

Orthodontic-prosthetic treatment of an adult with a severe Class III malocclusion

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This case report describes the treatment of a 37-year-old woman with multiple restored and missing teeth, a Class III subdivision malocclusion, and complete dental crossbite. Treatment options included orthognathic surgery and an orthodontic-prosthetic approach. The patient opted for nonsurgical treatment with space opening for prosthetic replacement of the first maxillary molars. (*Am J Orthod Dentofacial Orthop* 2010;138:820-8)

The treatment of adults with Class III malocclusion is a clinical challenge in orthodontics. With no maxillomandibular growth potential, adults have no treatment options except either orthognathic surgery or a nonsurgical compensatory approach.¹ Surgical correction consists of mandibular setback, maxillary advancement, or a combination of mandibular and maxillary procedures.² Nonsurgical treatment of a Class III malocclusion involves orthodontic treatment with compensation mechanics.³

Patients with multiple restorations can have restorative treatment goals that complicate the orthodontic treatment. In adolescents with complete dentitions, orthodontic treatment objectives tend to be idealistic. In orthodontic-restorative patients, however, it is important to establish realistic, not idealistic, treatment objectives.⁴ As Kokich and Spear⁴ stated, treatment objectives should be economically realistic, occlusally realistic, and restoratively realistic.

This case report describes the treatment of an adult with many restored and missing teeth, a Class III subdivision malocclusion, and complete dental crossbite.

DIAGNOSIS AND ETIOLOGY

A 37-year-old woman came for an orthodontic consultation with chief complaints of temporomandibular

joint pain and an unesthetic smile. Her medical history showed no contraindication to orthodontic therapy. Her dental history included many restored teeth with previous endodontic therapy.

The extraoral examination (*Fig 1*) indicated a straight to concave profile and marked nasolabial lines (suggesting maxillary retrusion) and a well-balanced face. Her forced smile had acceptable gingival display but suggested retroinclined maxillary incisors.

Intraoral (*Fig 1*) and dental cast (*Fig 2*) examinations showed several missing teeth in the maxilla (first molars, right lateral incisor, and left first premolar) and the mandible (third molars and right first premolar). All spaces between the teeth had closed. She had a Class III dental relationship on the right side and a Class I relationship on the left, as well as anterior and posterior crossbites. The maxillary midline was coincident with the facial midline, and the mandibular midline was shifted 4 mm to the right. There was no discrepancy between maximum intercuspation and centric relation.

The lateral cephalogram and tracing (*Fig 3*) showed a thin mandibular symphysis and mandibular incisors almost out of the bony crest. The cephalometric analysis (*Table*) indicated a vertical skeletal pattern (GoGn-SN, 45.0°; FMA, 37.0°; PFH, 51.0 mm; AFH, 79.0 mm; and FHI, 0.65) and a skeletal Class III relationship with maxillary retrusion (SNA, 70.0°, SNB, 73.0°; ANB, -3.0°; and AO-BO, -4.0 mm). The mandibular and maxillary incisors were retroinclined (FMIA, 66.0°; IMPA, 77.0°; 1.NB, 17.0°; 1-NB, 5.0 mm; 1.NA, 19.0°; 1-NA, 6.0 mm; and interincisal angle, 147.0°). She had a concave profile due to a more retruded maxilla (Z-angle, 78.0°; Pog-NB, 4.0 mm; S line-lower lip, 0.0 mm; S line-upper lip, -5.0 mm; and nasolabial angle, 94.0°). The panoramic radiograph (*Fig 4*) showed many restored teeth. There were no evidence of bone or dental pathology and no defective restorations.

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Fig 1. Pretreatment extraoral and intraoral photographs.

TREATMENT OBJECTIVES

The ideal treatment objectives were to correct the skeletal discrepancies between the maxilla and the mandible, resolve the anterior and posterior crossbites, establish satisfactory overbite and overjet, correct the mandibular midline, align and correct the rotations, obtain a stable occlusal relationship, and improve the patient's facial and dental esthetics.

Because this adult patient had multiple restorations with a vertical and Class III skeletal pattern as well as a thin mandibular symphysis, the realistic treatment objectives were to (1) establish a functional occlusion and mitigate the temporomandibular disorder symptoms, (2) establish satisfactory overbite and overjet, (3) correct the anterior and posterior crossbites, (4) improve facial esthetics, and (5) provide an esthetic smile.

