



# A “midline dilemma” in an adult mutilated dentition

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Orthodontic treatment for adult patients who have mutilated dentitions can be clinically challenging. A 58-year-old man with several occlusally abraded teeth, a congenitally missing maxillary lateral incisor, and prior implant placement sought orthodontic treatment and restoration. Prosthetic restoration would not be possible. The “dilemma” for this patient was whether to trephine and remove an existing implant and make space for a new lateral incisor implant, or to restore the maxillary canine as a lateral incisor. (*Am J Orthod Dentofacial Orthop* 2014;146:364-70)

Dentists “restore” patients who have mutilated dentitions every day. Many of these patients would benefit from orthodontic treatment before prosthetic restoration, but some decline orthodontic treatment because of finances or inconvenience. Some, however, have no choice because their dentitions are not restorable without orthodontic or surgical intervention or both. The patient whose records are presented here had a dentition that was complicated by prior implant placement. He was referred because the general dentist could not restore his mouth to an acceptable esthetic and functional level unless he had orthodontic treatment before restorative dentistry.

## HISTORY AND ETIOLOGY

The patient was a white man, age 58 years 8 months, who had an unremarkable medical history. He had a Class I malocclusion with a slightly prognathic profile. His dental history showed prior extraction of the mandibular right first premolar and the maxillary right first and second premolars with implant and crown replacements of these teeth. The maxillary left lateral incisor was missing. The maxillary right canine was in the lateral’s position and functioned as a lateral incisor. The patient’s chief concerns were his worn-down teeth and dental esthetic appearance. He desired a better esthetic appearance and restoration of his abraded teeth. The primary etiology

was believed to be heredity and lack of adequate planning for dental restorations over the years.

## DIAGNOSIS

The facial photographs (*Fig 1*) demonstrated a slight mandibular prognathic facial profile with the maxillary midline off to his left. The patient’s teeth were stained and dark.

The dental casts (*Fig 2*) showed an Angle Class I occlusion. The maxillary left lateral incisor and mandibular right first premolar were missing. The maxillary right first premolar and second premolar were implant crowns. The maxillary left third molar was present, as were the mandibular third molars. There was mandibular crowding of 6 mm. There was a 3-mm space between the maxillary left canine (it functioned as a lateral incisor) and the first premolar crown. The mandibular left central incisor and left first premolar were in buccal crossbite. The dental midlines were coincident. There was extensive wear on the maxillary and mandibular incisors.

The panoramic radiograph (*Fig 3*) showed that the maxillary left lateral incisor was missing, and the maxillary left canine was in its place. The maxillary right first and second premolars were osseointegrated implants with crowns. The mandibular right first premolar was missing. The mandibular third molars and the maxillary left third molar were present.

The cephalogram and its tracing (*Fig 4*) show an ANB angle of 0.5°. The FMA was 24°. A facial height index of 0.82 was confirmation of a balanced anterior and posterior facial height.<sup>1</sup> The IMPA angle of 94° reflected slightly procumbent mandibular incisors. The Z-angle of 80° confirmed a straight soft-tissue overlay.<sup>2</sup> A Wits appraisal measurement of –1.1 mm confirmed a slight Class III alveolar imbalance.<sup>3,4</sup> There was a minimal overbite.

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The author has completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and none were reported.

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**Fig 1.** Pretreatment facial and intraoral photographs.

### TREATMENT OBJECTIVES

1. Maintain the profile line to nose relationship and the Z-angle.
2. Obtain normal canine and incisal guidance.
3. Resolve the crowding.
4. Close the maxillary spaces.
5. Prepare the dentition to be prosthetically restored.

