

CLINICAL SECTION

Invisible treatment of a Class III female adult patient with severe crowding and cross-bite

T. Fukui and M. Tsuruta

Tsurumi University, Yokohama, Japan

Abstract

Index words:

Invisible orthodontic appliance, lingual bracket, Class III treatment

This article reports on the treatment for a 24 year 9 month adult female patient with severe skeletal Class III and crowding. As the patient wanted to wear an invisible appliance treatment we provided treatment with lingual brackets.

Introduction

In this case report we will outline the treatment of a patient with a lingual appliance.

Treatment

Case history and chief complaints

The patient was a 24-year 9-month-old female with good general health. She has no significant medical problems. Her chief complaints were total cross-bite, severe crowding, and protrusion of the mandible. She did not wish to wear any visible and declined any treatment plan involving orthognathic surgery. We therefore decided to use 'invisible' appliances, namely a lingual arch and a lingual appliance.

Diagnosis

Extra-oral

Facial photographs before treatment (Figure 1) show a concave profile with maxillary retrognathia. Her lower lip was slightly prominent and there was no significant asymmetry.

Intra-oral

All teeth were in good condition, although the gingival margin of the left lower central incisor was low. The

maxillary midline was coincident with the facial midline. The midline of the lower dental arch deviated 3.3 mm to the left. The overbite and overjet were 4 and -1.5 mm, respectively. The right first molars were a slight Class III and the left first molars were a full unit Class III with lateral crossbite. The upper left second molar had no contact with its opposite number allowing over eruption of the tooth. There was anterior crowding with the canines blocked out in the maxillary arch. The lower left lateral incisor was also blocked out lingually. The arch length discrepancy of both upper and lower arches were -11.9 and -9.1 mm, respectively (Figures 2 and 3).

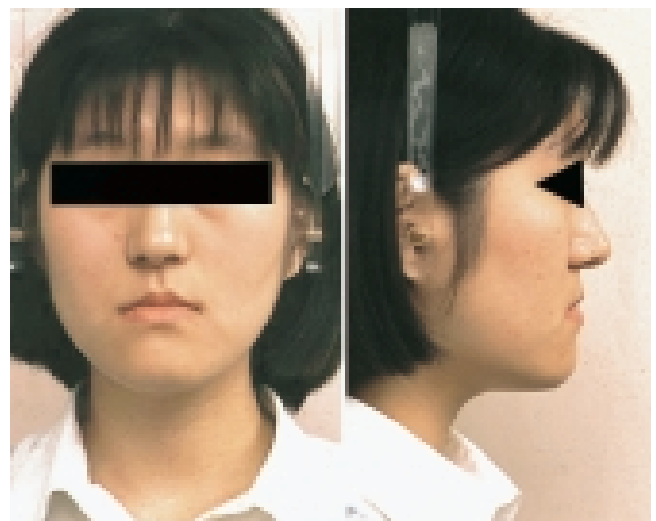


Fig. 1 Facial photographs before treatment.



Fig. 2 Intra-oral photographs before treatment.

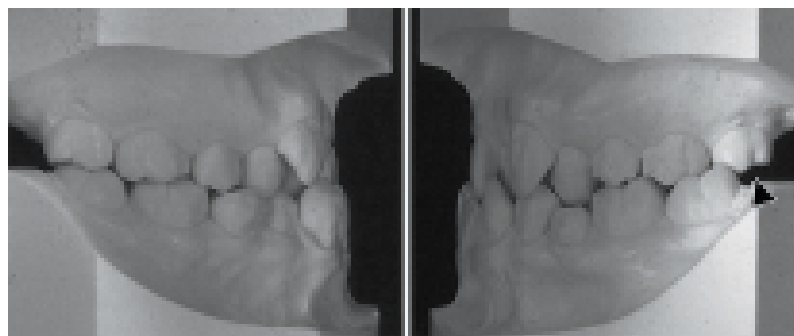


Fig. 3 Lateral view of the dental models before treatment. Arrowhead indicates severe Class III relationship between upper and lower second molars.

Radiographic analysis

The panoramic radiograph (Figure 4) revealed that all teeth were present except the four third molars. There was no evidence of periodontal disease.