TREATMENT ALTERNATIVES

All observations made during the diagnosis were shown to and discussed with the patient. Because she had no maxillomandibular growth potential to assist in establishing ideal treatment goals, the treatment options were either orthognathic surgery or a nonsurgical approach.

Surgical correction would consist of maxillary advancement or a combination of mandibular and maxillary procedures. Maximum esthetics, ideal occlusion, and skeletal discrepancy correction would be possible with this approach. The patient, however, refused any surgical procedures.

For an adult with many restorations, orthodontic treatment alone had limitations and would require the assistance of other dental specialties to help camouflage some skeletal and dental aspects of the malocclusion,

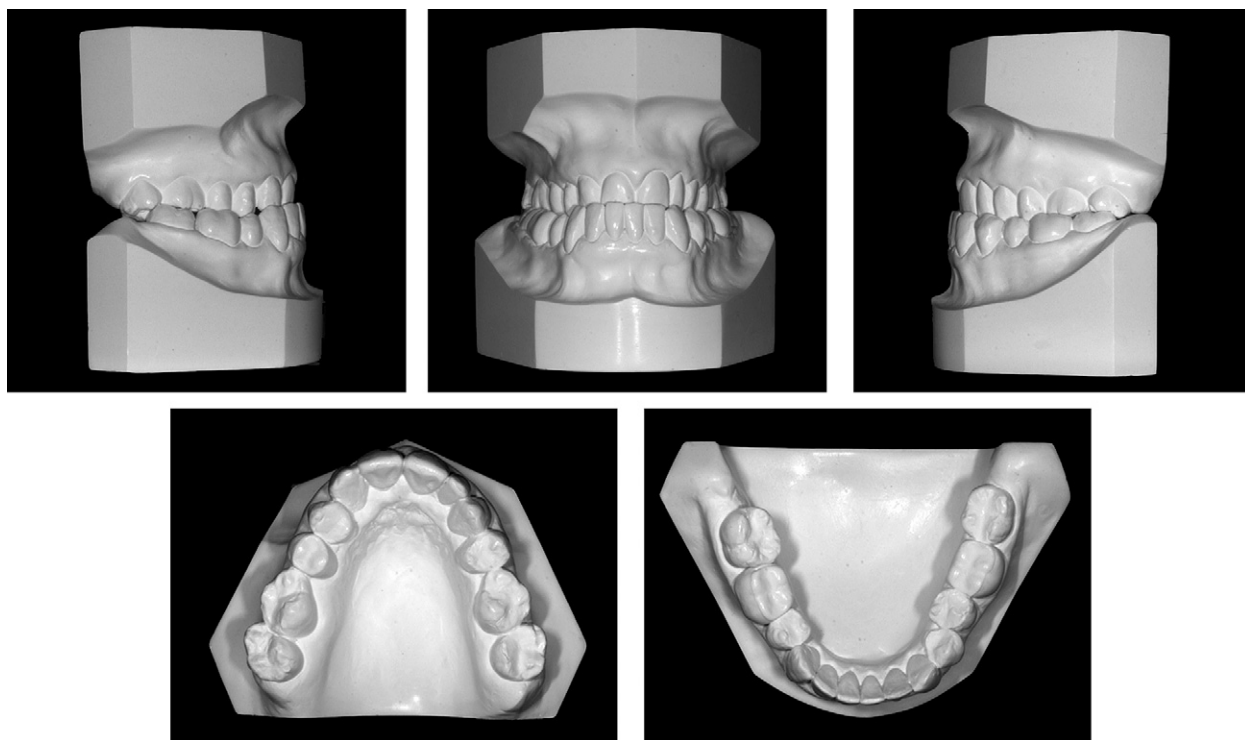


Fig 2. Pretreatment dental casts.

