

Case Report DM

Orthodontic treatment enhances the use of endosseous implants to replace missing teeth

As increasing numbers of adults are referred for orthodontic care, problems created by missing anterior teeth as a result of trauma are becoming more common. Individuals often present with a unique set of problems requiring a multi-disciplinary approach to treatment. Recent advances in the use of endosseous implants combined with increased concern for esthetics provide the clinician with new opportunities in the treatment of these patients. Benefits to the compromised patient are numerous when the orthodontist can coordinate tooth movement with orthognathic surgery and prosthetic treatment to fulfill all treatment objectives. The following case report successfully meets this challenge.

—Editor

By John C. Ives, DDS, MSD

This 19 year 9 month healthy Caucasian female presented with a Class III, asymmetrical, partially edentulous malocclusion characterized by unilateral mandibular hyperplasia. The patient had a temporary partial denture to replace several maxillary teeth lost in an auto accident. Centric relation was coincident with centric occlusion. A TMJ screening exam gave no history or signs of dysfunction. The patient's primary concern was improved esthetics and the desire for a fixed prosthesis.

The pretreatment frontal facial photograph (Figure 1) showed a distinct lower facial asymmetry. The mandibular soft-tissue symphysis was deviated to the right of the facial midline. The underlying mandibular unilateral hyperplasia was quite evident when comparing right and left mandibular soft tissue borders. In profile the nose was prominent, the nasolabial angle was acute, lips were parted at rest and the throat length was within normal limits and attractive. The pretreatment intraoral photograph (Figure 4) showed severe palatal and maxillary anterior alveolar inflammatory papillary hyperplasia. The mandibular dental midline was coincident with the mandibular symphysis with both deviated approximately three millimeters to the right of the facial midsagittal plane.

The pretreatment panograph (Figure 3), inadvertently taken with the maxillary partial denture in place, demonstrated the absence of the maxillary right central incisor through the left first premolar. The maxillary third molars were impacted. The remaining mandibular third molar

was partial hard and soft tissue impacted. The bone pattern in the maxillary edentulous area appeared amorphic suggesting a lack of alveolar bone in this region.

Pretreatment study models (Figure 5) demonstrated the rather poor character of the gingival surface texture in the maxillary edentulous ridge. The buccal occlusion was Class III bilaterally. A transverse discrepancy was present with the right canines and premolars in crossbite. Although arch length was adequate, generalized dental irregularities and rotations were present.

