

# Case Report: Developmental characterization of skeletal Class III malocclusion

*Skeletal Class III malocclusion is usually characterized by a steep mandibular plane angle, obtuse gonial angle, overdeveloped mandible, underdeveloped maxilla, and a small cranial base angle which may displace the glenoid fossa anteriorly to cause a forward positioning of the mandible. These factors are generally thought to contribute to the development of skeletal malocclusion as well as facial deformities, and are believed to originate from genetic and/or environmental factors. The posterior discrepancy is an important etiological factor in the development of a skeletal Class III malocclusion because it affects the occlusal plane. This idea must be amended for an appropriate clinical approach to the treatment of Class III malocclusion.*

Sadao Sato, DDS, DDS

Many diagnostic procedures have been proposed for the treatment of skeletal Class III malocclusion. The antero-posterior component of such malocclusion has been amply analyzed and discussed, but information concerning the vertical component is insufficient. The occlusal plane is the most important component affecting the lower face vertically. The vertical position of the posterior teeth in a Class III malocclusion is not stable during growth and development.<sup>1,2</sup> Continuous molar eruption occurs not only during growth of the facial structure, but also during the post-pubertal growth period.<sup>3,4</sup> In this sense, genetics may not be the sole reason this type of Class III malocclusion develops; rather, the continued eruption of second and third molars in a limited space may be the major contributing factor. A developing Class III malocclusion may be considered an effect of the posterior discrepancy or posterior crowding.

When overeruption of the molars occurs, several unfavorable changes take place (Figure 1A, B). If the patient's growth potential is low, the mandible may rotate backward. Consequently, an anterior openbite may be created. However, if the patient has enough growth potential, vertical growth of the condyle is stimulated. Then, the mandible rotates forward creating a skeletal Class III malocclusion.

In our practice, we use the Multiloop Edgewise Arch-Wire (MEAW) technique developed by Kim<sup>5</sup> to reconstruct the occlusal plane and correct the Class III malocclusion. Figure 2 shows the basic

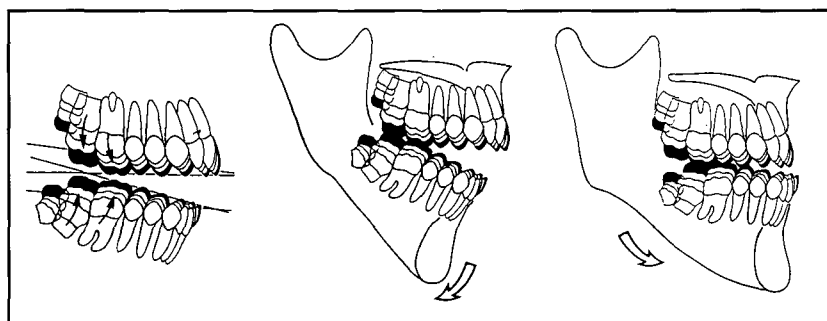


Figure 1A

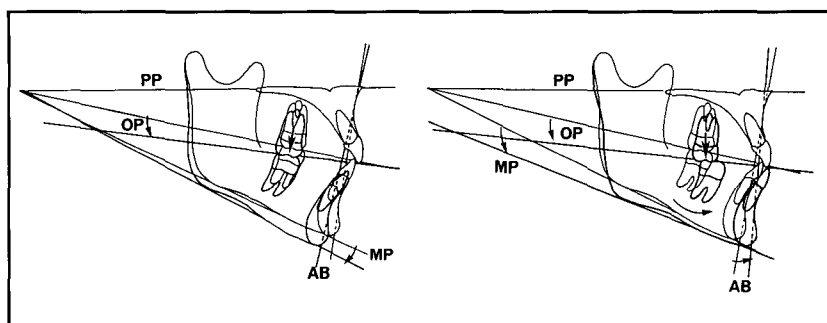


Figure 1B

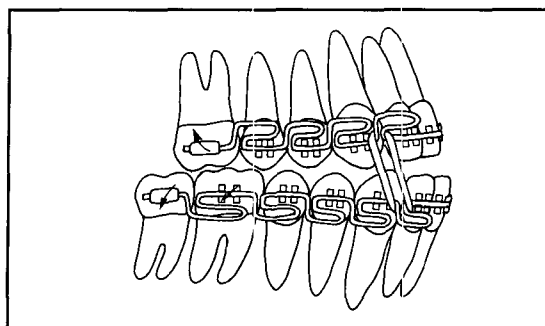
force system used.