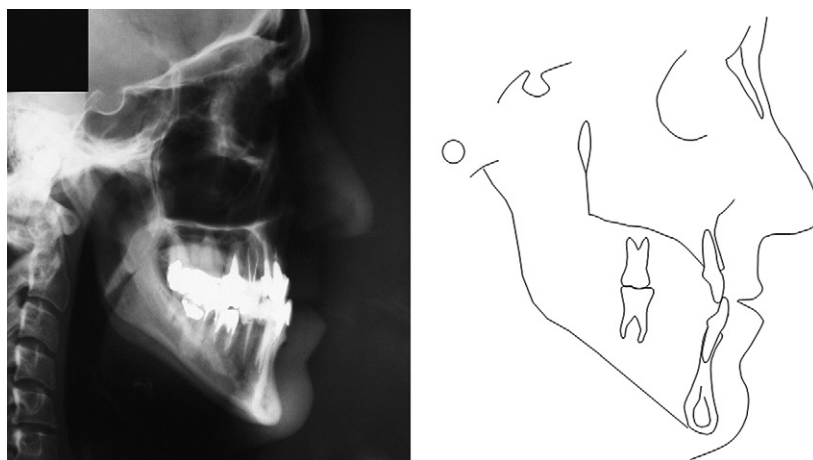


Fig 3. Pretreatment lateral cephalogram and tracing.

thereby improving esthetics and function. The options included (1) compensation mechanics with Class III elastics and further occlusal adjustment; (2) maxillary dental expansion to correct the crossbite and the Class III dental relationship and, if necessary, a mandibular incisor extraction to correct the overjet and the anterior crossbite; and (3) space opening for prosthetic

replacement of the maxillary first molars and occlusal adjustment. The patient chose the third option.

TREATMENT PROGRESS

Treatment began with the placement of an anterior bite plate and sequential bonding of the maxillary central incisors, right first premolar and left canine, and

Table. Cephalometric analysis

Measurements	Average	Initial	Final	Prosthodontics
Skeletal				
SNA (°)	82.0	70.0	71.0	71.0
SNB (°)	80.0	73.0	73.0	73.0
ANB (°)	2.0	-3.0	-2.0	-2.0
AO-BO (mm)	2.0	-4.0	-5.0	-5.0
GoGn-SN (°)	32.0	45.0	44.0	43.0
Occ Pl-FH (°)	10.0	7.0	7.0	7.0
PFH (mm)	45.0	51.0	53.0	53.0
AFH (mm)	65.0	79.0	78.0	77.0
FHI (PFH/AFH)	0.70	0.65	0.68	0.69
FMA (°)	25.0	37.0	36.0	35.0
Dental				
FMIA (°)	68.0	66.0	66.0	68.0
IMPA (°)	87.0	77.0	78.0	77.0
1.NB (°)	25.0	17.0	17.0	17.0
1-NB (mm)	4.0	5.0	5.0	5.0
1.NA (°)	22.0	19.0	28.5	27.0
1-NA (mm)	4.0	6.0	10.0	9.0
Interincisal angle (°)	131.0	147.0	136.0	138.0
Soft tissues				
Z-angle (°)	75.0	78.0	76.0	77.0
Pog-NB (mm)	-	4.0	4.0	4.0
S line-lower lip (mm)	0.0	0.0	0.0	0.0
S line-upper lip (mm)	0.0	-5.0	-1.0	-2.0
Nasolabial angle (°)	100.0	94.0	92.0	94.0

PFH, posterior facial height; AFH, anterior facial height; FHI, facial height index.

second and third molars. Standard edgewise 0.022-in brackets and bands and an 0.018-in stainless steel archwire were used to initiate leveling and alignment. After 6 months, the anterior crossbite was corrected, and the use of the anterior bite plate was stopped. In this phase of the treatment, the patient's complaints of temporomandibular disorder symptoms stopped.

All maxillary teeth were then bonded. An ideal 0.018 × 0.025-in stainless steel archwire with open-coil springs between the maxillary second molars and second premolars was then used to protrude the anterior teeth and create the space for the maxillary first molars.

Orthodontic treatment was supervised by the general dentist. When correct overbite and overjet were achieved and the space was sufficient for a functional prosthesis, the space opening was stopped. The patient's cooperation was optimal, and fixed appliance treatment was completed in 26 months.