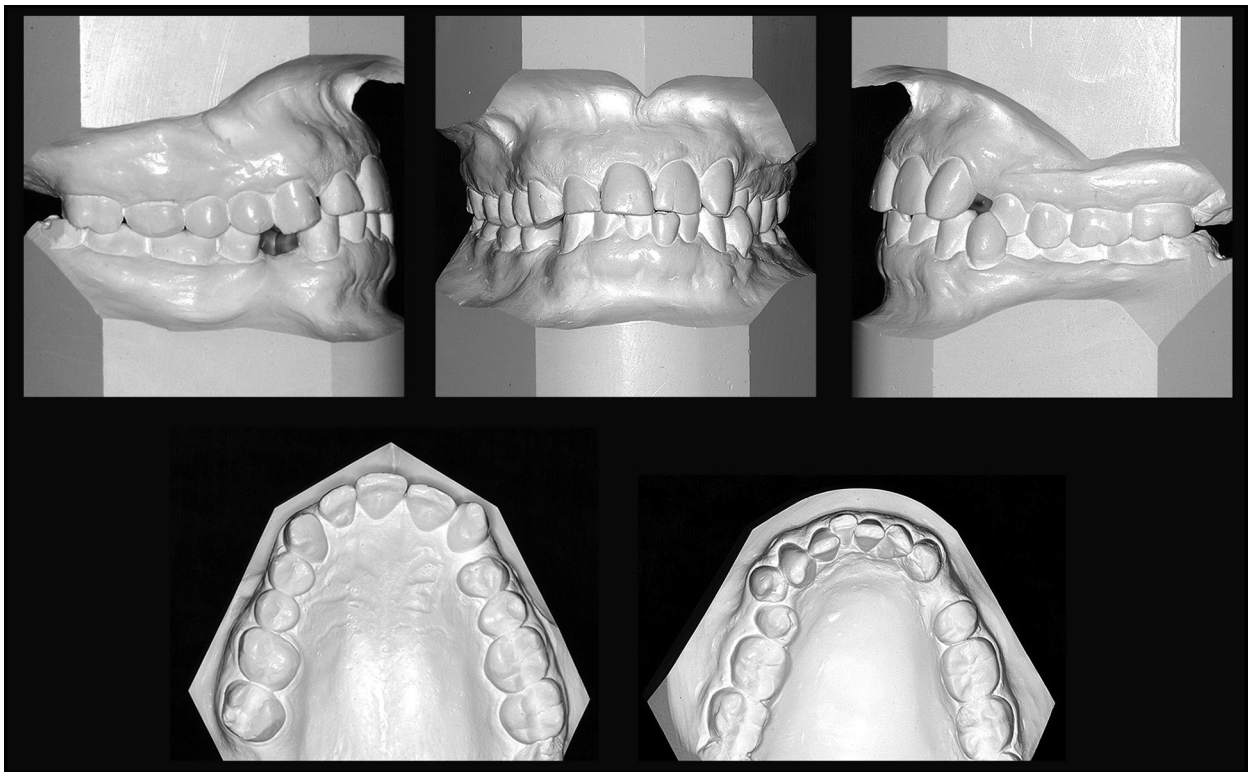
### TREATMENT ALTERNATIVES

1. Use a trephine to remove the maxillary right first premolar implant. Move the maxillary right canine and central incisors to the right and open space between the maxillary left central incisor and maxillary left canine to create room for an osseointegrated implant for a maxillary lateral incisor and crown. Close the space mesial to the maxillary first premolar. Close the mandibular right first premolar space and move the mandibular midline to the right to resolve the mandibular anterior crowding. Interproximal reproximation could be used as necessary.

2. Prosthetically restore all maxillary and mandibular teeth to create anterior and canine guidance.
2. Extract the mandibular left central incisor. Accept the maxillary midline position. Use the maxillary right implant crowns as anchorage to move the left buccal segments forward. Maintain the mandibular right first premolar space for an osseointegrated implant and crown. Restore all the maxillary and mandibular teeth. The maxillary left canine would be restored as a lateral incisor, but it would still function as a canine with the mandibular left canine to provide disocclusion of the left buccal segments in lateral excursions.

### TREATMENT PLAN

Merrifield's total space analysis<sup>5,6</sup> was used to determine space requirements. A decision was made to extract the mandibular left central incisor and maintain the midline as described in option 2. This extraction pattern would provide room to resolve the mandibular anterior crowding. The mandibular first

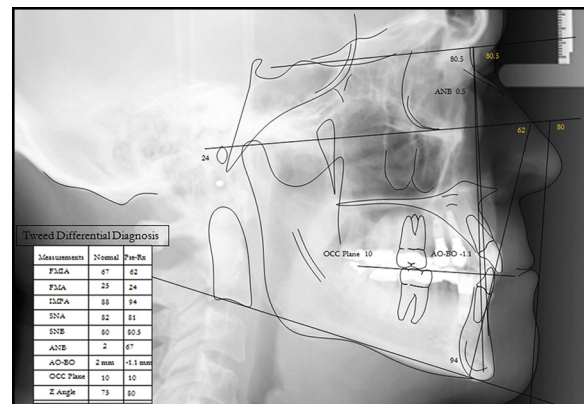


**Fig 2.** Pretreatment dental casts.



**Fig 3.** Pretreatment panoramic radiograph.

premolar space would be maintained to accommodate an osseointegrated implant and crown. The maxillary right premolar implant would be used as anchorage to close the maxillary spaces and to bring the maxillary left buccal segment forward as well as help to maintain the midline. The molar relationship would remain Class I. The maxillary space distal to the canine would be closed by moving the left buccal segment forward. The maxillary left canine would be restored to resemble a lateral incisor. All anterior teeth would be



**Fig 4.** Pretreatment cephalometric radiograph and tracing.

restored, and 1 implant would be used to replace the mandibular first premolar.

