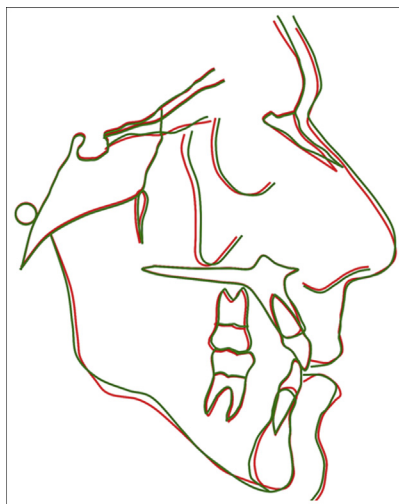


Fig 14. Posttreatment vs follow-up lateral tracing superimposition.

to Proffit et al,¹⁶ impaction of the maxilla is among the osteotomies that provide greater stability.

Surgical correction of mandibular asymmetry can be accomplished through various types of osteotomies according to the nature and magnitude of the deformity.⁷ The most widely used techniques in this case are bilateral sagittal split osteotomy and intraoral vertical ramus osteotomy.¹⁷ In this case we opted for bilateral sagittal split osteotomy with advancement on the right side and setback on the left side, to avoid a genioplasty.¹⁸⁻²⁰ The features that characterized this deformity did not warrant more invasive procedures such as alloplastic or autogenous reconstructions of the ramus or condyle. Furthermore, this option is well documented in the literature.^{16,21,22}

In the orthognathic surgery performed on this patient, internal fixations with titanium plates and screws were used in the maxilla and the mandible. Therefore,

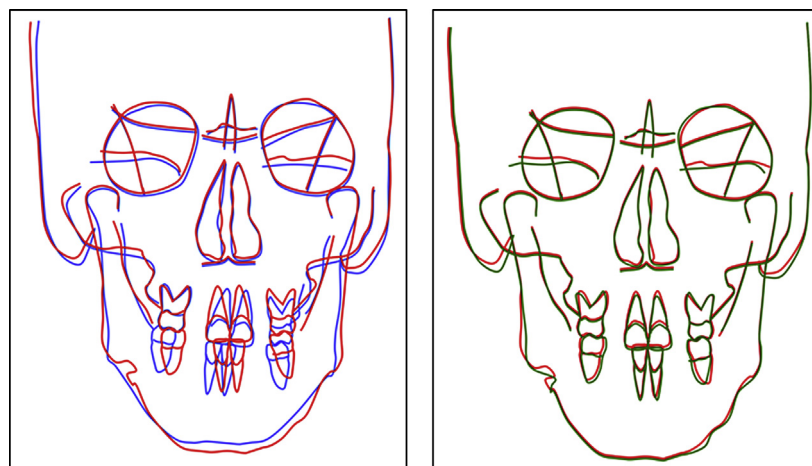


Fig 15. Preoperative vs posttreatment posteroanterior tracing superimposition, and posttreatment vs follow-up posteroanterior tracing superimposition.

there was no need to apply maxillomandibular fixation in the postoperative period.¹⁷⁻¹⁹

Some authors found that patients with mandibular asymmetry often also have temporomandibular disorders or improper positioning of the condyles relative to the glenoid cavity and joint discs. It was observed that temporomandibular disorder symptoms regressed, and stomatognathic functions improved. This perception stemmed from condylar effects after orthodontic-surgical treatment in patients with asymmetry.^{18-20,23}

Other researchers assessed the position of the condyles of patients undergoing surgical repositioning of the mandible through bilateral sagittal split osteotomy. They found no case of bad postoperative positioning.^{24,25} Likewise, they evaluated intercondylar width and the angulation of the condyle's long-axis angle as measured from the condyle: ie, from the computed tomography axial projections immediately before and immediately after surgery. However, another study suggested that condyles tend to move in a certain direction, and this may influence postoperative relapse within 6 months after surgery. Nevertheless, the condyles remained relatively stable after this period.²⁶

Despite the mandibular asymmetry, our patient, at the initial clinical examination, voiced no complaints in this regard, and neither did he show any temporomandibular disorder-related symptoms, such as pain on palpation, opening and closing displacements, popping, clicks, or crepitus in the temporomandibular joints. After 40 months of treatment, the goals were achieved: improved oral health, dental and facial esthetics, occlusion, mandibular functions, nonocclusion guidances, and proper temporomandibular joint function.

Superimposition of the lateral cephalometric tracings indicated that a slight mandibular advancement occurred, along with impaction of the maxilla (Fig 10). The changes observed in the superimposition of the frontal tracings (Fig 15), both preoperative and post-treatment, indicate that the facial asymmetry was corrected, the dental midlines coincided with each other, and the dental midlines coincided with the facial midlines. Analysis of the extraoral and intraoral photographs confirms that the facial deformity was corrected with improved facial symmetry and a balanced occlusal plane (Fig 7).

Evaluation of the patient 3 years after completing retreatment shows that it remains stable, with the face attractive and symmetrical. In particular, there is smile symmetry, and the intraoral view also attests to the effectiveness of this treatment (Fig 11). Moreover, the panoramic and periapical radiographs illustrate the stability of the resorption that had occurred in the previous treatment, as well as good root parallelism (Fig 12). Profile and posteroanterior radiographs, cephalometric tracings and frontal superimpositions attest to the efficacy of the treatment and its stability after a 3-year follow-up (Figs 13-15).

CONCLUSIONS

The favorable results achieved for this patient with facial asymmetry retreatment with occlusal plane inclination and marked root resorption, which remained stable after a 3-year follow-up, demonstrate that the best indication for evident facial asymmetries is orthognathic surgery, often combined, and involving both the maxilla and the mandible.

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