

Multidisciplinary treatment of a mutilated dentition

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A black woman with a skeletal Class II malocclusion and a mutilated dentition was referred by her general dentist. Her dentition could not be restored with prosthetics alone. Her mandibular incisors and left premolars occluded with her edentulous ridge, and her incisors were procumbent. The multidisciplinary treatment plan included orthodontics, implant placement, and restorative dentistry. (*Am J Orthod Dentofacial Orthop* 2009;135:S96-102)

Dentists "restore" mutilated dentitions every day. Many patients would benefit from orthodontic treatment before prosthetic restoration to achieve more ideal esthetic and functional results. Many patients decline treatment because of finances or inconvenience, but some have no choice, because their dentitions are not restorable without orthodontic or surgical intervention or both. This patient was referred because her general dentist could not restore her mouth to an acceptable esthetic and functional result unless she had orthodontic treatment.

HISTORY AND ETIOLOGY

The patient was a black woman, aged 37 years 8 months, with an unremarkable medical history. Her dental history showed previous extraction of the maxillary lateral incisors, left canine, left first and second premolars, and the mandibular right first molar. She had a Class II malocclusion with bialveolar protrusion and a convex facial profile. She was wearing a maxillary "flipper" to replace the missing teeth. Her chief concerns were her protruding teeth and facial appearance. She desired a better esthetic appearance and elimination of the prosthesis. The etiology of this problem was believed to be heredity combined with a lack of good dental care in her formative years.

DIAGNOSIS

The facial photographs (Fig 1) show a convex facial profile. The patient was able to close her lips without

mentalis strain. The maxillary incisors were procumbent upon smiling.

The dental casts (Fig 2) show an Angle Class II occlusion. The maxillary left lateral incisor, left first and second premolars, and the mandibular right first molar were missing. The maxillary third molars and the mandibular right third molar were present. There was no mandibular anterior crowding, but there were spacing and procumbancy of both the maxillary and mandibular incisors.

The panoramic radiograph (Fig 3) showed that the maxillary lateral incisors, left canine, left first and second premolars, and the mandibular right first molar were missing. The maxillary and mandibular left first molars had endodontic treatment. There was a large edentulous space where the mandibular right first molar had been extracted.

The cephalometric tracing (Fig 4), with an ANB angle of 7°, illustrate a Class II skeletal pattern. The FMA is 20°. The facial height index of .70 confirmed balanced anterior and posterior facial heights.¹ The IMPA of 113° reflected proclination of the mandibular incisors. The Z-angle of 62° confirmed a protruded soft-tissue overlay.² The Wits appraisal of 4.7 mm reflected alveolar imbalance.^{3,4} There was 100% overbite, and the mandibular left canine and left first premolar were nearly occluding with the maxillary left edentulous area. McNamara's nasion Frankfort perpendicular⁵ suggested bialveolar protrusion.

TREATMENT OBJECTIVES

The treatment objectives for this patient were to obtain a normal profile line to nose relationship and a normal Z-angle, obtain normal canine and incisal guidance, reduce the overbite, reduce the incisor procumbancy, close the mandibular molar space, and prepare the dentition to be restored prosthetically.

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Fig 1. Pretreatment facial and intraoral photographs.

TREATMENT ALTERNATIVES

1. Extract the mandibular left second premolar and close the mandibular right molar space to upright and retract the mandibular incisors. Extract the maxillary right second premolar to make room for a lateral implant. Consolidate the maxillary incisor spacing. Use mandibular advancement surgery to align the apical bases, followed by implant placement to replace the teeth in the maxillary left quadrant and the maxillary right and left lateral incisors.
2. Extract the mandibular left second premolar and close the mandibular right molar space to upright and retract the mandibular incisors. Place the maxillary right canine next to the maxillary right central incisor and accept the Class II molar relationship. Restore the maxillary right first premolar as a canine,

and the maxillary right canine as a lateral incisor, crown the maxillary central incisors, and place 3 implants to restore the maxillary left lateral incisor, canine, and first premolar.