Cephalometric analysis

The cephalometric radiograph and corresponding tracing illustrated an ANB angle of -4.2 degrees. The

SNA angle of 70.8 degrees indicated severe retrognathia of the maxilla. The SNB angle of 75.0 degrees indicated retrognathia of the mandible. Twenty-eight degrees of FMA indicated a normal mandibular plane angle. Both maxillary and mandibular incisors showed severe retroclination. FMIA angle was 72.4 degrees, the mean value for Japanese standard being 58 (Figure 5). These results indicated a skeletal Class III malocclusion with maxillary and mandibular retrognathia.

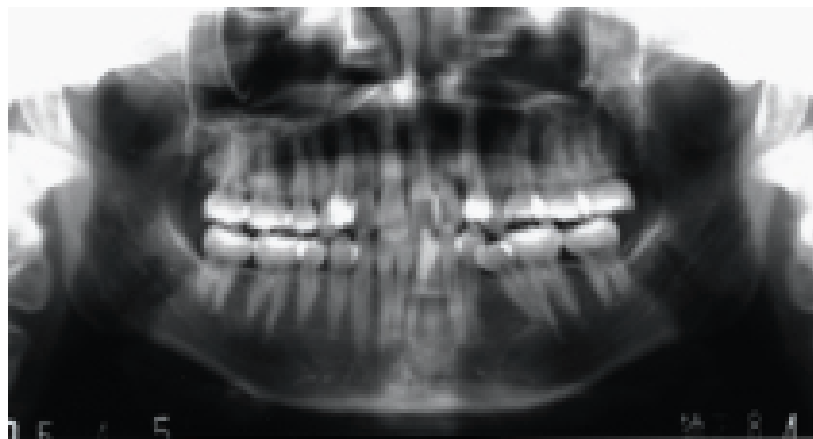


Fig. 4 Panoramic radiograph before treatment.

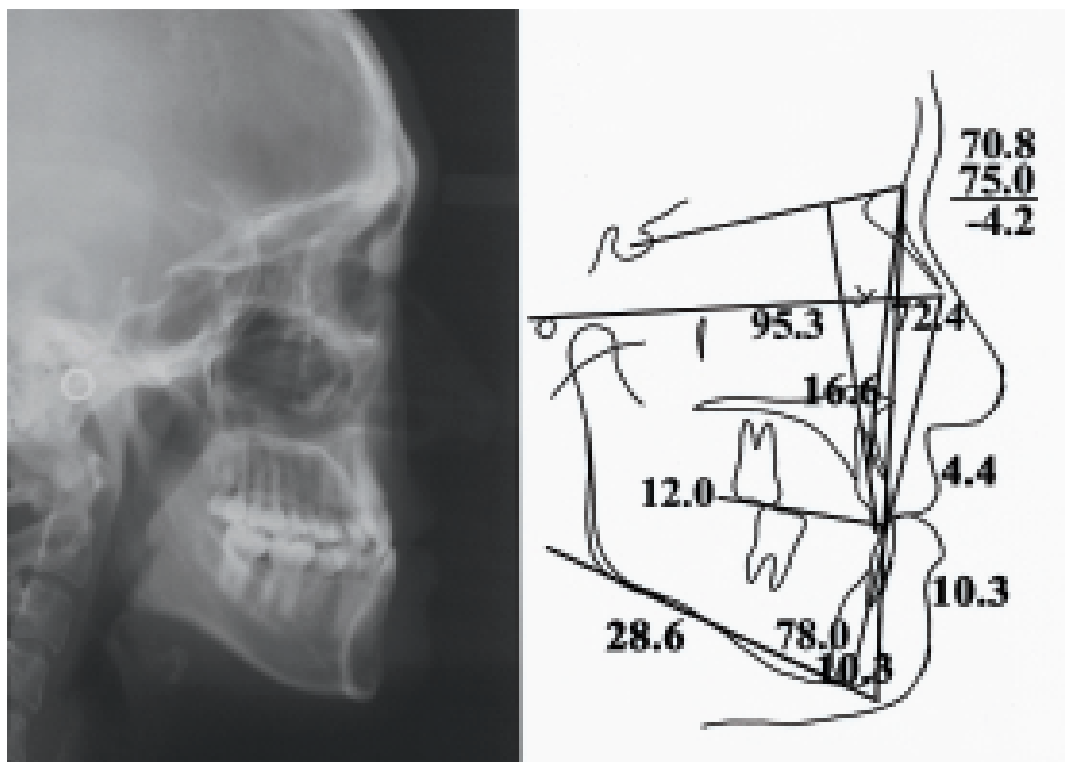


Fig. 5 Lateral cephalogram and tracing before treatment.