This system typically induces the following changes:

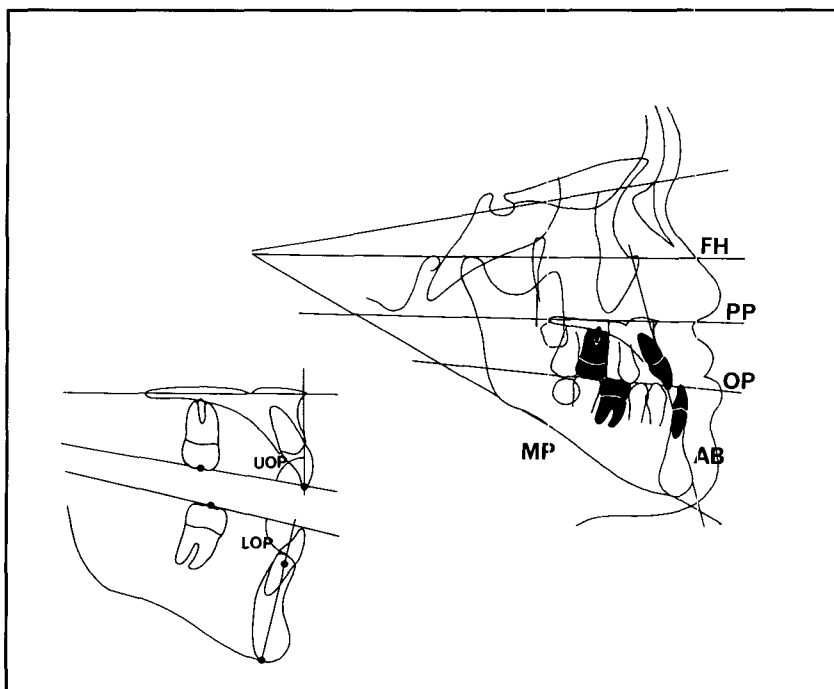
1. The posterior teeth are intruded and uprighted so that the occlusal plane can be reconstructed and the mandible repositioned posteriorly.
2. Repositioning of the mandible may prevent overgrowth of the condyles.
3. The maxilla can be protracted downward and forward.

**Figure 1A-B**  
Possible mechanism of posterior overeruption due to posterior discrepancy and development of a skeletal openbite and Class III malocclusion. The balance of angles AB-MP, PP-MP and AB-PP is related to changes of the occlusal plane.

**Figure 2**  
Basic force system using a multiloop edge-wise archwire and vertical elastics.



**Figure 2**



**Figure 3**

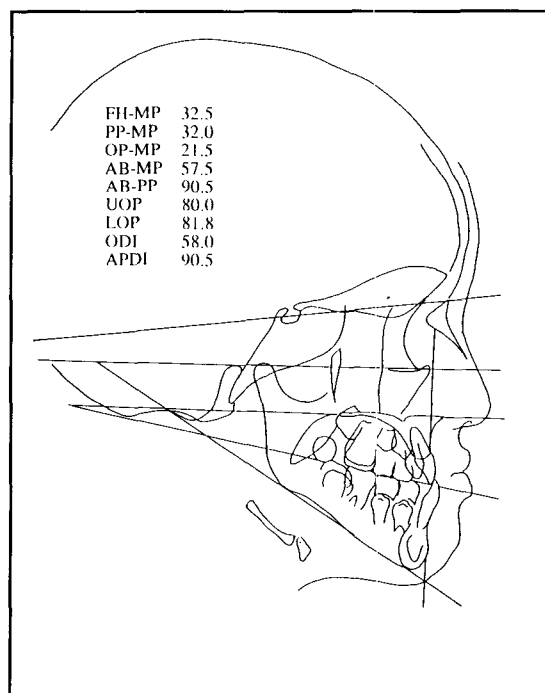
**Figure 3**  
Cephalometric points used.

In order to prevent a reduction in the occlusal plane, conventional long Class III elastics should not be used; such elastics tend to extrude the upper second molars. Short Class III elastics on the MEAW set up should produce the desired result.