TREATMENT PLAN

Merrifield's total space analysis^{6,7} was used to determine space requirements. A decision was made to extract the mandibular left second premolar and close the mandibular right molar space as described in option 2. This extraction pattern would provide space to upright the mandibular incisors. This mandibular incisor movement would also allow the procumbent maxillary incisors to be retracted. The molar relationship would remain Class II, and the maxillary right canine would be placed next to the maxillary right central incisor. The

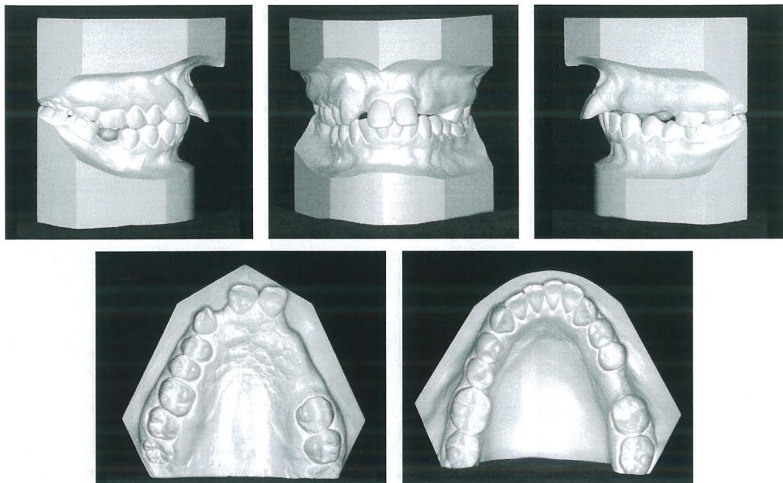


Fig 2. Pretreatment dental casts.



Fig 3. Pretreatment panoramic radiograph.

maxillary anterior teeth would be retracted and all anterior teeth would be restored along with 3 implants in the maxillary left quadrant to replace the maxillary left lateral incisor, canine, and first premolar.

TREATMENT PROGRESS

All teeth were sequentially banded or bonded with a .022-in standard, nontorqued, nonangulated edgewise appliance. The 10-2 system of Merrifield[®] was used. The patient was instructed to wear J-hook high-pull headgear with the J-hooks directly against the mandibular canine brackets to push the canines and premolars dis-



Fig 4. Pretreatment cephalometric tracing.

tally. Power chain was used with the headgear from the mandibular left second molar and the mandibular right third molar to augment the retraction of the premolars into the first molar edentulous space on the right and the second premolar space on the right. As the canines and premolars were moved distally, space was created in the maxillary and mandibular anterior segments. A .020 × .025-in mandibular closing loop archwire was constructed, and the mandibular anterior teeth were

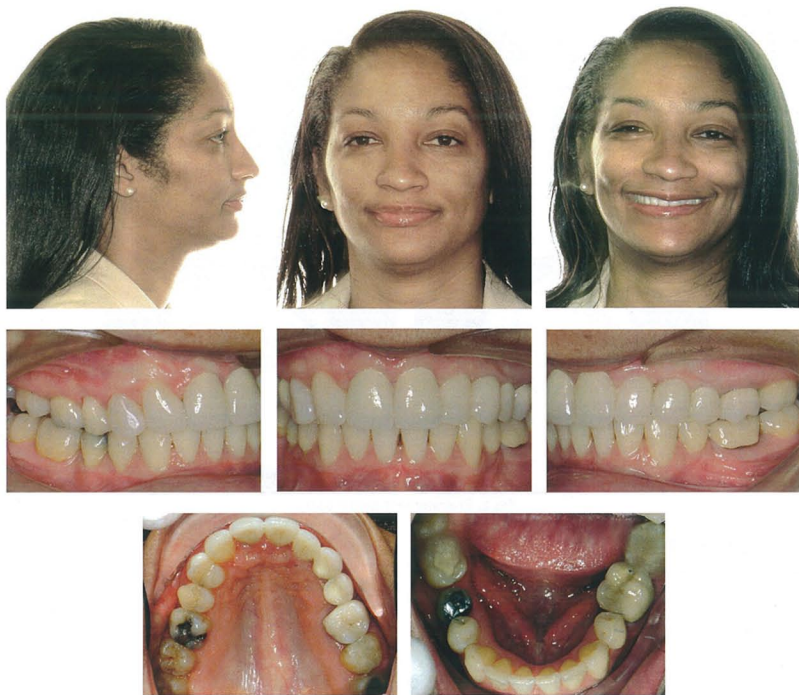


Fig 5. Posttreatment facial and intraoral photographs.