Functional analysis

The functional movement of the mandible was normal with no pathologic findings on TMJ examination.

Treatment objectives

1. Correct the anterior and posterior crossbites.
2. Resolve the anterior crowding
3. Correct the midline discrepancy in lower dental arch.
4. Reduce the lower lip protrusion and improve the soft tissue profile.
5. Establish a Class I molar relationship.

Treatment plan

A lingual arch with double spring was placed to correct the anterior crossbite and expand the inter-molar width of maxillary arch. Both maxillary second premolars, and the mandibular right first premolar and left second premolar were then selected for extraction to allow correction of the midline and to achieve a Class I molar relationship. Premolar extraction also provided enough spaces to align and upright the incisors.

Treatment progress

The lingual arch appliance soldered with a double spring corrected the anterior cross bite in four months (Figure 6). A multi-lingual bracket appliance (Fujita bracket) was then bonded to the lingual surface of all the teeth and at the same time, a 0.0155-inch Respond wire (Ormco, California) fabricated in a mushroom-shaped was placed before extraction of maxillary second premolars and the mandibular right first premolar teeth

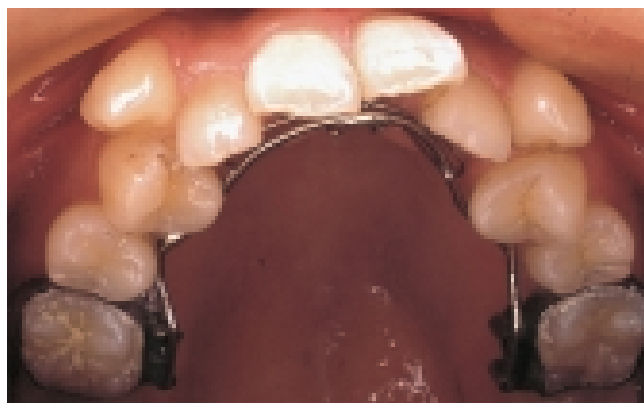


Fig. 6 Intra-oral photograph of the upper arch during initial treatment phase.

(Figure 7). After correcting the lower midline the mandibular left second premolar was extracted.

The lingual bracket used had three wire slots, e.g. an occlusal slot, a horizontal slot, and a vertical slot. The occlusal slot was used during all stages of the treatment.

A small hook of a 016 × 022 stainless steel wire was welded to the right mandibular canine bracket for attaching elastic thread to move the tooth distally to achieve a Class I canine relationship (Figure 8). It took 6 months for right canine retraction after which then the mandibular midline was coincident with the maxillary midline. A set of 0.018 × 0.018-inch stainless steel wires were rigidly engaged into horizontal slot of both appliances to allow protraction of the molars slowly using elastic chain. Vertical elastics were used during this phase to reinforce the anchorage and to achieve intercuspation (Figure 9). Ideal arches wires of 0.018 × 0.018 inch stainless steel wires were engaged into the horizontal slot for 3 months for detailing (Figure 10).

The total treatment period was 32 months and a Hawley type retainer was placed after the removal of the appliance.

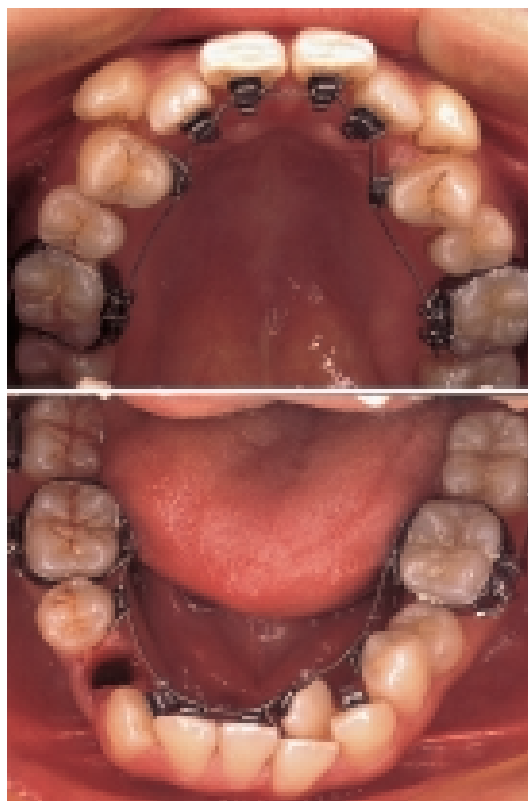


Fig. 7 Intra-oral photograph after engaging the initial arch wires, lower right first premolar recently extracted.