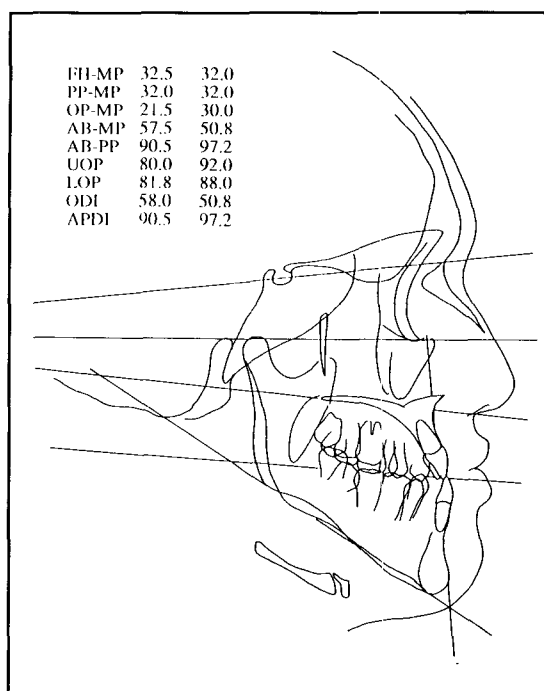
To eliminate the posterior discrepancy, the upper and lower third molars should be extracted prior to the onset of treatment. If the patient is too young for third molar extractions, the upper second molars can be removed instead, provided third molar development is good in terms of size, morphology and direction. Along with the removal of upper second molars, the lower third molars should be extracted. Occasionally, a gummectomy can be performed simply if the developmental stage is early enough.

**Case 1: Male, 8 years 7 months, with anterior crossbite**

Cephalometrically, this patient's mandible demonstrated a forward growth tendency with an



**Figure 4A**



**Figure 4B**

ODI of 58.0 and ADPI of 90.5. Dentally, the patient occluded with a Class III relationship (Figure 4A). Although the patient was treated with a lingual arch appliance combined with a chin cap for the first several years, he resisted adequate correction and orthognathic surgery was planned. However, the patient did not wish to be treated surgically and his treatment was discontinued at age 13 years. He returned at 19 years 9 months with an anterior openbite, Class III malocclusion and

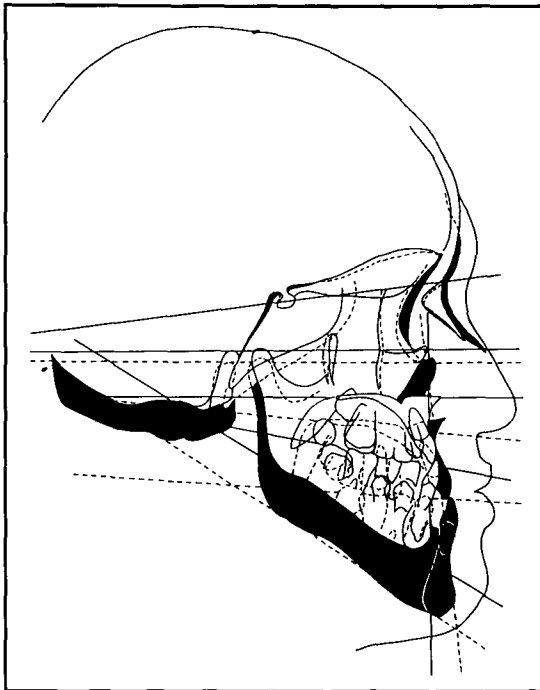


Figure 4C

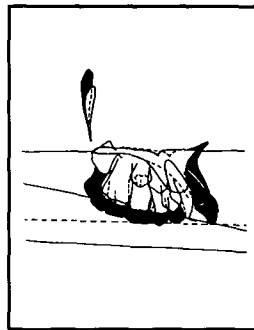


Figure 4D

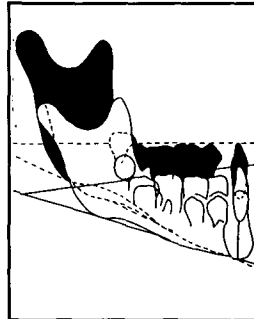


Figure 4E

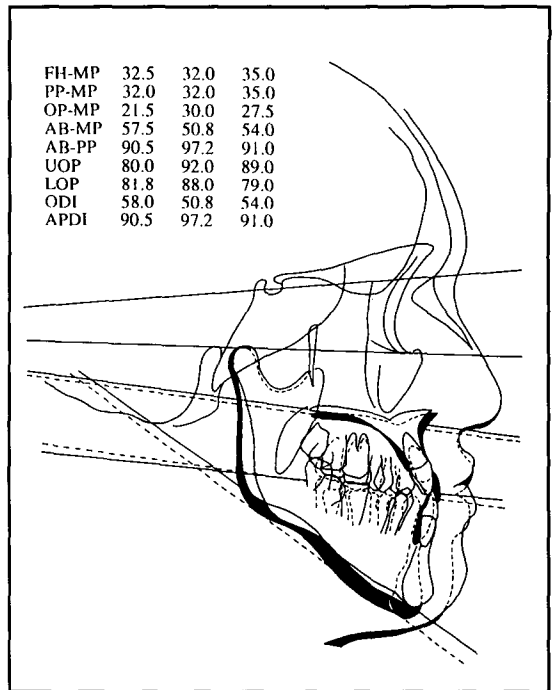


Figure 4F

**CASE 1**

**Figure 4A-F**  
Cephalometric tracings and superimposition of Case 1.

**A:** 8 years old;  
**B:** 19 years old;  
**C:** Superimposition of tracings at 8 y and 19y;  
**D-E:** Independent superimpositions of maxilla and mandible;  
**F:** Superimposition of pretreatment (19 years) and posttreatment.