TREATMENT RESULTS

At the end of orthodontic treatment, the patient's facial and dental aspects were improved. Her marked nasolabial lines were attenuated, and her profile improved from better maxillary incisor and upper lip positions (Fig 5). Furthermore, the crossbites were

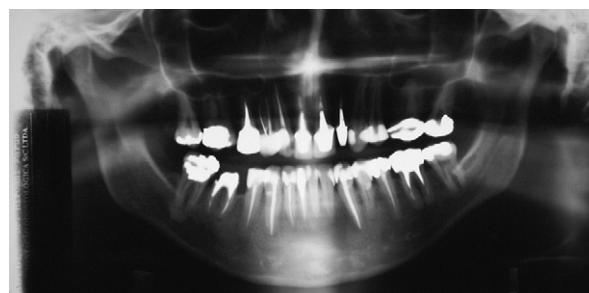


Fig 4. Pretreatment panoramic radiograph.

corrected, and acceptable overjet and overbite were established (Figs 5 and 6).

The lateral cephalogram, tracing, and analysis (Fig 7 and Table) confirmed the clinical examinations. Vertical and sagittal skeletal patterns were maintained as shown by the GoGn-SN, FMA, PFH, AFH, FHI, SNA, SNB, ANB, and AO-BO measurements. The mandibular incisor positions were also maintained as shown by FMIA, IMPA, 1.NB, and 1-NB. The maxillary incisors were advanced in a more favorable position as shown by 1.NA, 1-NA, and interincisal angle. Moreover, the facial profile improved because of better upper lip position, which was confirmed by Z-angle, Pog-NB, S line-lower lip, S line-upper lip, and nasolabial angle. The profile improvement and the extent of overall, as well as maxillary and mandibular, tooth movement during the treatment were clearly observed on the superimposition of the pretreatment and posttreatment cephalometric tracings (Fig 7).

The panoramic radiograph (Fig 8) shows that the level of interradicular bone remained relatively stable during orthodontic treatment.

A prosthodontist completed the restorative treatment, and the final results were satisfactory. The extraoral and intraoral photographs (Fig 9) and dental casts (Fig 10) show a well-balanced face as well as a functional and esthetic occlusal relationship. There was 1 undesirable effect: the right second molars were not in contact as in the beginning of treatment.

The lateral cephalometric tracing and analysis (Fig 11 and Table) show the dental and skeletal outcome of the orthodontic treatment results. The panoramic radiograph (Fig 12) shows maintenance of the interradicular bone level.

The treatment plan was a satisfactory nonsurgical alternative, and the treatment objectives were achieved. A functional and esthetic occlusion was obtained. Mandibular incisor position was maintained, and this avoided the risk of moving teeth with a thin mandibular symphysis. The more favorable maxillary incisor



Fig 5. Posttreatment extraoral and intraoral photographs.

inclination resulted in satisfactory overjet and overbite, relief of temporomandibular joint pain, and improved facial appearance. Correction of the malocclusion was accomplished with only dentoalveolar changes. Skeletally, the maxilla was still retrognathic.

DISCUSSION

Class III malocclusions are some of the most difficult anomalies to treat, because the deformity is not restricted to the jaws, but also involves the total craniofacial complex.¹ For adults, when the etiology of a Class III malocclusion is due to skeletal or a combination of skeletal and dental factors, the possible treatment options are either a combination of orthodontics and surgery or camouflage orthodontic treatment. The orthodontist should therefore listen to the patient's primary concerns to respond adequately to his or her needs.⁵

After we discussed the diagnosis with the patient, she refused the orthognathic surgical approach. For patients reluctant to undergo surgery or who are satisfied with their facial appearance, an alternative is to treat them with dentoalveolar compensation without correcting the underlying skeletal deformity,³ as shown in this case report.

Nonsurgical options for Class III malocclusion treatment, when there is a full complement of teeth, could be compensation mechanics with Class III elastics and further occlusal adjustment,⁶ high-pull headgear with Class III elastics,⁷ mandibular second molar extraction,⁸ maxillary dental protraction with extraction of a mandibular central incisor,⁵ and miniplates.⁹ Unfortunately, because our patient had multiple restorations, none of these alternatives was appropriate.