### TREATMENT PROGRESS

The mandibular left central incisor was extracted. All teeth including the third molars were sequentially banded or bonded with a 0.022-in standard,





**Fig 5.** Posttreatment facial and intraoral photographs.

nontorqued, nonangulated edgewise appliance. The 10-2 system of Merrifield<sup>7</sup> was used. The remaining mandibular incisors were moved mesially to make room for the mandibular left premolar that was in buccal crossbite. The mandibular right first premolar space was maintained with an open-coil spring. The maxillary right first and second premolar implant crowns were used as anchorage. Power chain was used to pull the left buccal segments mesially. The occlusion was detailed and finished at the same time that an implant was placed in the mandibular left first premolar space so that it could be integrating during the completion of the orthodontic treatment.

#### TREATMENT RESULTS

The posttreatment facial and intraoral photographs (Fig 5) illustrate a marked improvement in the patient's smile. His facial profile continues to exhibit a slight prognathic appearance. His facial midline was maintained.

The posttreatment dental casts (Fig 6) exhibit a Class I occlusion with normal overjet, overbite, and canine and

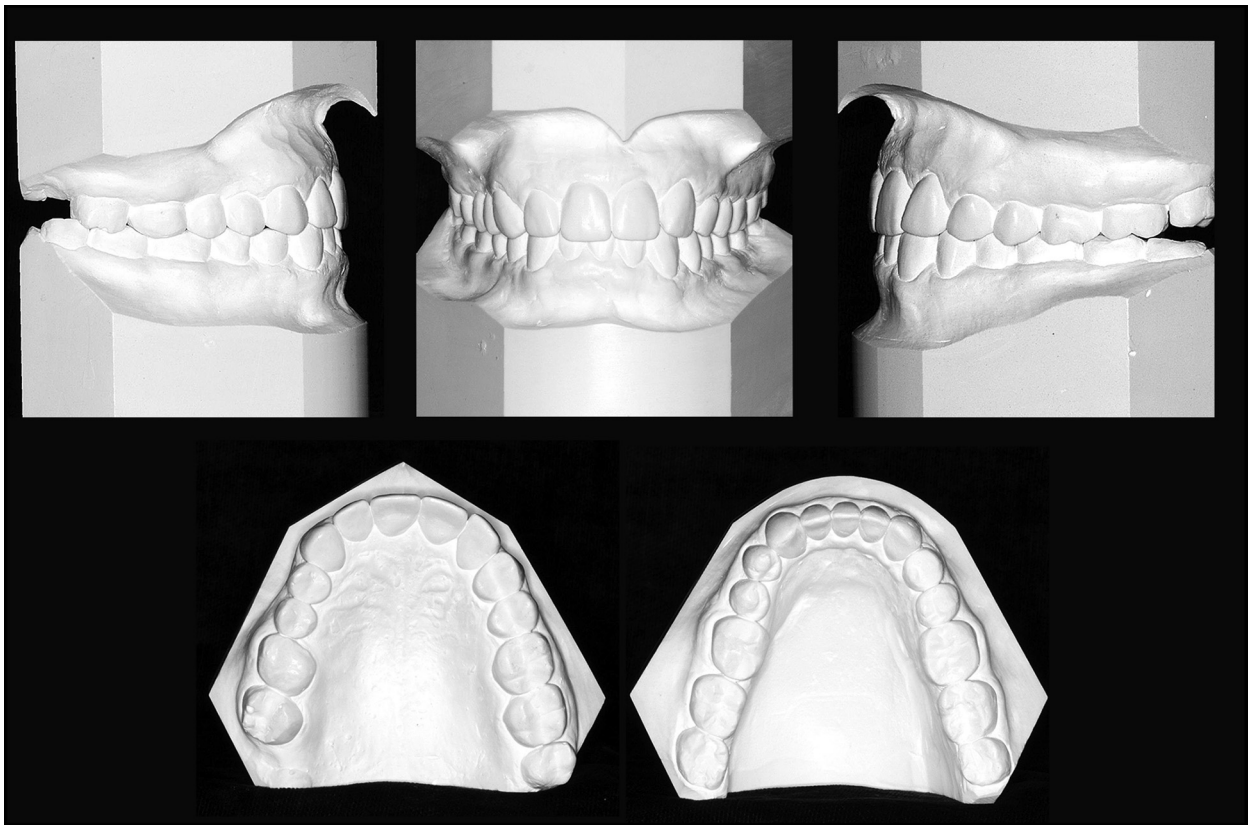
incisal guidance. The maxillary left canine has been restored as a lateral incisor. A crown has been placed on the mandibular implant. Restorations have been placed on all maxillary and mandibular anterior teeth. The maxillary left first premolar has also been restored. The left third molars were purposefully tipped out of occlusion and would "settle" during retention.