**Figure 5A-B**

The occlusion was altered over the course of treatment. The number on the photograph indicates the age or the number of months since active orthodontic treatment was initiated.

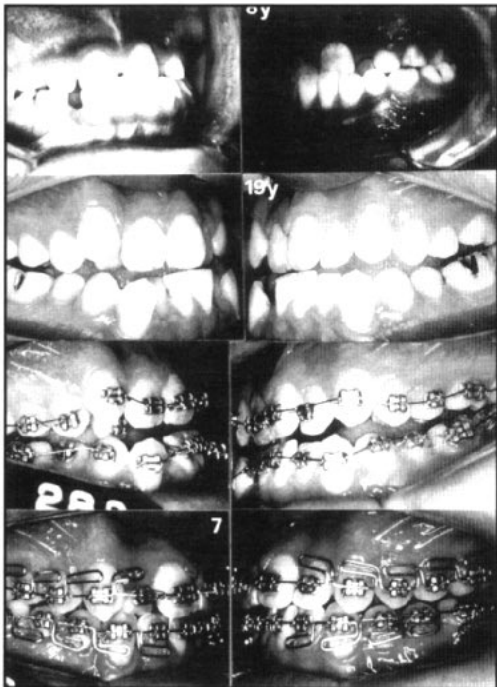


Figure 5A

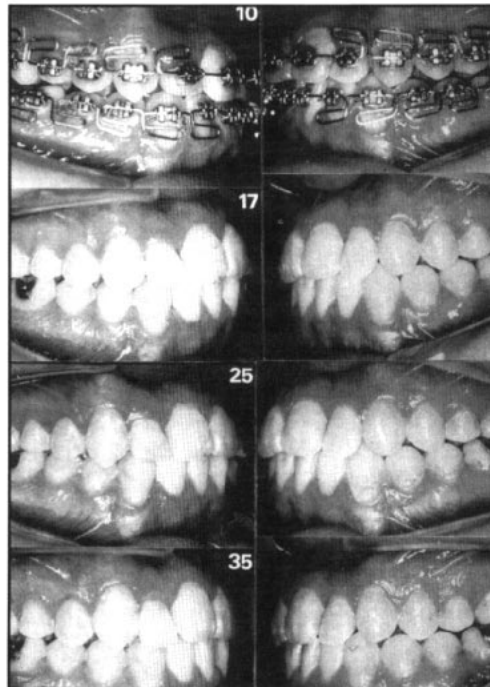


Figure 5B

severe crowding (Figure 4B). Superimposition of cephalometric tracings at 8 years and 19 years indicated that the occlusal plane had increased due to the overeruption of maxillary and mandibular molars (Figure 4C-E). The following developmental possibilities existed for this patient: 1) molar overeruption was a primary factor in the etiology of the skeletal Class III and openbite; and 2) the molar eruption was caused by the posterior discrepancy.