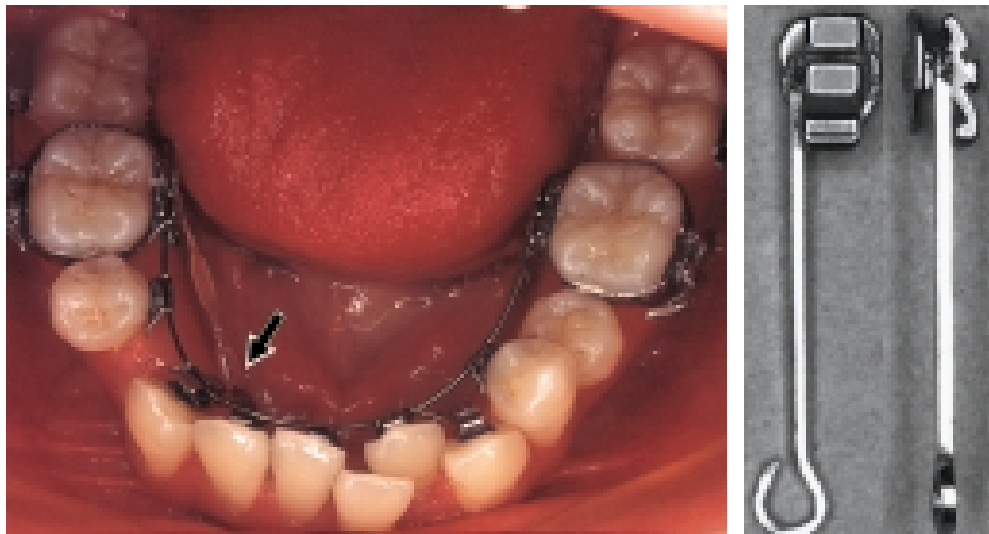


Fig. 8 Canine retraction. A hook (0.016 × 0.022) was welded to the canine lingual bracket.

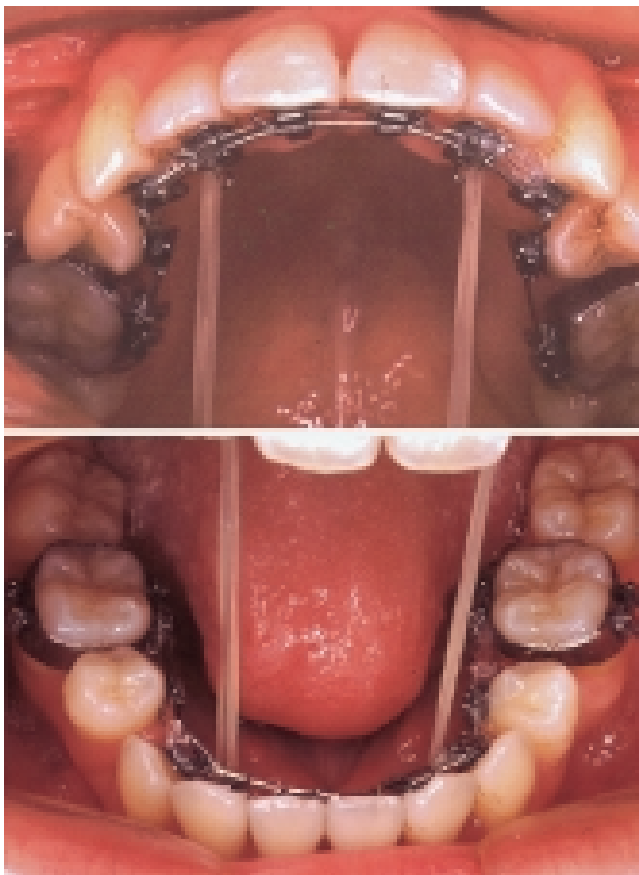


Fig. 9 Anchorage reinforced by a figure-of-eight ligature wire. Up and down elastics also used.