retracted. This procedure was repeated until all spaces were closed. Mandibular anchorage was prepared with a .020 × .025-in archwire with J-hook high-pull headgear attached to hooks soldered gingivally at the contact points between the mandibular canine and the lateral brackets. After anchorage preparation, a maxillary .012 × .025-in closing arch was fabricated, and the maxillary anterior teeth were retracted with Class II elastics. During the orthodontic treatment, the patient's acrylic partial was modified, and brackets were bonded to the prosthetic teeth and attached to the archwire to maintain an acceptable esthetic façade.

TREATMENT RESULTS

The posttreatment facial and intraoral photographs (Fig 5) show marked improvement in the patient's pro-

file, although the profile line was more anterior than ideal.

The posttreatment dental casts (Fig 6) exhibit a Class I occlusion with normal overjet, overbite, and canine and incisal guidance. The maxillary right first premolar was restored as a canine, the maxillary right canine was restored as a lateral incisor, and the central incisors were crowned. Implants with restorations were placed on the maxillary left lateral incisor, canine, and first premolar.

The posttreatment panoramic radiograph (Fig 7) shows no pathology and 3 osseointegrated implants with restorations in the maxillary left quadrant.

The posttreatment cephalometric tracing (Fig 8) illustrate the changes that were achieved with treatment. The mandibular incisors were uprighted over basal bone

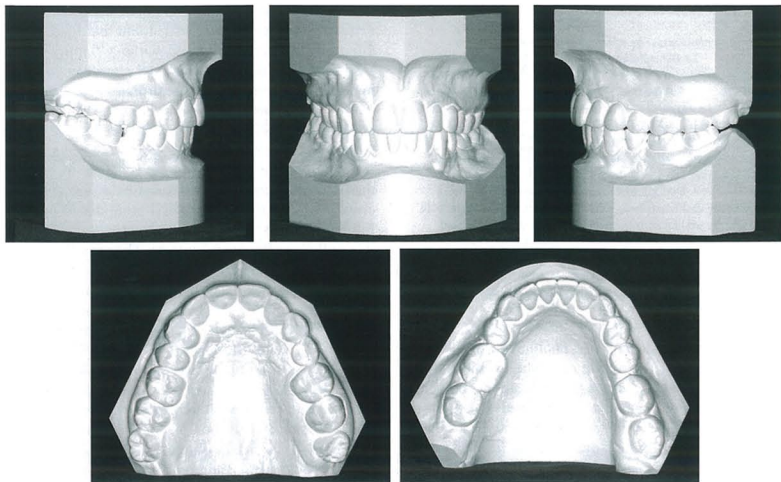


Fig 6. Posttreatment dental casts.



Fig 7. Posttreatment panoramic radiograph.

to an IMPA of 98° . This uprighting caused the Z-angle to improve to 68° . The FMA decreased to 20° .

The superimposed cephalometric tracings (Fig 9) show the changes with treatment.

Maxillary and mandibular Hawley retainers were placed. Total treatment time was 29 months.

DISCUSSION

Several investigators have compared cephalometric norms of black and white Americans.⁹⁻¹⁵ They found that blacks had greater mean values for all measurements than whites. More negative values were found for the Wits appraisal. Drummond¹⁶ compared white Americans with black Americans and found that the black subjects had a large tongue and loose, flaccid lips that allow the teeth to be in harmony in a



Fig 8. Posttreatment cephalometric radiograph tracing.

procumbent position. A similar study by Connor and Moshiri¹⁷ confirmed that the soft-tissue profile of black people was more protrusive and differed significantly from white norms. Diels et al¹⁸ and Russell and Nelson¹⁹ found that orthodontic treatment with extraction of the first premolars in black patients reduced the procumbancy of the lips. Farrow et al²⁰ surveyed black and white laypersons as well as general dentists and orthodontists and found that blacks prefer a straighter, but not necessarily "white," profile. In that study, the