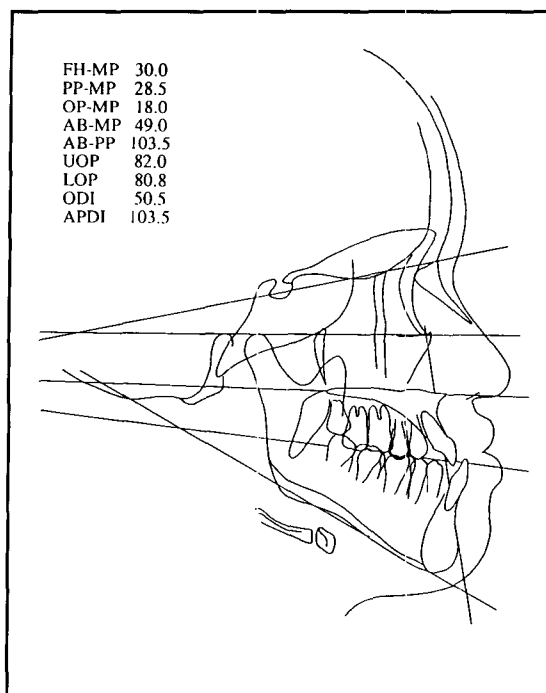
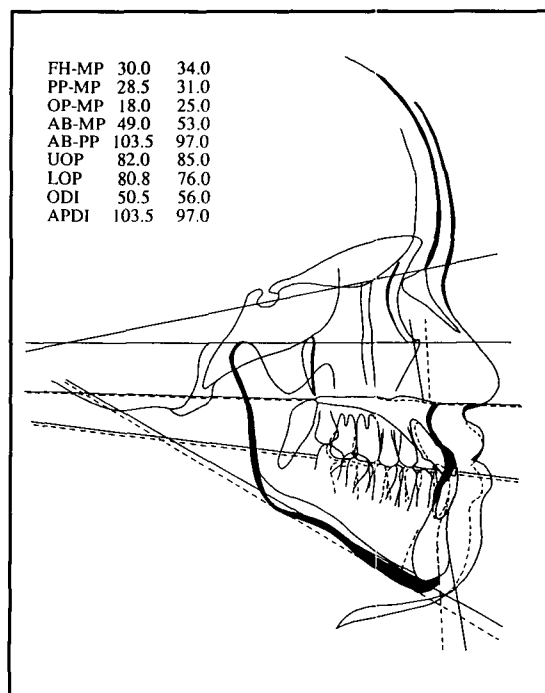
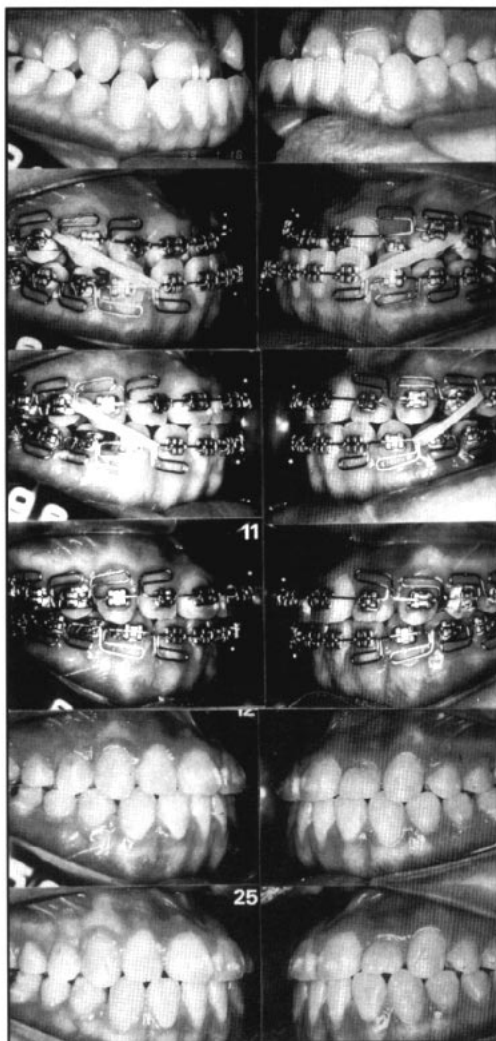
The primary treatment objectives were to eliminate the posterior discrepancy, control the occlusal planes and simultaneously reposition the mandible distally. Maxillary and mandibular third molars were extracted to eliminate posterior crowding. Treatment began with a standard edgewise appliance and multiloop edgewise archwires (MEAW, Figure 5A-B). Elastics were attached to the upper second loop (distal to canine) and lower first loop (mesial to canine; the so-called short

**CASE 2****Figure 6A-B**

**Pretreatment (19 y 7 m)**  
and superimposed pre-  
and posttreatment  
cephalometric trac-  
ings.

**Figure 7**

The occlusion was al-  
tered over the course  
of treatment. The num-  
ber on the photograph  
refers to the number of  
months since the start  
of active orthodontic  
treatment.

**Figure 6A****Figure 6B****Figure 7**

Class III elastics). The conventional long Class III elastics were avoided to prevent the extrusion of maxillary molars while the anterior crossbite was corrected. After 16 months of edgewise therapy, the appliance was removed and removable appliances were placed. Superimposition of the tracings from before and after edgewise treatment showed the changes of mandibular position and occlusal plane (Figure 4F).