The cephalometric analysis and tracing (Fig-

Figure 1
Pretreatment facial photographs



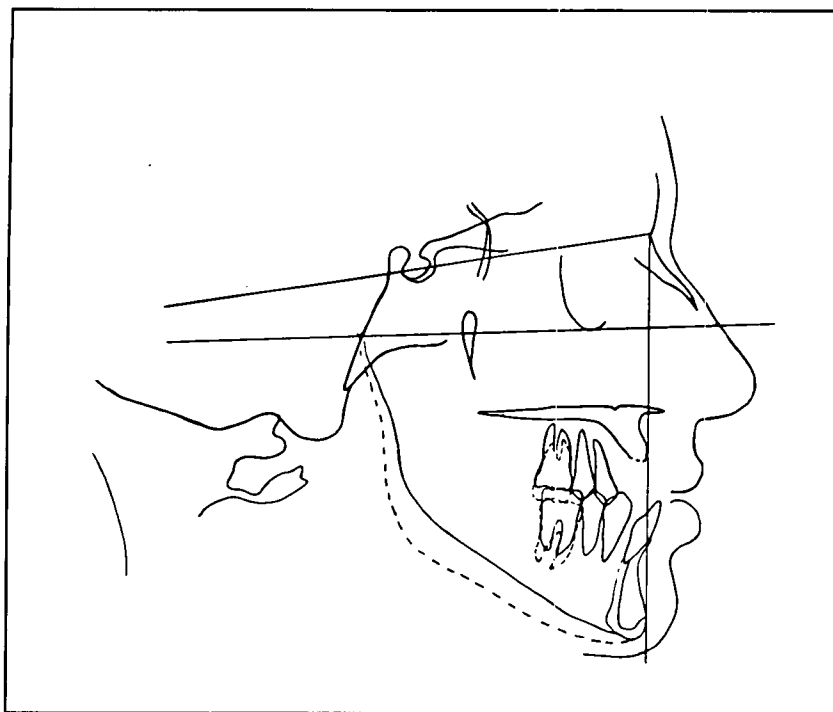


Figure 2

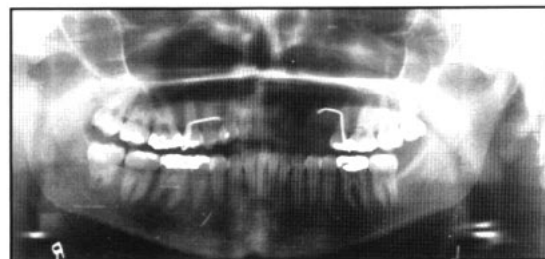


Figure 3



Figure 4

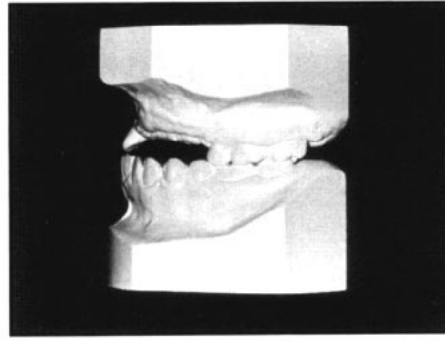
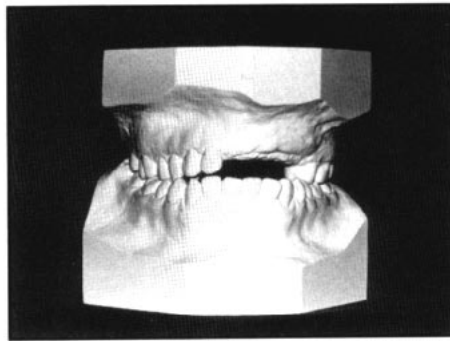
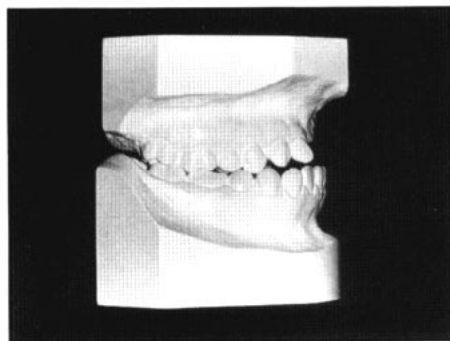
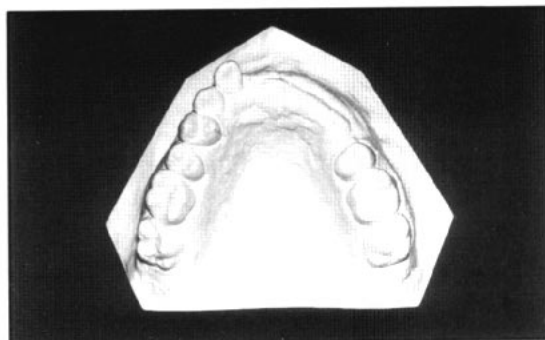
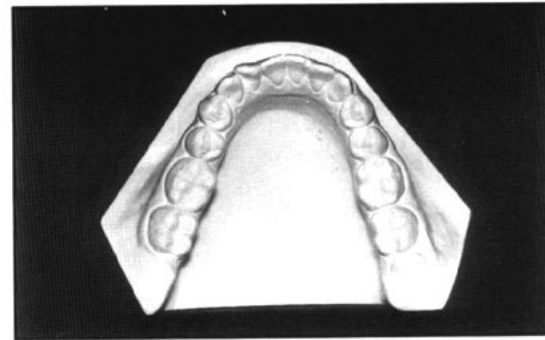
Figure 2
Pretreatment cephalometric tracingFigure 3
Pretreatment panoramic radiographFigure 4
Pretreatment intraoral photographFigure 5
Pretreatment study models

Figure 5



ure 2) demonstrated a mild Class III skeletal pattern with an ANB angle of -1 degree. This was in part due to a retrusive "A" point in response to the loss of maxillary incisors. The mandibular incisors were in good relationship to the mandible, with a 6:3 Holdaway ratio and 91 degrees to the mandibular plane. An asymmetry was present between the left and right mandibular borders with the left vertical ramus longer than the right. The upper lip was retrusive at seven millimeters to the esthetic plane.