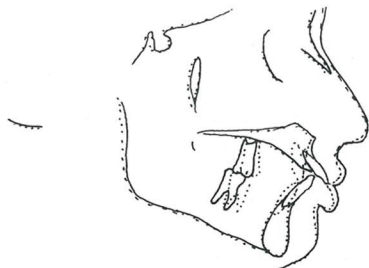


Fig 9. Superimposed cephalometric tracings.

second most popular morphed photograph of a black subject resembled the profile of a white subject. The authors suggested that, if the patient's chief complaint is the profile, orthognathic surgery and orthodontic treatment should be considered. Connor and Moshiri²¹ established orthognathic surgery norms for American black patients. They suggested that, if surgery for protrusion correction is indicated, chin augmentation improves the profile. Wolfe et al,²² in a historical review of perceptions of facial flatness and convexity and what constitutes a pleasing face both in North America and internationally, found that attractive faces range from slightly flat to mildly alveolar protrusive. However, marked deviation in either direction is a deformation and might warrant combined surgical and orthodontic treatment. Scott and Johnston,²³ in a study that used panels of judges (black and white)—orthodontists and laypersons—to study the perceived impact of extraction and nonextraction treatment on matched samples of black patients, found that the posttreatment profiles were preferred, especially the posttreatment extraction profiles. The panelists differed at which point the profile would benefit from extraction. The point for white panelists was reached when the lower lip was 2 mm in front of Ricketts' E-plane. For the black panelists, the equilibrium point came at 4 mm in front of Ricketts' E-plane. They found that facial beauty "is in the hand of the orthodontist, as well as the eye of the beholder and the face of the beheld."

This patient desired a facial change. Closing the mandibular right molar extraction space and extracting the mandibular left second premolar were necessary to provide space to upright the mandibular incisors, without which the procumbency of the maxillary incisors could not be corrected. Stepovich,²⁴ in a clinical study of edentulous space closure in the man-

dible, found that spaces of 10 mm or more (ie, molar extraction spaces) can be closed and that large mandibular spaces can be closed without tipping teeth. He found that the space remained closed in younger patients, but closed spaces are difficult to maintain in adults. No studies were found that specifically related to closed molar extraction spaces after treatment. In this patient, the spaces opened slightly in retention. The restorative dentist plans to remake the first molar crown on the mandibular left side and crown the mandibular right first premolar to prevent future problems with its large amalgam restoration; this will close the open contacts. The maxillary third molars will be extracted.

Implant therapy is highly predictable and successful. Astrand et al²⁵ studied 48 consecutive patients treated with Branemark titanium implant-supported prostheses (Nobel Biocare AB, Goteborg, Sweden) after 20 years; the survival rate was 99.2%. Kao²⁶ stated that, although implant success can be rewarding, all parties need to be involved in treatment planning issues. He stated that poor planning can result in increased surgical needs, surgical costs, and even case failure. Klokkevold and Han²⁷ studied the effects of smoking, diabetes, and periodontitis on implant success rates and found that patients who smoked or had diabetes were at greater risk for failure.

This patient was a diagnostic challenge because of her display of incisors, missing teeth, and deep overbite that extended to the premolar edentulous area on the maxillary left side. At first glance, a surgical procedure came to mind along with extractions and uprighting teeth over basal bone to achieve a Class I molar relationship and open the bite. This patient did not want a surgical procedure. It was reasoned that deep overbites are corrected routinely with conventional orthodontic treatment, and, if a Class I canine occlusion were possible by tooth substitution, then a Class II molar relationship would be an acceptable compromise. A major clinical challenge with this patient was maintaining an acceptable esthetic appearance with a removable acrylic appliance attached to the archwire while retracting her anterior teeth.

When the extraction sites were closed and the protrusion was reduced, the patient was sent for implant placement. She remained in orthodontic appliances for 4 months to allow the titanium implants to osseointegrate. After the implants were uncovered and tested for stability, the orthodontic appliances were removed, and temporary crowns were placed on the implants by the restorative dentist. Removable appliances were made the same day. The patient was pleased with the result provided by the various dentistry specialties.

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