**Case 2: Female (19 years 7 months) with severe anterior crossbite and imbrication of maxillary dentition**

Cephalometric analysis indicated that this patient's mandible was overdeveloped with an ODI of 50.5 and an ADPI of 103.5 (Figure 6A). Dentally, the patient occluded in a Class III relationship. Treatment objectives included elimination of the posterior discrepancy and control of the occlusal plane. After removing the maxillary and mandibular third molars, an edgewise appliance was placed. Maxillary and mandibular MEAWs were inserted and short Class III elastics used to control the occlusal plane (Figure 7). After 11 months of active edgewise treatment, appliances were removed. Cephalometric superimposition showed maxillary forward and mandibular backward repositioning with a slight change of the occlusal plane (Figure 6B).

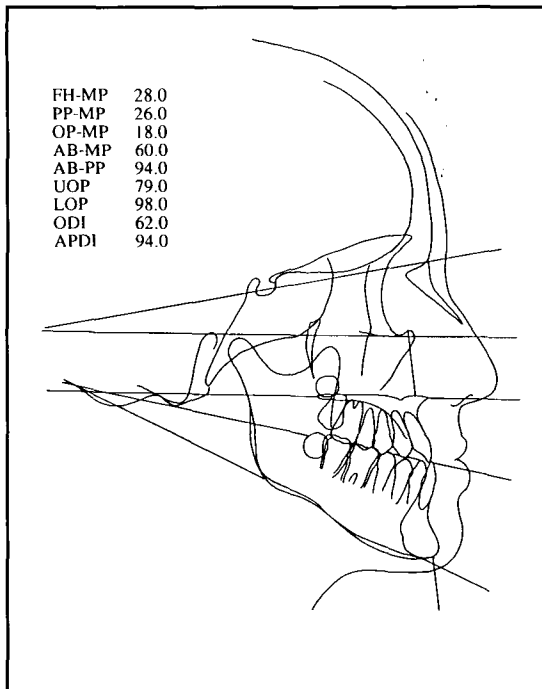


Figure 8A

**Case 3: Female, 14 years 5 months, with a bilateral posterior crossbite and negative overjet**

Cephalometrically, this patient's maxilla was underdeveloped relative to the cranium. The mandible was overdeveloped with an ODI of 58.0 and an APDI of 98.0 (Figure 8A). Maxillary incisors were proclined and mandibular incisors were retroclined relative to the palatal and mandibular planes. Treatment objectives for this patient included expansion of the maxillary denture base, elimination of the posterior discrepancy, control of the occlusal plane, and simultaneous repositioning of the mandible. The mandibular third molars and the maxillary second molars were extracted to eliminate the posterior discrepancy. Treatment began with a fixed palatal expansion appliance to correct the buccal crossbite. Following three months of post-expansion retention, brackets were attached on all teeth with a standard edgewise appliance. Multiloop edgewise archwires and anterior vertical elastics (upper and lower first loops) were used to control the occlusal plane. After 10 months of edgewise therapy, the appliance was removed and retained with a fixed quadhelix appliance (Figure 9). Superimposition of the tracings from the initial examination and the end of active treatment dramatically reveals the relationship between the maxilla and mandible as can be seen in Figure 8B.

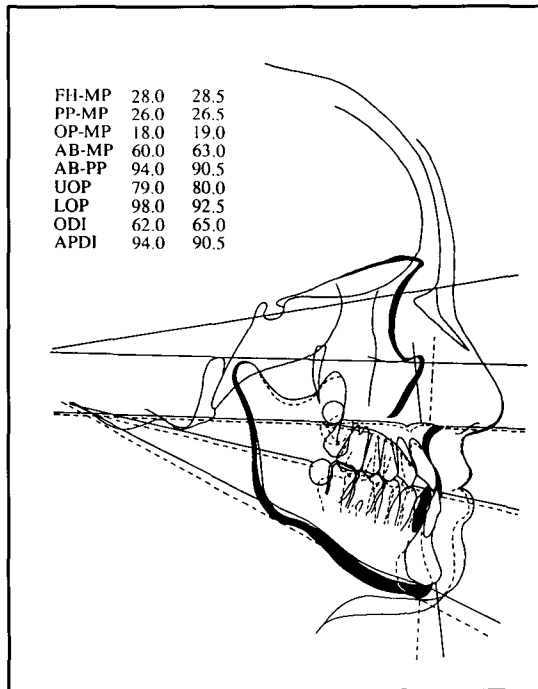


Figure 8B

**CASE 3****Figure 8A-B**

Pretreatment and superimposed pre- and posttreatment cephalometric tracings.

**Figure 9**

Occlusal changes during orthodontic treatment in Case 3. Numbers indicate the months since the start of orthodontic treatment.