History and etiology

The patient had a significant dental history due to a serious automobile accident seven months prior to the gathering of orthodontic diagnostic records. The accident resulted in the traumatic loss of five maxillary teeth and associated alveolar bone. The patient's emergency physician-oral surgeon performed an autogenous bone graft using iliac bone to build up the edentulous ridge. A follow-up soft tissue graft was done to provide attached gingiva over the

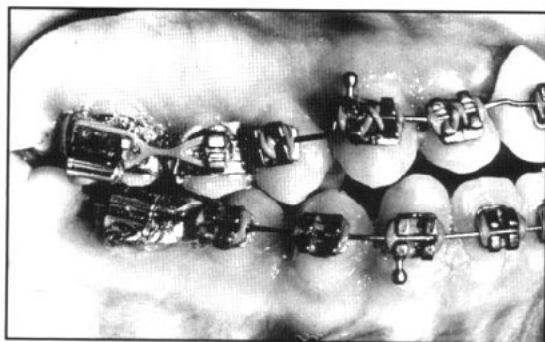


Figure 6

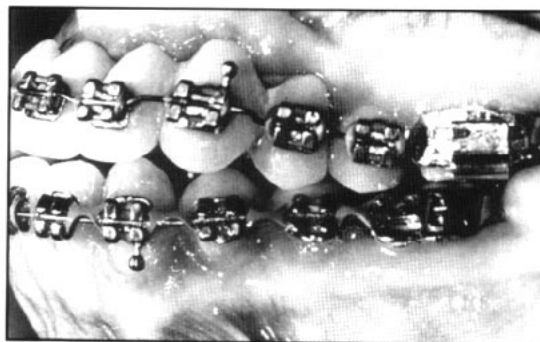


Figure 6
Appliance design showing brackets bonded to a single unit tooth-colored acrylic prosthesis and attached to the maxillary arch wire.

edentulous area. The patient had seen her general dentist on a regular basis prior to the accident. The patient moved following the accident, and was in the process of selecting a new dental team.

The causes of the malocclusion were considered to be genetic factors combined with the severe trauma. The asymmetrical hyperplastic mandibular growth pattern caused the lower facial asymmetry, Class III buccal occlusion, and right skeletal-dental crossbite relationship.

Treatment objectives

- 1) Establish interocclusal symmetry and bilateral Class I occlusion allowing optimum prosthesis design.
- 2) Achieve facial symmetry and improve dental and facial esthetics.
- 3) Provide an improved environment for long-term oral health.

Treatment plan

Because of the severity of the unilateral mandibular skeletal hyperplasia and the precarious nature of the edentulous ridge, it was felt that a combination of orthodontic treatment, orthognathic surgery, and prosthodontic treatment would be necessary to reach all treatment objectives. The plan called for orthodontic therapy to coordinate dental arches, extraction of the impacted third molars, sagittal osteotomies to correct the mandibular deformity, and the surgical placement of tissue integrated titanium fixtures (Branemark implants) to support a fixed prosthesis. The asymmetrical mandibular setback would simultaneously correct the transverse discrepancy, achieve Class I occlusion, and establish facial symmetry. Tissue integrated fixtures in the previous bone graft to the maxilla would result in placing a functional load to the graft preventing gradual resorption and simultaneously provide support for an esthetic prosthesis that could be removed without additional trauma for repair when necessary.