The posttreatment panoramic radiograph (Fig 7) shows no pathology and 3 osseointegrated implants.

The posttreatment cephalometric radiograph and its tracing (Fig 8) illustrate the changes that were achieved with treatment. The mandibular incisors were uprighted over basal bone to an IMPA of 90°. This uprighting facilitated the Z-angle improvement to 80°. The FMA angle decreased to 22°.

A maxillary night guard was used both as a retainer and as a device to protect the restorative treatment. A mandibular Hawley retainer was also used. Total treatment time was 22 months.

Retention casts taken 1 year posttreatment (Fig 9) show the posterior molars in occlusion.



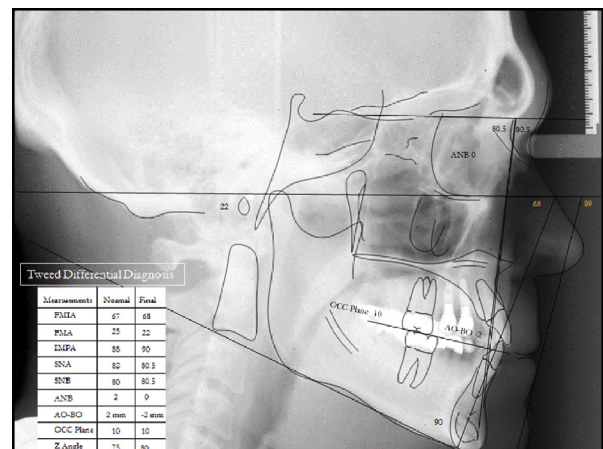
**Fig 6.** Posttreatment dental casts.