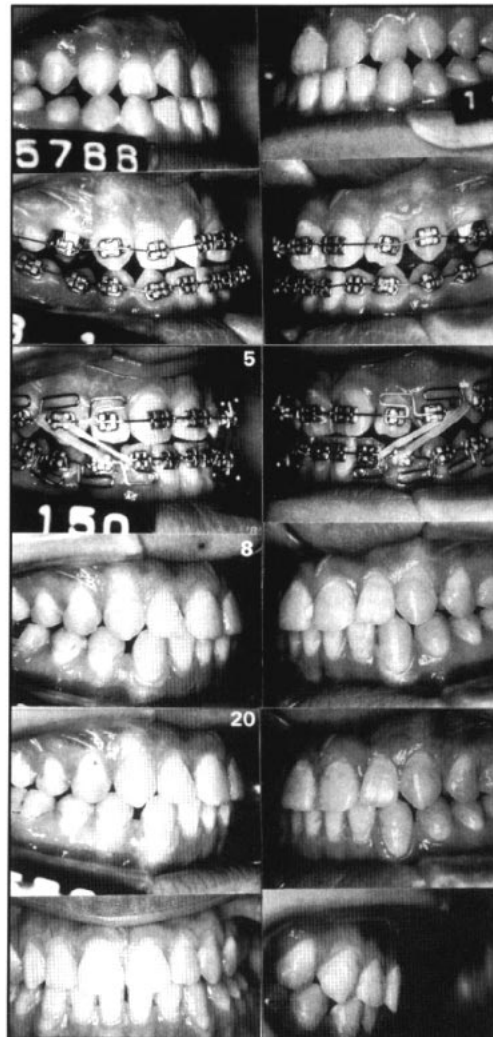


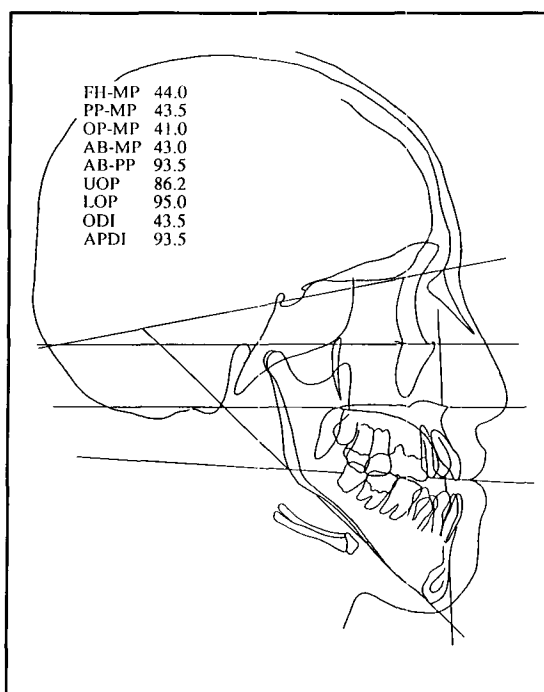
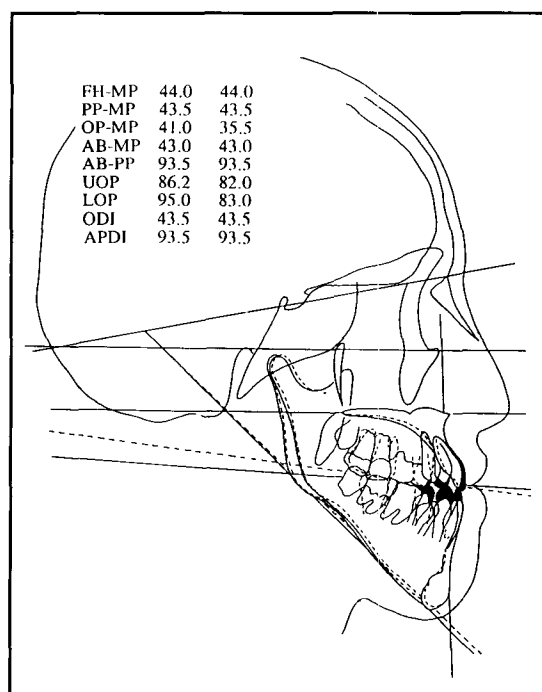
Figure 9

**CASE 4****Figure 10A-B**

Pretreatment and superimposed pre- and posttreatment cephalometric tracings.