Treatment progress

Upper and lower 0.022 x 0.028-inch edgewise

appliances were placed. Brackets were bonded to a single unit tooth-colored acrylic prosthesis and attached to the maxillary arch wire (Figure 6). The acrylic prosthesis extended several millimeters over the alveolar ridge to provide additional support while in round wires. Initial alignment and rotations were corrected in round wire. A heavy rectangular archwire was then placed in the maxillary arch to support the bracket born temporary prosthesis and achieve buccal root torque to the maxillary molars. Bilateral sagittal osteotomies, third molar extraction, and the insertion of a four-unit, tissue integrated prosthesis to the maxilla were procedures simultaneously performed nine months after placement of fixed appliances. Following six weeks of intermaxillary fixation and post-fixation therapy, the patient returned for post-surgical finishing. Mandibular fixed appliances were removed 11 months after the initiation of treatment. Partial maxillary appliances were left in place to support the temporary prosthesis until complete osseointegration took place in preparation for the second surgical entry to place the extension into the implants. The need to maintain dental esthetics made scheduling between the second surgery, appliance removal, retainer delivery, and final prosthetic placement an interesting challenge for all members of the dental team.

The patient was never without a prosthesis except during a 45 minute drive (immediately following the second surgery) between the oral surgeon's office and the prosthodontist's office. A temporary maxillary retainer was made and given to the patient to hand carry to the prosthodontist. He removed the maxillary fixed orthodontic appliances in preparation for an impression for the definitive prosthesis and fitted the temporary removable retainer. The definitive fixed prosthesis was placed 15 months following the initiation of treatment.

Results

The posttreatment facial photographs (Figure 7) show facial symmetry was established with a



Figure 7
Figure 7
Posttreatment facial
photographs
Figure 8
Posttreatment intraoral
photographs

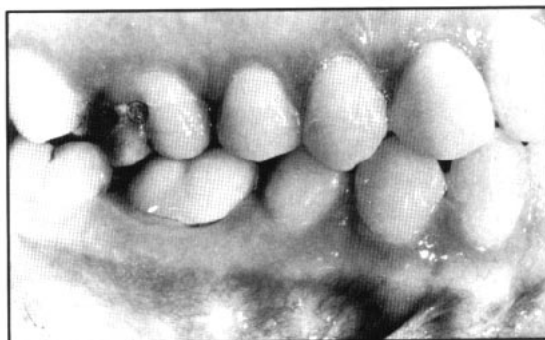
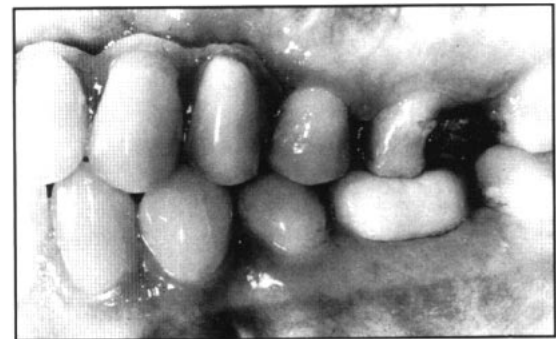
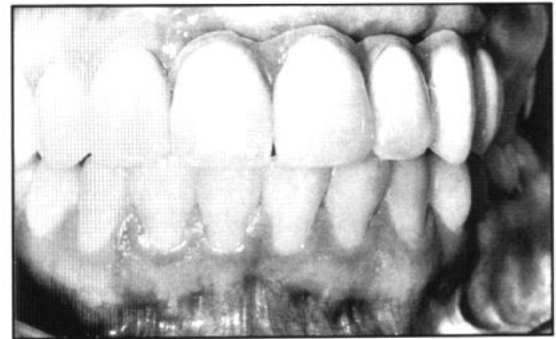
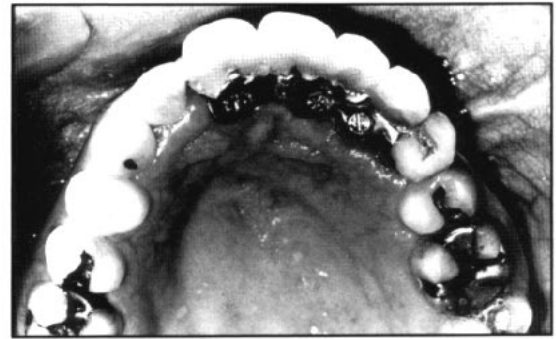


