A 23-year-old woman with a skeletal Class III relationship, a normal vertical jaw relationship, and missing maxillary lateral incisors was treated with bidimensional fixed edgewise appliance therapy combined with orthognathic surgery. A functional and esthetic occlusion in an improved facial profile was established at the end of the surgical and orthodontic treatment. Pretreatment, posttreatment, and long-term follow-up records for the patient are presented. (Am J Orthod Dentofacial Orthop 2011;139:388-96)

Nonetheless, most patients with severe skeletal Class III malocclusion are candidates for orthognathic surgery in adulthood, the only means of obtaining functional occlusion and an esthetically pleasing profile. Moreover, many adults presenting for comprehensive orthodontic therapy have additional dental and periodontal problems that require multidisciplinary treatment approaches.

The aim of this case report was therefore to present the interdisciplinary treatment of an adult patient with a Class III malocclusion complicated by missing maxillary lateral incisors.

**DIAGNOSIS AND ETIOLOGY**

A 23-year-old woman reported with the principal complaint of unsatisfactory esthetic appearance of her teeth. Her medical history showed no contraindication to orthodontic therapy, and no history of trauma or serious illness. Facial photographs showed maxillary retraction and severe mandibular protrusion with an unesthetic smile (Fig 1). Intraoral examination of the maxillary dental arch showed a transverse skeletal constriction, a diastema between the central incisors, and congenital absence of the permanent lateral incisors. In the mandibular arch, on the other hand, mild incisor crowding, and anterior and bilateral crossbite with negative overjet (−6.5 mm) were evident. The tooth discoloration was probably due to tetracycline administration during dental development. Class III molar and canine relationships were observed on both the right and left sides. The mandible deviated toward the right. The maxillary left lateral incisor edentulous space had been partially closed by migration of the adjacent teeth (Fig 2).

Evaluation of the panoramic radiograph confirmed that the maxillary lateral incisors were missing and showed the impacted maxillary and mandibular third molars (Fig 3). Cephalometric analysis showed a skeletal
Class III relationship, normal vertical jaw proportions (SNA-SNP/Go-Gn, 23°), and inclined mandibular incisors (lower incisor GoGn, 84°).

**TREATMENT OBJECTIVES**

The skeletal objectives for this patient were correction of the maxillary position and asymmetrical mandibular
prognathism. The dental objective of treatment was closure of the lateral incisor spaces to establish a functional occlusion with normal anterior overbite and overjet.

TREATMENT ALTERNATIVES

Three treatment options were proposed to the patient. The first would involve orthodontic treatment of the maxillary and mandibular arches, reopening of the maxillary lateral incisor space, and surgical treatment to correct the vertical and sagittal skeletal discrepancies. This option would also include replacing the missing maxillary lateral incisors with 2 dental implants. Although this solution would produce Class I molar and canine relationships on both sides, the gingival contour and margin levels would be critical and difficult to control in the long term.

Another option consisted of closing the spaces left by the congenitally missing teeth before bimaxillary surgery. This choice would also require restoration of the maxillary canines to resemble lateral incisors and the first premolars to simulate canines.

The third choice was nonsurgical orthodontic treatment. This option would involve extraction of the mandibular first premolars and replacement of the missing maxillary lateral incisors with 2 dental implants. The premolar extractions and opening of the lateral incisor spaces would permit resolution of the anterior crossbite and achieve an occlusal compromise. However, neither facial esthetics, skeletal asymmetry, nor the transverse discrepancy would be improved.

After consultation, the patient chose the second option, and her treatment course and outcome are detailed below.

TREATMENT PLAN

Levelling and alignment of both arches and closure of the lateral incisor spaces were the first steps. Then LeFort I surgery would be used to correct the vertical and transverse skeletal discrepancies and to assist in sagittal coordination of the mandible. Finally, bilateral sagittal split ramus osteotomy would be used to correct the asymmetry, prognathism, sagittal maxillomandibular relationship, and dental malocclusion. The final steps would be occlusal finishing and restorative rehabilitation of the maxillary canines and first premolars to substitute as lateral incisors and achieve adequate occlusal and esthetic results.

TREATMENT PROGRESS

The mandibular third permanent molars and maxillary right deciduous lateral incisor were extracted.
Although a bidimensional appliance was used initially, the maxillary second molars were not bonded, and the maxillary canines were fitted with conventional fixed appliances (0.022 × 0.028 in) to facilitate sliding mechanics of the maxillary central incisors.

Leveling and alignment were begun with a 0.014-in nickel-titanium archwire and completed with a 0.016 × 0.022-in stainless steel wire. Space closure was achieved by using 0.018 × 0.022-in stainless steel archwires, selected to maintain incisor torque control (0.018 × 0.025-in slot) and reduce friction on the canines, premolars, and molars during incisor retraction (brackets, 0.022 × 0.028 in) (Fig 4).