**Figure 11**

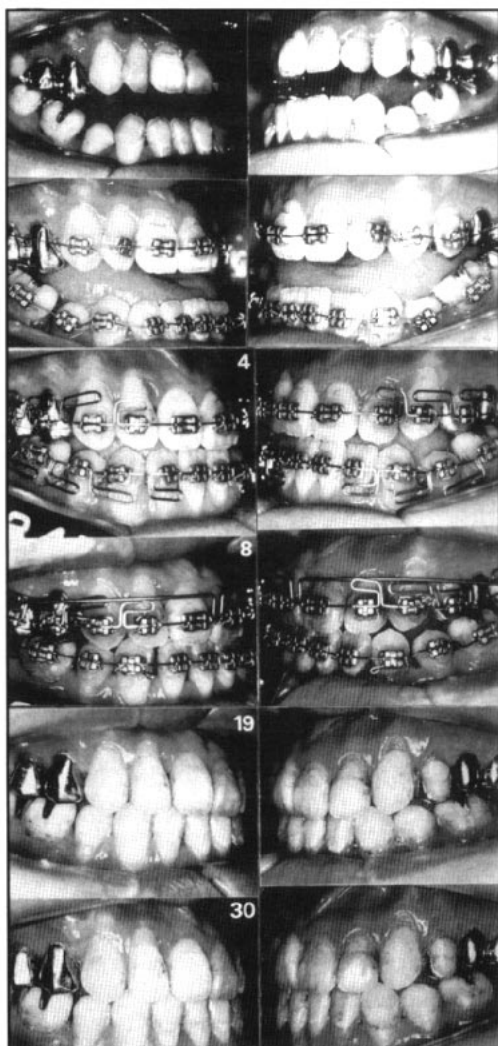
Changes in the occlusion during orthodontic treatment in Case 4. Numbers indicate the months since the start of orthodontic treatment.

**Figure 10A****Figure 10B**

**Case 4: Female, 21 years, with severe Class III malocclusion and anterior openbite**

The patient had received orthodontic treatment following extraction of the mandibular first premolars at the age of 13 years (Figure 10A). Although her malocclusion improved with the initial orthodontic treatment, the bite began to open at age of 16 years and worsened progressively, suggesting that this malocclusion was caused by the overeruption of posterior teeth. Removal of the third molars was necessary to eliminate the posterior crowding, to upright the mesially inclined buccal teeth, and to change the occlusal plane. A standard edgewise appliance and MEAW system were planned for correction of the occlusion. The anterior openbite was corrected in approximately 10 months of edgewise treatment. After 19 months of active treatment, brackets were removed and removable retainers placed. (Figure 11).

The uprighting of buccal segments was well controlled with MEAW. Cephalometric superimposition showed no skeletal changes occurred. Changes were observed in the occlusal plane angle as well as uprighting of the dentition, which seemed to have contributed to correction of the malocclusion (Figure 10B).

**Figure 11**

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# References

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# Commentary: Skeletal Class III malocclusion

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The high incidence of Class III malocclusion in the Japanese population makes it essential for that nation's orthodontists to be proficient in treating Class III cases. And since many such patients are not candidates for orthognathic surgery, a conservative approach — namely dentoalveolar camouflage — is often necessary. Dr. Sato does this extremely well. He reports on four cases of high angle Class III malocclusions, one 19-year-old male and three females — 14, 19 and 21 years old. Each had been treated with molar extractions. Upper second and lower third molars were extracted in the 14-year-old. In the other three patients, third molars were removed, along with the lower first premolars in one case.

Dr. Sato states that the objectives of his treatment are to intrude the posterior teeth and upright them, reconstruct the occlusal plane, and reposition the mandible posteriorly. I do not believe he achieves these goals.

Three of his cases show a steepening of the mandibular plane which helps resolve the antero-posterior discrepancy. Class III elastics cause slight advancement of the upper anteriors and retrac-

tion of the lower anteriors, while the vertical component of the elastics assist in closing any anterior openbite that may be present. The result is an acceptable occlusal scheme with soft tissue changes consistent with the dropping of chin point.

Dr. Sato credits the use of a multiloop edgewise archwire (MEAW) for intruding the molars and uprighting the posteriors. Loops are useful in increasing the range and reducing the force on teeth that are subject to the force generated by the loops; teeth remote from the loops become the anchorage units. The MEAW uses a loop between every tooth so that forces on all the teeth are reduced. This is precisely the same as using a more resilient alloy, such as TMA, with no loops. The second order bends placed in the MEAW are comparable to what Tweed enthusiasts achieved with anchorage preparation. The loops do not offer a unique force system. They lighten the forces and provide excellent loops for elastics.

Dentoalveolar camouflage for Class III occlusions is a useful modality of treatment when surgery is not available. Dr. Sato demonstrates excellent results, given the limitations inherent in this approach.