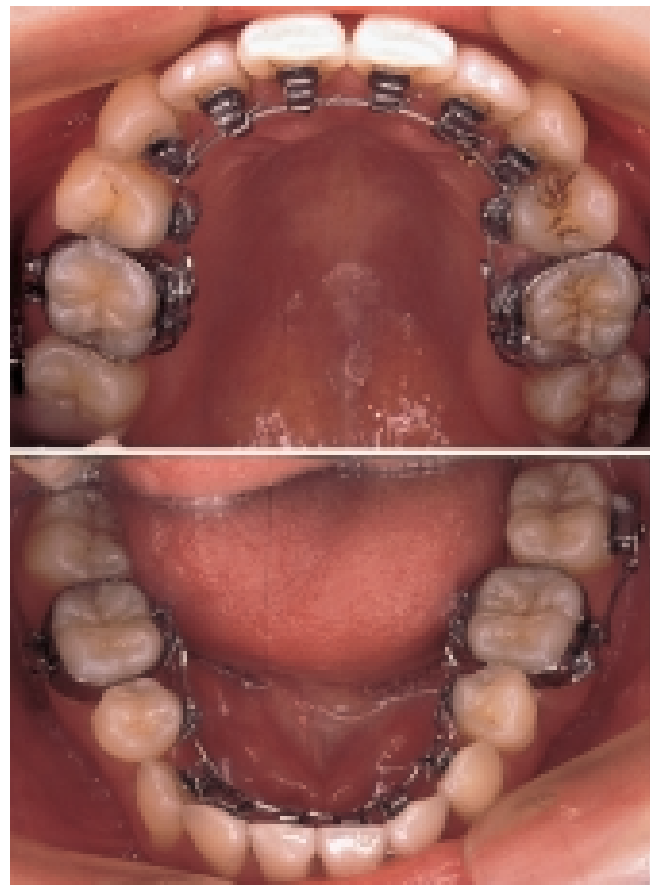


Fig. 10 Intra-oral photographs during ideal treatment phase.



Fig. 11 Facial photographs after treatment.

Treatment results

Facial photographs after treatment show an improvement in the facial profile, whilst the patient still exhibits slight Class III facial appearance. A reduced lower lip prominence was achieved by retroclining the mandibular incisors (Figure 11). The intra-oral photographs after treatment show the improvement of the severe Class III posterior occlusion to Class I molar relationship. The reversed overjet and the severe anterior crowding were corrected. The amount of overbite and overjet were 3.0 and 2.1mm, respectively, and good interditation was achieved (Figure 12).

The cephalogram tracing after treatment illustrated the improvement of ANB from -4.2 to -3.0 degrees. The SNB



Fig. 12 Intra-oral photographs after treatment.

angle decreased due to retraction of the lower incisors. Although FMA was unchanged, FMIA and U-1 to FH plane angle were slightly increased (Figure 13).

Cephalometric superimposition demonstrated slight labial tipping of upper incisors, intrusion and lingual

tipping of lower incisors, and uprighting of the mandibular molars and mesial movement of the upper molars. No tooth was extruded (Figure 14). The healthy condition of the gingival tissue of the mandibular left incisor was maintained.

