

Case Report BB

Use of maxillary intraosseous implants for Class II elastic anchorage

This case report was presented at a regular meeting of the Southern California Component of the Edward H. Angle Society in 1994. It includes the use of maxillary intraosseous implants for Class II elastic anchorage.

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This 39-year-old female was referred for an orthodontic examination by her general dentist. She had been involved in an auto accident as a teenager and had lost six maxillary anterior teeth. A removable partial denture constructed at that time was the first of several removable appliances she had worn over the years. Her general dentist had discussed some fixed restorative options; however, her insurance would not cover any of the fixed treatments. She had been saving for several years to afford, in her words, "some quality treatment." Her dentist had recently determined that he would not be able to place any type of restorative work due to a lack of space occlusally between the soft tissue of the upper anterior area and the mandibular teeth. He suggested an orthodontist might be able to solve the problem.

Clinical exam

The patient wore a removable partial denture (Figure 1) to the initial exam, and she was reluctant to remove it, even for the brief examination. She indicated that in her 20 years of marriage, her husband had never seen her without it.

In the maxillary arch, all four incisors and both canines were missing, along with the third molars. All teeth except the third molars were present in the mandibular arch and there was moderate spacing adjacent to both mandibular canines. The mandibular incisors and canines were overerupted and nearly in contact with the soft tissue on the upper arch (Figure 2), resulting in an accentuated curve of Spee. A full Class II molar relationship existed on the left side. The mandibular midline appeared to have shifted 2 mm to the left (Figure 3).

All remaining maxillary teeth had alloy restorations. The maxillary right first molar restoration was particularly large. The mandibular first molars had been restored but the crowns were overcontoured and bulky.

Facial esthetics were pleasing, although the lips were receded well behind a prominent

Figure 1
The patient wore this removable partial denture to the initial examination.

Figure 2
The mandibular incisors and canines were overerupted and nearly in contact with opposing soft tissues.

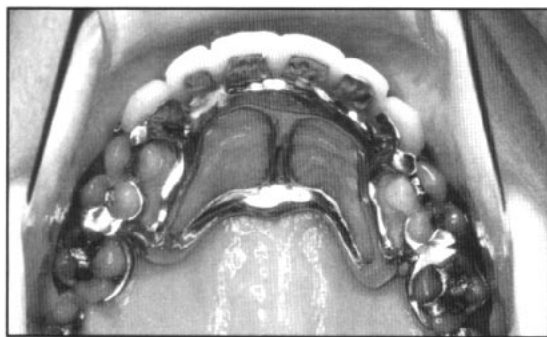


Figure 1



Figure 2

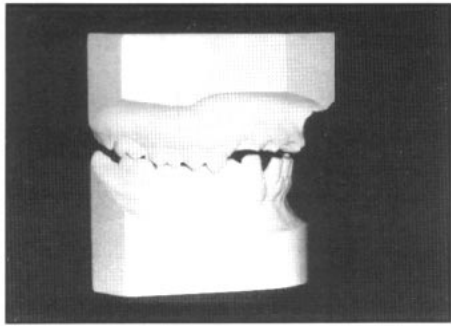


Figure 3A

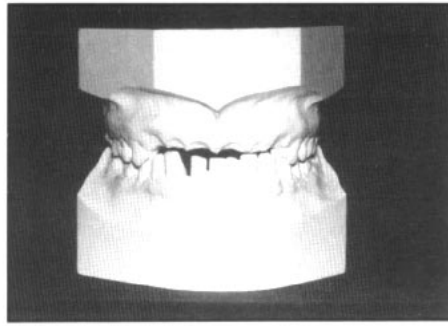


Figure 3B

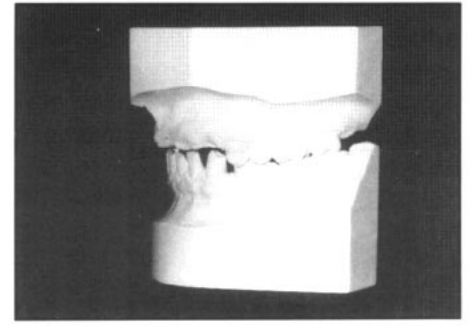


Figure 3C

Figure 3A-E
Pretreatment study casts.