Figure 8

pleasing smile and good dental esthetics. The profile was unchanged maintaining the attractive throat length. The dental midlines are nearly coincident with each other and the facial midline. The intraoral photographs (Figure 8) show the fixed prosthesis in place with acrylic extensions and papillae to provide esthetics for the deficient alveolar ridge. The palatal tissues have returned to a state of health with no sequelae to the pre-existing inflammatory papillary hyperplasia.

The posttreatment radiograph (Figure 10) demonstrates improved root parallelism in the mandibular arch and the placement of four implants in the maxilla.

The posttreatment study models (Figure 11) show the fixed prosthesis in place with normal anterior and posterior horizontal overjet and vertical overlap. Class I occlusion was established with group function in left working and canine rise in right working with no balancing interferences.



The posttreatment cephalometric changes (Figure 9) were unremarkable with the mandibular symphysis positioned approximately one millimeter distal to the pretreatment position. Slight dental changes are evident, most notably greater proclination of the mandibular incisors (from 90 degrees to 95 degrees). The esthetic plane values remain unchanged with the upper lip deficient at seven millimeters.

Final evaluation

The key factor in correction of this malocclusion was establishing mandibular skeletal-dental symmetry. This alone simultaneously corrected the asymmetrical Class III malocclusion, the transverse occlusal discrepancy, the facial asymmetry, and provided a favorable occlusal relationship for fabrication of an esthetic and functional prosthesis. Another interesting aspect of this case was the indication for tissue integrated fixtures to provide physiologic loading to the previous bone graft preventing gradual bony