In addition, for this type of patient, there is the question of whether orthodontics alone can solve all the

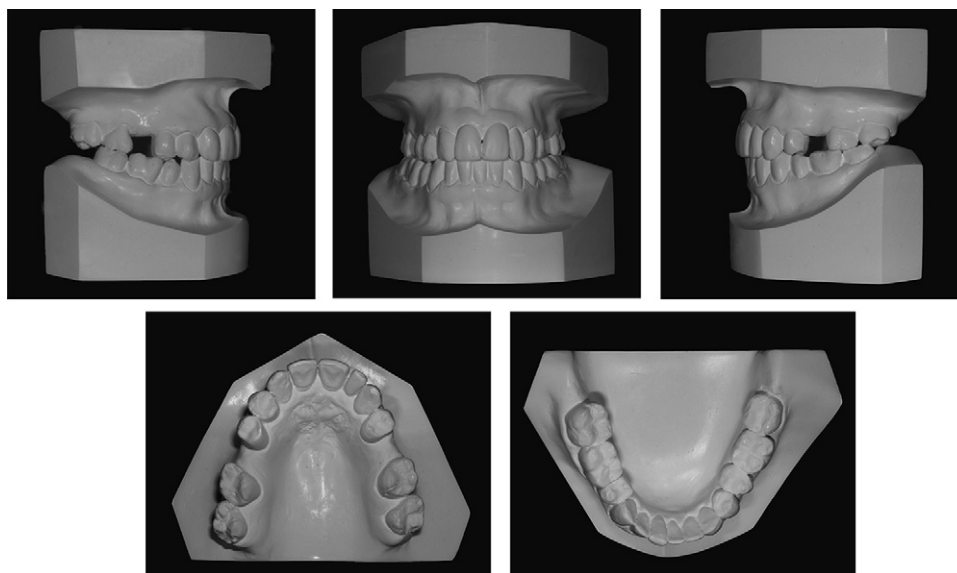


Fig 6. Posttreatment dental casts.

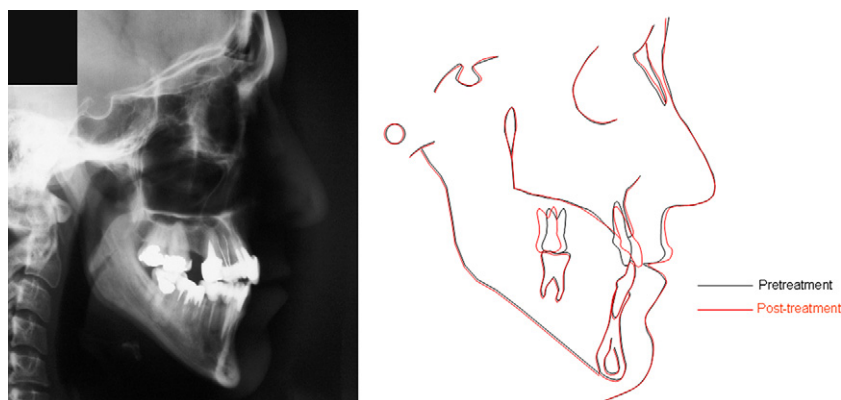


Fig 7. Posttreatment lateral cephalogram and superimposed pretreatment and posttreatment tracings.

patient's needs. The same issue is faced by other professionals. Spear et al¹⁰ stated that, with some patients, restorative dentistry cannot accomplish the correction alone and might require the assistance of other dental specialties. As the number of adult patients requiring dental treatment grows, the use of multidisciplinary approaches will become more necessary. In this patient, the only way to obtain acceptable results was to combine orthodontic and prosthetic strategies.

When a makeover is planned for the esthetic appearance of a patient's teeth, the clinician must have a logical diagnostic approach that results in an appropriate treatment plan.¹⁰ For this patient, the decision to open the maxillary first molar spaces was based on her request for a nonsurgical approach as well as the angulation

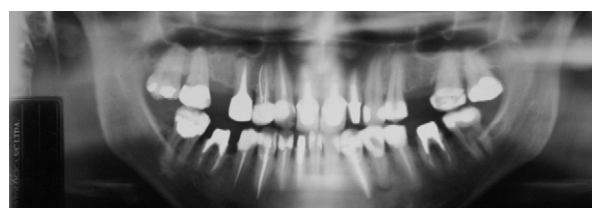


Fig 8. Posttreatment panoramic radiograph.

of the adjacent teeth and the Class III relationship between the maxillary and mandibular teeth. Because the maxillary molars and anterior teeth had drifted and inclined into the maxillary first molar sites, the opening of this space would allow prosthetic rehabilitation and was preferred.



Fig 9. Prosthodontic treatment extraoral and intraoral photographs.