Figure 4
Pretreatment cephalometric tracing.
Note the low mandibular plane angle.

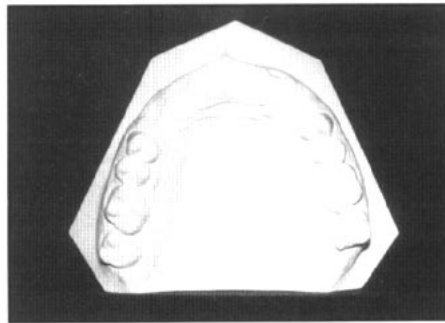


Figure 3D

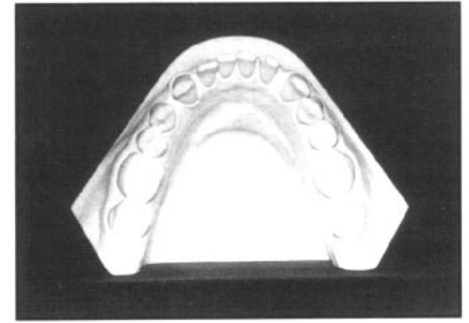


Figure 3E

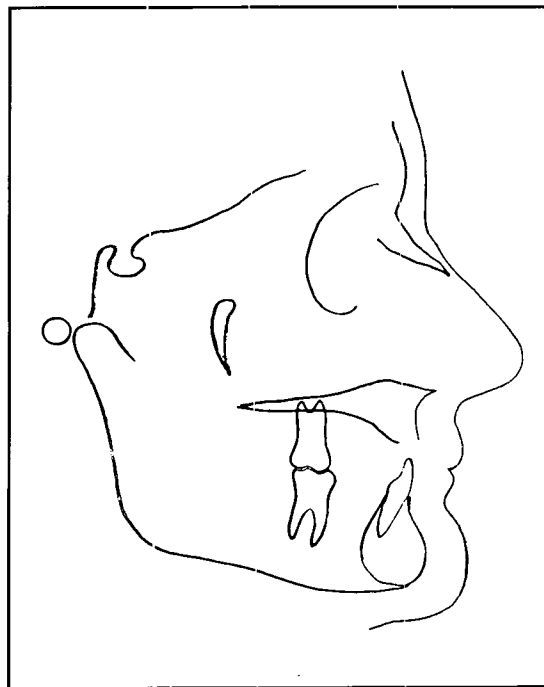


Figure 4

chin and nose. The patient was comfortable with her appearance.

She gave no indication of temporomandibular dysfunction. There had been no prior clicking or popping in the joints and no soreness or tenderness associated with the temporomandibular joints or in the locale of the ears.

Records

Radiographic examination confirmed a brachycephalic facial pattern with a very low or flat mandibular plane angle of only 19.5 degrees to SN (Figure 4). A Class I skeletal pattern was evident as reflected by an ANB angle of 2.5 degrees.

Amalgam restorations in both maxillary first molars and the mandibular left second molar needed replacement. Periodontal condition was very good with acceptable bone levels in all quadrants and no sign of recession or pockets.

Diagnosis

This patient was diagnosed as a Class II, subdivision right, dental malocclusion with lower anterior spacing, shifting of the mandibular midline to the left side, and accentuated curve of Spee due to overerupted mandibular teeth. The teeth were generally small with moderate wear facets on all mandibular anteriors.