After bimaxillary surgery, esthetic recontouring of the maxillary canines was accomplished by using a combination of grinding and composite resin buildups (Fig 5). In addition, the maxillary canines, which had been reshaped as lateral incisors, were fitted with new 0.018 × 0.025-in brackets (bidimensional prescription) to provide precise control of torque and tipping, and the mandibular second molars were banded. After rebracketing of the maxillary canines (lateral incisors), a 0.016 × 0.022-in Quad-Cat (GAC International, Bohemia, NY) archwire was placed.

Subsequently, space was opened by using an 0.018 × 0.025-in stainless steel archwire, and a coil spring on the left side was used to prepare the first premolars for restoration with canine-shaped ceramic crowns. Ultimately, individualized extrusion and intrusion of the canines (lateral incisors) and first premolars (canines) were performed to obtain optimum marginal gingival contours for the anterior teeth (Fig 6). Final detailing, involving 8 months of treatment time, was completed with 0.018 × 0.025-in stainless steel archwires.

**TREATMENT RESULTS**

At the end of treatment, Class I canine and Class II molar relationships were achieved, and overbite and
overjet were within the normal limits. Facial appearance and skeletal balance were improved, and mandibular asymmetry and prognathism had been corrected. Despite the missing lateral incisors, the patient appeared to exhibit a natural intact dentition (Figs 7 and 8).

The cephalometric changes included increases in the ANB angle (almost ideal) and Wits appraisals, an

Fig 5. Esthetic recontouring of the maxillary canines.

Fig 6. Individualized extrusion and intrusion of the canines (lateral incisors) and first premolars (canines) to improve gingival contours.
improvement in the lip relationship, and no variation in lower vertical face height (Table). Superimposition of the pretreatment and posttreatment cephalometric tracings showed that mandibular retraction was achieved by slight downward and forward movement of the maxilla, as well as minor maxillary incisor proclination (Fig 9).

Long-term records were collected 2 years after treatment (Figs 10 and 11). Posttreatment and long-term cephalograms and superimposed tracings demonstrated minimal anteroposterior changes in incisor position and little or no surgical relapse.

**DISCUSSION**

Almost 30% of adult orthodontic patients require multi-disciplinary management to obtain optimal treatment outcomes.12 Often, functional and esthetic results can only be achieved by a combination of surgery, orthodontics, and prosthodontic rehabilitation.13

In this patient, the missing lateral incisors complicated the treatment of the Class III skeletal malocclusion. Orthodontic treatment of missing teeth comprises 2 alternatives: closure or opening of the edentulous spaces.14-22 Many clinicians prefer to create space for missing lateral incisors with single-tooth implants or resin-bonded bridges,21,22 but, in this case, we decided to close the spaces because of the permanence and the biologic compatibility of the result.23

Managing patients with congenitally missing maxillary lateral incisors raises several important issues concerning the amount of space, the patient’s age, the type of malocclusion, and the condition of the adjacent teeth. One of 3 treatment options can be selected when
replacing missing lateral incisors: canine substitution, a tooth-supported restoration, or a single-tooth implant. There are also specific criteria that must be addressed when choosing an appropriate treatment option. The primary consideration must be conservation, and, in general, the treatment of choice should be the least invasive option that satisfies the expected esthetic and functional objectives.

In this context, the orthodontist plays a key role by achieving specific space requirements and positioning teeth in an ideal restorative position. For example, canine substitution can be an excellent treatment option for replacing missing lateral incisors from an esthetic perspective. However, if this treatment is unsuitable for the patient in question, the final result might be less than ideal. Ultimately, an interdisciplinary approach is the most predictable way of achieving optimal final esthetics.24

According to Rosa and Zachrisson,25,26 Class III treatment with space closure can be difficult to obtain, but a natural-looking result is possible with good collaboration. Fundamental to clinical success are careful correction of the crown torque, esthetic recontouring, and intentional whitening of the mesially relocated canine. Furthermore, to obtain an optimal level for the marginal gingival contours of the anterior teeth, individualized extrusion and intrusion of the canines and first premolars are necessary.

In contrast, replacing the missing lateral incisors with a single-tooth implant and prosthetic crown would commit the patient to a lifelong artificial restoration in a highly visible area of the mouth. In this region, tooth hue and transparency, along with gingival color, contour, and marginal levels are critical and difficult to control, particularly over time.27,28

Fig 9. Posttreatment radiographs and superimposed cephalometric tracings.
Fig 10. Photographs 2 years posttreatment.

Fig 11. Cephalometric radiograph and tracing 2 years posttreatment.
Table. Cephalometric analysis

<table>
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<th>Final</th>
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Treatment outcomes and long-term results demonstrated that combined orthodontic surgery and prosthodontic treatment of a Class III malocclusion can provide a stable, intact dentition, despite the congenital absence of the lateral incisors.

CONCLUSIONS

Interdisciplinary treatment combining orthodontics, surgery, and prosthodontics helped to achieve good esthetic and functional results in an adult with a Class III skeletal malocclusion and missing lateral incisors.

REFERENCES