The initial use of an anterior bite plate associated with sequential bonding permitted correction of the anterior crossbite and relief of the temporomandibular joint pain. This procedure motivated the patient. Subsequently, the remaining maxillary teeth were bonded, and an ideal 0.018×0.025 -in stainless steel archwire with open-coil springs between the maxillary second molars and second premolars was used to protrude the anterior teeth and create the space for the maxillary first molars. These simple mechanical strategies resulted in 26 months of active orthodontic treatment with satisfactory results.

This conservative approach avoided movement of the mandibular teeth. All mandibular teeth were restored, and the mandibular incisors were well positioned in a thin mandibular symphysis. The placement of fixed mandibular brackets and archwires could have increased the potential risk of problems during the orthodontic treatment process.

The patient was cooperative during the entire orthodontic treatment. This is consistent with the report of Whitesides et al,¹¹ who noted that adults are more likely to see orthodontic care as a personal priority compared with providing it for their children.

When satisfactory overjet and overbite were achieved, the prosthodontist completed the planned restorative treatment. For economic reasons, the patient chose not to have an implant-supported prosthesis, preferring a fixed prosthesis instead. With current technology, a prosthetic replacement can be successfully made with either fixed bridges¹² or an implant-supported prosthesis.¹³

Facial appearance improved for this patient and was due to more favorable maxillary incisor inclination. This result is consistent with those of Lin and Gu,¹⁴ who noted remarkable soft-tissue changes in Class III patients treated with compensatory mechanics, due to

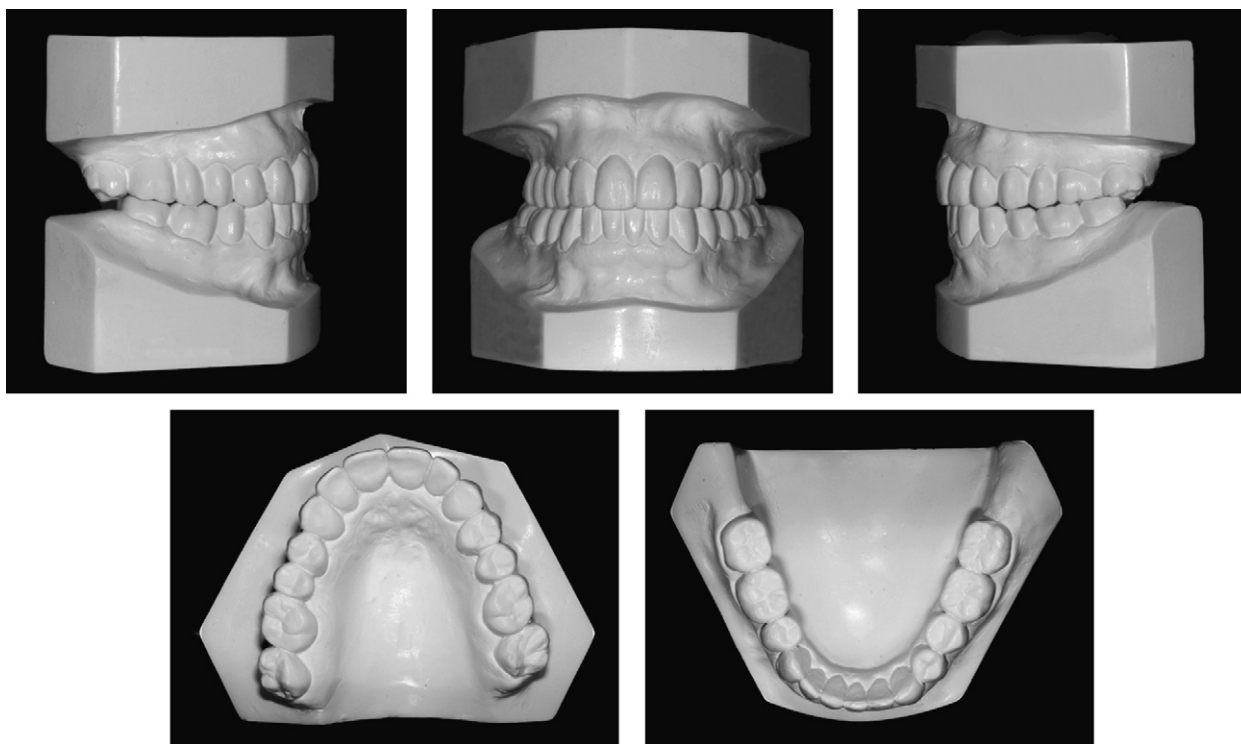


Fig 10. Prosthodontic treatment dental casts.