Treatment objectives

Based on the patient's chief complaint and the request of the general dentist, the objec-

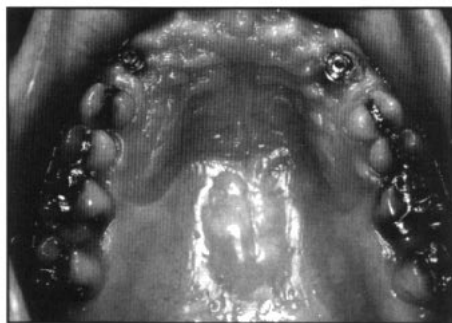


Figure 5A

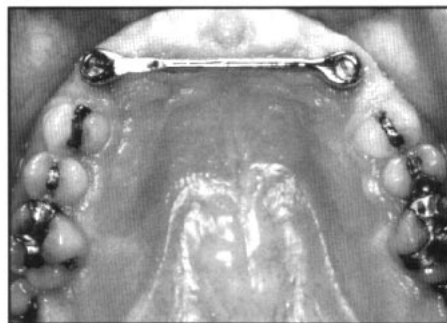


Figure 5B

Figure 5A-B
Following surgical exposure, a horizontal bar was attached to the implants.

tives for treatment were to:

1. Provide interocclusal space for a maxillary anterior fixed prosthesis.
2. Level and align the mandibular arch and close mandibular anterior spaces.
3. Create a Class I occlusion.
4. Maintain or improve facial esthetics.

General plan of treatment

Normal closure of the mandibular anterior spaces has a tendency to retract the mandibular incisors—an undesirable effect in this case because it would exacerbate the Class II dental condition and create a more recessive profile. It would be beneficial to close all mandibular spaces by moving the lower posterior segments forward, holding the mandibular anterior teeth in their current position anteroposteriorly. Occlusal improvement could then take place toward a Class I goal. This could be accomplished using Class II mechanics. However, since the maxillary anterior teeth were missing, an alternative anchor was needed.

Implants had been considered for restoration of the maxillary anterior teeth, and a maxillary anterior implant could also provide anchorage for the Class II elastics. The implants could then be used to attach the fixed crown and bridge work at the conclusion of the orthodontic treatment. At the time this was reviewed with the patient, several studies showing use of implants as anchorage for orthodontic forces in animals were available.

Gray et al.,¹ in Gainesville, FL, placed implants in the femurs of rabbits. Loading the implants with force magnitudes similar to Class II elastics showed no effects on the implants.

Smalley et al.,² at the University of Washington in Seattle, used monkeys to show that even larger forces would not affect the implant, but could actually create orthopedic movements in the bones.

After much discussion among the team treat-

ing this case—an oral surgeon, a general dentist, and an orthodontist—a treatment plan was developed which included a fully bonded mandibular edgewise appliance and placement of maxillary anterior implants. A maxillary removable appliance would be fabricated which could attach to the implants and serve as an anchor for the Class II elastics. The maxillary removable appliance would have a small bite plane built on the anteriors to facilitate opening the bite by extruding the buccal segments. Reverse curve in the mandibular archwire would also contribute to leveling the mandibular arch.

Treatment progress

Since the maxillary arch was established with anteroposterior skeletal and tooth positions that were essentially correct, the entire team agreed that implants could be placed immediately. This is generally a time-consuming process requiring periods of up to 6 months for bone integration and healing. Two Branemark 21 mm implants were placed bilaterally in the maxillary canine regions. Healing was uneventful. Five months after placement of the implants, the mandibular molars were banded and the other mandibular teeth were bonded with an edgewise appliance. The initial archwire was .018 nickel titanium. Three months later an .018 steel archwire with a reverse curve was placed in the mandibular arch. During this time the patient continued to wear her removable appliance, with only slight modification, because the implants were completely submerged. Five months from initial banding, impressions were taken and a maxillary retainer with six anterior teeth was fabricated. The implants were exposed and a horizontal bar was attached to each implant (Figure 5A-B). Once this horizontal bar was placed, the maxillary appliance previously worn would not fit, so it was important to carefully plan the next series of steps and accomplish them in one day. An impression was taken of the maxillary

Figure 6A-B

The lab fabricated a removable appliance ready to be placed over the horizontal bar.

Figure 7

The bite opened to provide space for a fixed prosthesis.

Figure 8

Posttreatment radiograph showing the maxillary bridge in place.