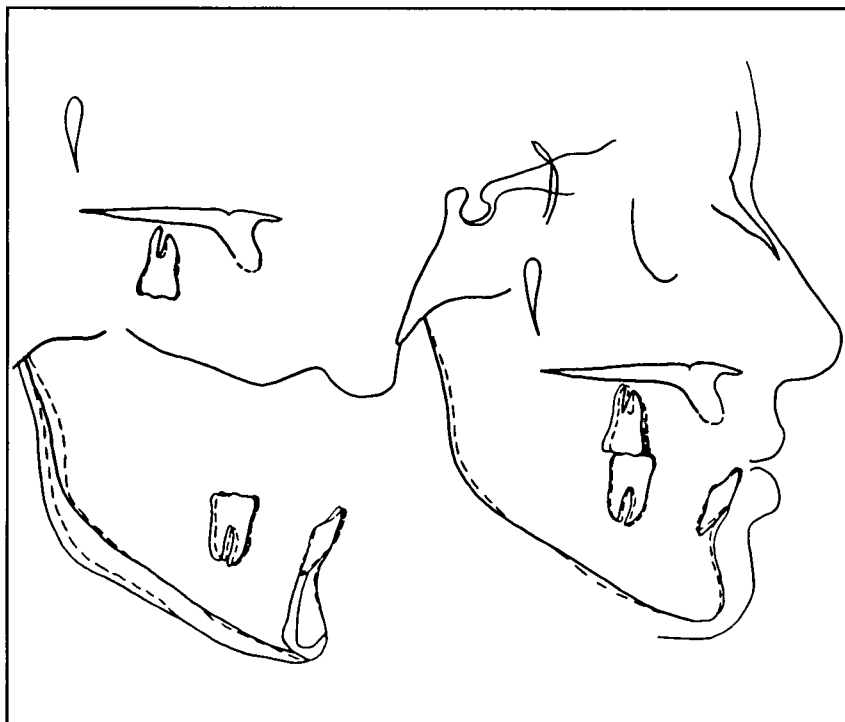


Figure 9

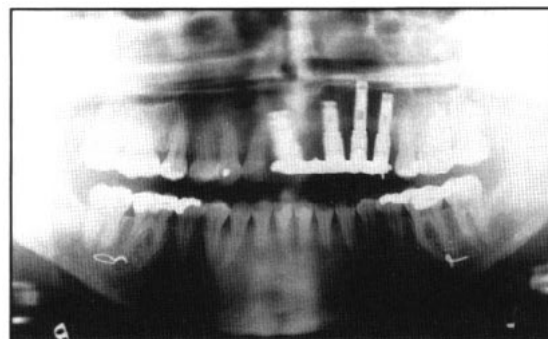


Figure 10

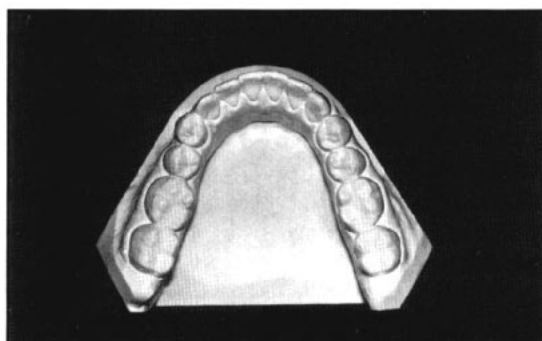
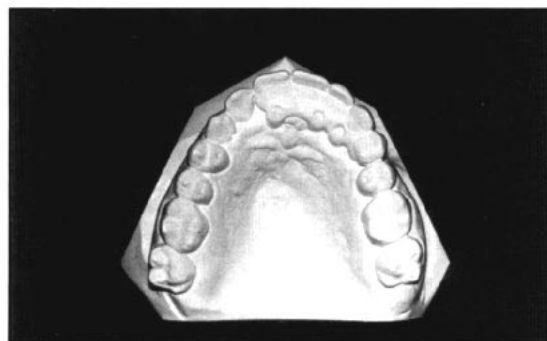
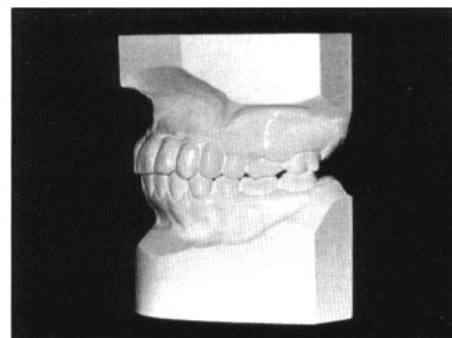
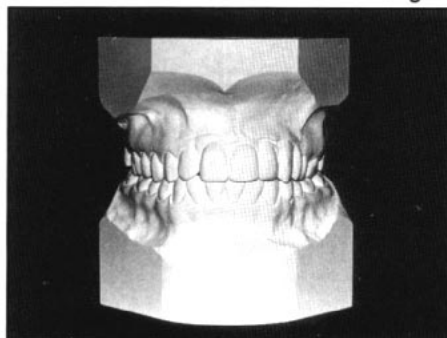
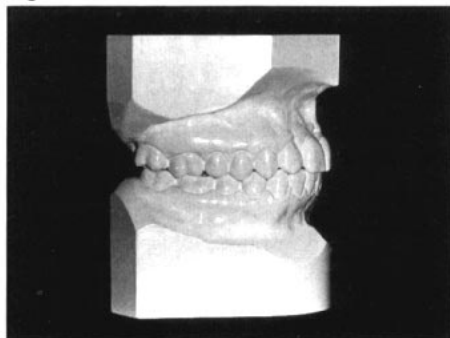


Figure 9
Composite tracing showing the subtle changes that occurred during treatment in the antero-posterior plane.

Figure 10
Posttreatment panoramic radiograph

Figure 11
Posttreatment study models

Figure 11

resorption through disuse atrophy. It was somewhat disappointing not to see greater fullness in the upper lip. The prognosis for stability of the treatment result is good with continued mandibular retainer wear.

Assisting Dr. Ive in the treatment of this patient were the following clinicians: Jeffrey D. Guinn, general dentist; Roger A. West, oral and maxillofacial surgeon; and James L. Lord, prosthodontist.

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