**Fig 7.** Posttreatment panoramic radiograph.

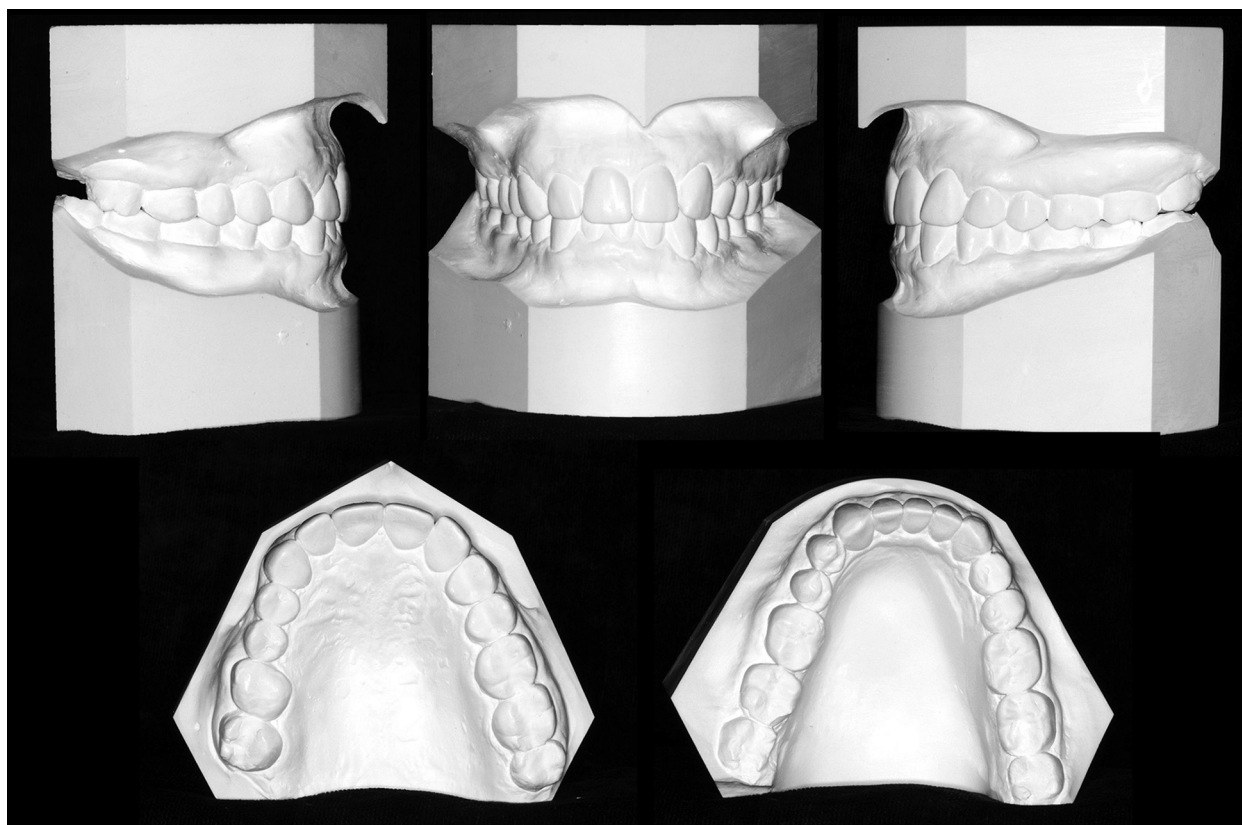
## DISCUSSION

Maxillary midline position relative to the facial midline is stressed as an important diagnostic feature in orthodontic treatment planning. Depending on the patient, however, movement of the dental midline to be coincident with the facial midline might be difficult to achieve. Beyer and Lindauer<sup>8</sup> studied how far the dental midline could deviate from the facial midline and still be considered esthetically pleasing. They used 120 subjects to ascertain midline choices.



**Fig 8.** Posttreatment cephalometric radiograph and tracing.

Orthodontists, general dentists, orthodontic patients, and parents of patients evaluated digitally altered photographs of 2 patients. They were asked to rate the acceptability of the dental midline deviations. The mean threshold for an acceptable dental midline



**Fig 9.** Retention casts taken 1 year posttreatment showing the posterior molars in occlusion.



**Fig 10.** Diagnostic setup.



deviation was  $2.2 \pm 1.5$  mm. The orthodontists and dentists were significantly less tolerant of midline deviations than were patients or parents. Janson et al<sup>9</sup> also studied 13 articles from a search of the literature for the influence of orthodontics on midline position, buccal corridor, and smile arc on facial attractiveness. These investigators found that a midline deviation of 2.2 mm can be considered acceptable by both orthodontists and laypeople. Kokich et al<sup>10</sup> intentionally altered smiling photographs with common esthetic discrepancies, including a maxillary midline deviation. Three hundred questionnaires were distributed to orthodontists, dentists, and laypeople. A maxillary midline deviation of 4 mm was necessary before orthodontists rated it significantly less attractive than the others. However, dentists and laypeople were unable to detect even a 4-mm deviation.

When first meeting this patient, one could have been overwhelmed by his dark and unsightly teeth. It was obvious from the amount of restorative dentistry in his mouth that he had kept regular dental appointments. Because his worn-down teeth could not be restored, he was forced to seek an orthodontic consultation.

When the first treatment alternative to correct his midline was explained to him, he had never realized his midline was deviated. When the use of a trephine to remove his maxillary right first premolar implant was explained, he immediately rejected it and asked if there were another way because "I paid a lot of money for that tooth." The second option was chosen, and a diagnostic setup was done with the mandibular left central incisor removed, the mandibular premolar space maintained, and the maxillary space closed. The posterior occlusion remained Angle Class I. The setup (Fig 10) illustrates normal overjet and overbite.

Implant therapy is highly predictable and successful. Astrand et al<sup>11</sup> studied 48 consecutive patients who were treated with Branemark design titanium implant-supported prostheses (Nobel Biocare AB, Goteborg, Sweden); the survival rate was 99.2% after 20 years. Kao<sup>12</sup> 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 and surgical costs, and even case failure. Klokkevold and Han<sup>13</sup> studied the effects of smoking, diabetes, and periodontitis on implant success rates and found that patients who smoked or had diabetes had a greater risk for failure.

This patient presented a diagnostic and treatment-planning challenge because of prior implant placement. Some of the problems might have been avoided with better planning.

The patient was pleased with the result provided by the various dental disciplines.

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