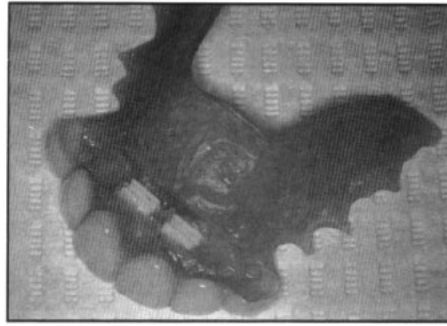


Figure 6A



Figure 6B

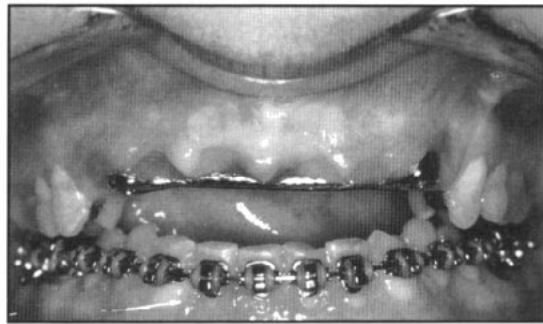


Figure 7

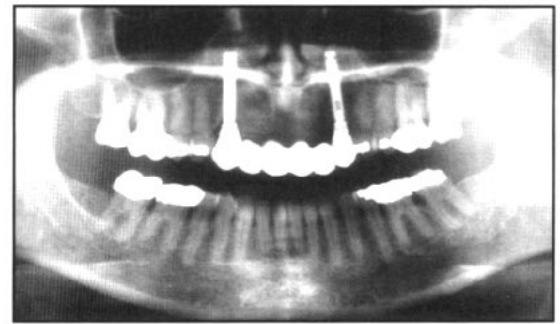


Figure 8

arch with the horizontal bar and sent to the lab with the previously constructed maxillary appliance. The lab returned the appliance with the attachment inserted and ready to be placed (Figure 6A-B). Ceramic brackets were bonded to the canines on the maxillary removable appliance for attachment of Class II elastics. This was delivered to the patient and she wore it full-time. After one month of patient accommodation to the new appliance, elastics were placed.

Class II elastics, .25 inch by 6.5 ounce, were used against the mandibular molars. Power chains were selectively tied to the mandibular teeth and moved forward one at a time as the spaces closed. A reverse curve was maintained in the mandibular arch together with a slight bite plane on the maxillary removable appliance to aid in opening the bite. Acrylic was added to the bite plane periodically as the teeth moved.

A progress film was taken after 5 months of Class II elastic wear to verify the stability and position of the implants.

Once the mandibular arch was consolidated, the general dentist and the orthodontist reassessed the occlusal relationship to determine if the interocclusal distance needed for the final prosthesis was adequate.

The mandibular arch was finished in a .016 X .022 steel wire. Final occlusion was achieved and maintained for several months prior to debonding.

Retention in the mandibular arch was accomplished with a removable Hawley-type retainer. The occlusion was allowed to settle for 3 months before construction of the final maxillary prosthesis took place.

Results

In general, the final treatment result is very acceptable. Treatment goals of opening the bite to provide room for fixed prosthetics, closing mandibular anterior spaces, and leveling and alignment of the mandibular arch were all accomplished (Figure 7). A Class I occlusion was achieved. A provisional fixed maxillary anterior bridge was constructed but it appeared bulky and large. After discussion with the general dentist, reduction of the upper anterior provisional was attempted, but this resulted in loss of support to the upper lip and accentuated an already recessive profile. The patient reviewed the alternatives and the size of the maxillary anterior teeth was reached as a compromise. A final prosthesis was constructed accordingly (Figures 8, 9A-E).

Final cephalometric tracing superimpositions show the mesial movement of the mandibular molars, very slight extrusion of the mandibular molars, intrusion of the mandibular anterior segment, and slight retraction of the mandibular anteriors. Superimposition of the implants show no migration or change (Figure 10).