Fig 11. Prosthodontic treatment lateral cephalometric tracing.

the concave facial profile change to a straight facial profile. Although the treatment performed here was a compromise, excellent results were achieved. The final occlusion was esthetic, functional, healthy, and stable. The patient benefited by gaining self-esteem and improved esthetics.



Fig 12. Prosthodontic treatment panoramic radiograph.

The choice of treatment for any malocclusion must be tailored to each patient. All treatment possibilities, including those that are ideal and those that are a compromise, should be considered and explained to the patient so that he or she can choose the most acceptable plan.

In the prosthetic and orthodontic treatment of adult patients, realistic treatment objectives must be established and followed. The treatment that this patient received satisfied her needs, despite its limitations. Multidisciplinary treatment can lead to the satisfaction of both the patient and the professional.

CONCLUSIONS

The choice of treatment for any malocclusion must be tailored to each patient. In adults with many restored teeth, orthodontic treatment objectives should be economically, occlusally, and restoratively realistic. In this case report, both the patient's chief concerns and the malocclusion were addressed and treated to her satisfaction. At the end of the treatment with an orthodontic-prosthetic approach, an esthetic smile and a functional occlusion were established, and a satisfactory and stable result was obtained.

REFERENCES

1. Stellzig-Eisenhauer A, Lux CJ, Schuster G. Treatment decision in adult patients with Class III malocclusion: orthodontic therapy or orthognathic surgery? *Am J Orthod Dentofacial Orthop* 2002;122:27-38.
2. Dwyer PW. Orthodontic and orthognathic surgical correction of a severe Class III malocclusion. *Am J Orthod Dentofacial Orthop* 1998;113:125-32.
3. Janson G, Souza JEP, Alves FA, Andrade P Jr, Nakamura A, Freitas MR, et al. Extreme dentoalveolar compensation in the treatment of Class III malocclusion. *Am J Orthod Dentofacial Orthop* 2005;128:787-94.
4. Kokich VG, Spear FM. Guidelines for managing the orthodontic-restorative patient. *Semin Orthod* 1997;3:3-20.
5. Daher W, Caron J, Wechsler MH. Nonsurgical treatment of an adult with a Class III malocclusion. *Am J Orthod Dentofacial Orthop* 2007;132:243-51.
6. Gelgör IE, Karaman AI. Non-surgical treatment of Class III malocclusion in adults: two case reports. *J Orthod* 2005;32:89-97.
7. Saito I, Yamaki M, Hanada K. Nonsurgical treatment of adult open bite using edgewise appliance combined with high-pull headgear and Class III elastics. *Angle Orthod* 2005;75:277-83.
8. Lin J, Gu Y. Lower second molar extraction in correction of severe skeletal Class III malocclusion. *Angle Orthod* 2006;76:217-25.
9. Sakai Y, Kuroda S, Murshid SA, Takano-Yamamoto T. Skeletal Class III severe openbite treatment using implant anchorage. *Angle Orthod* 2008;78:157-66.
10. Spear FM, Kokich VG, Mathews DP. Interdisciplinary management of anterior dental esthetics. *J Am Dent Assoc* 2006;137:160-9.
11. Whitesides J, Pajewski NM, Bradley TG, Iacopino AM, Okunseri C. Socio-demographics of adult orthodontic visits in the United States. *Am J Orthod Dentofacial Orthop* 2008;133:489.e9-14.
12. Gazit-Rappaport T, Bayer A, Gazit E. An innovative orthodontic-prosthetic approach for a patient with dental and skeletal asymmetry. *Am J Orthod Dentofacial Orthop* 2003;123:185-91.
13. Sabri R. Treatment of a Class II Division 2 malocclusion with space reopening for a single-tooth implant. *Am J Orthod Dentofacial Orthop* 2001;119:135-42.
14. Lin J, Gu Y. Preliminary investigation of nonsurgical treatment of severe skeletal Class III malocclusion in the permanent dentition. *Angle Orthod* 2003;73:401-10.