Much planning is necessary prior to the

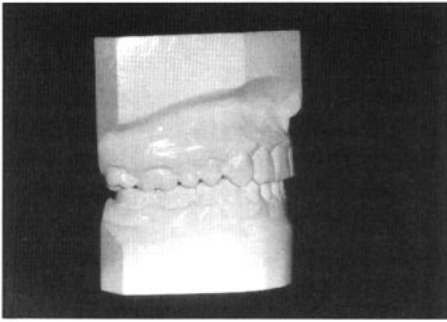


Figure 9A

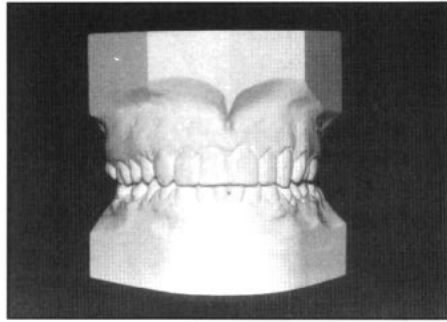


Figure 9B

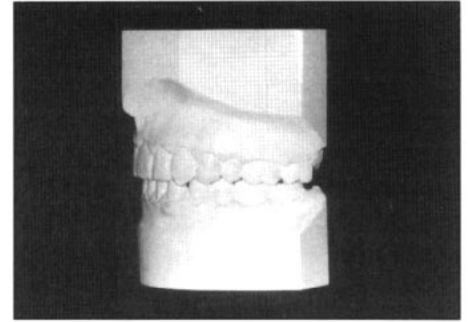


Figure 9C

Figure 9A-E
Posttreatment study casts.

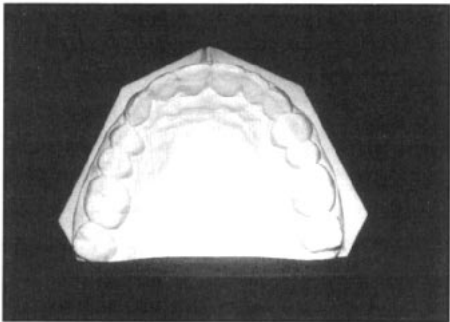


Figure 9D

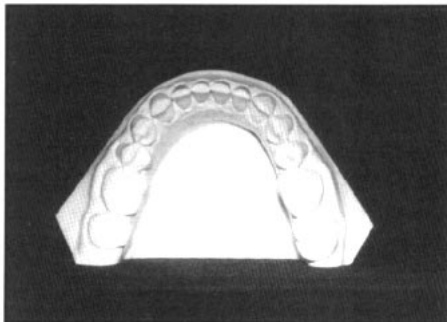


Figure 9E

Figure 10
Superimposed tracings show mesial movement of the first molars and intrusion of the mandibular anterior segment.

placement of implants, particularly if they are to be placed before the final orthodontic movement takes place. Osseous implants can serve very effectively as anchorage for various magnitudes of orthodontic forces, providing an attachment is maintained which is comfortable for the patient and can easily be ligated.

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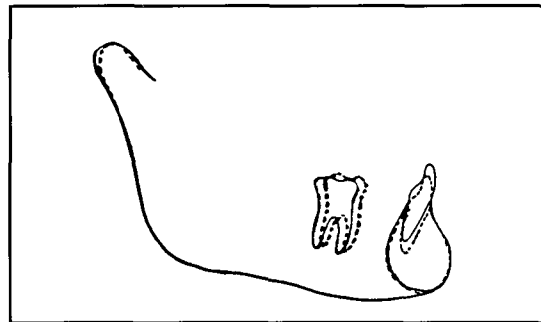


Figure 10

References

1. Gray JB, Steen ME, King GJ, Clark AE. Studies of the efficacy of implants as orthodontic anchorage. *Am J Orthod* 1983;83:311-7.
2. Smalley WM, Shapiro PA, Hohl TH, Kokich VG, Branemark PI. Osseointegrated titanium implants for maxillofacial protraction in monkeys. *Am J Orthod Dentofac Orthop* 1988;94:285-95.