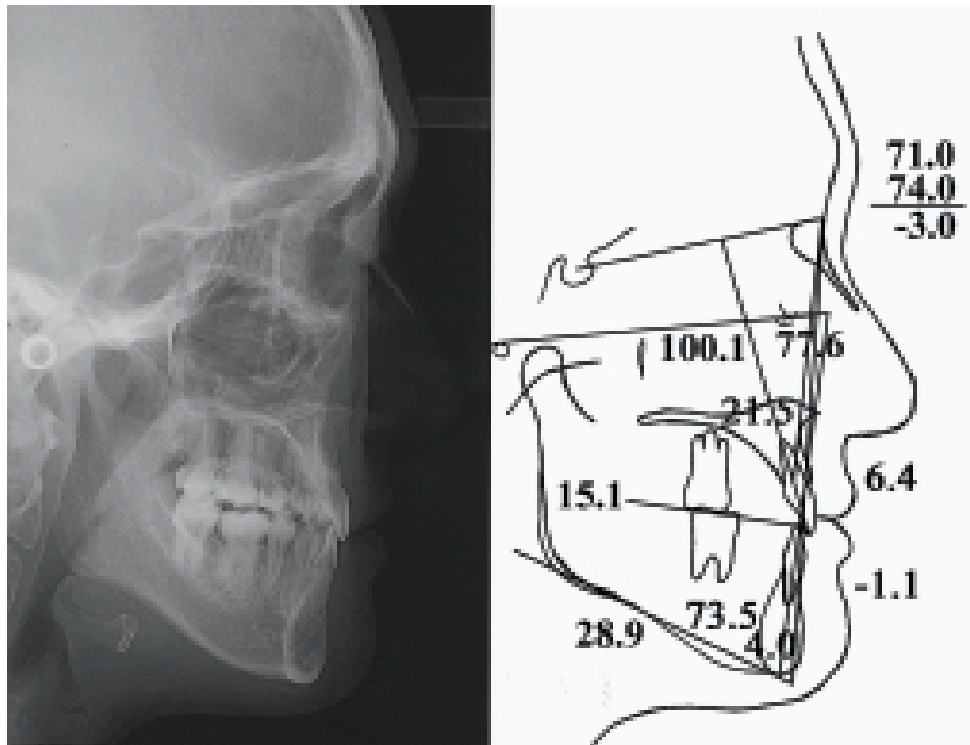


Fig. 13 Cephalogram and tracing after treatment.

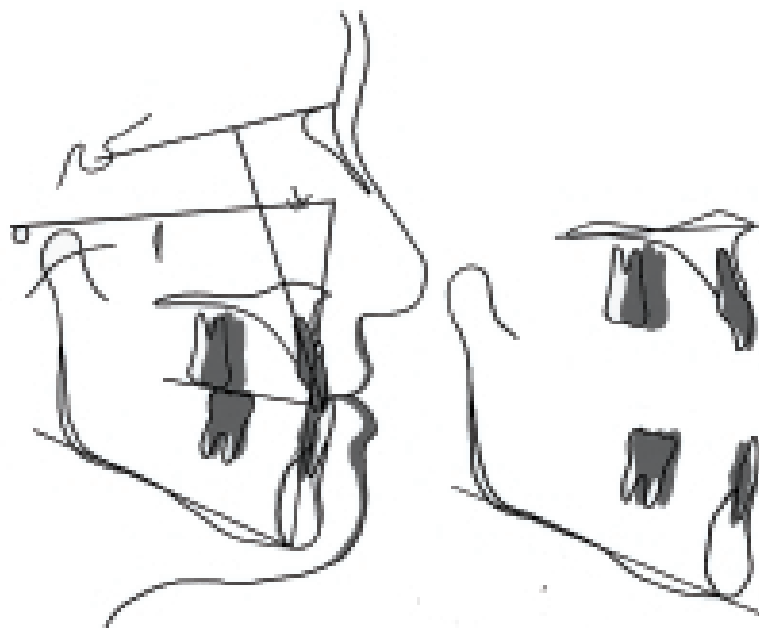


Fig. 14 Superimposition of cephalometric tracings before and after treatment. Solid lines: before treatment. Grey zone: after treatment.

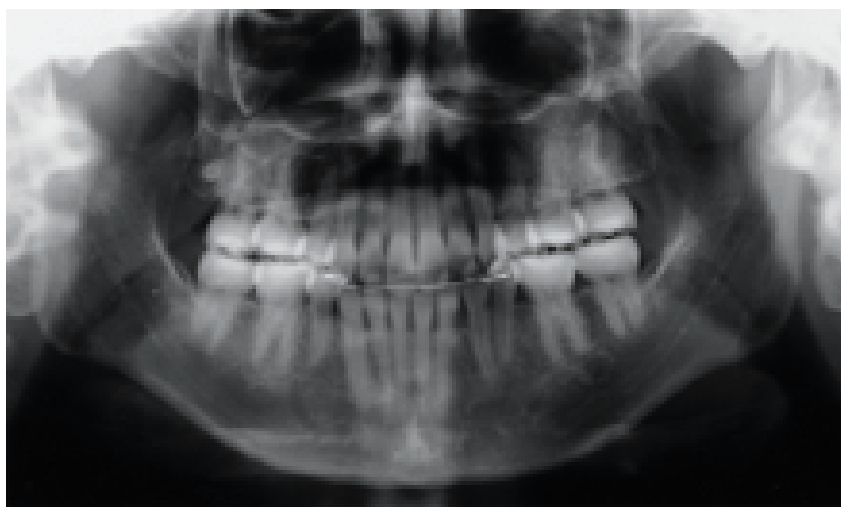


Fig. 15 Panoramic radiograph after treatment.

The overall treatment result was good. The functional mandibular movement was normal, and no sign or symptom of TMJ disorder was found. Panoramic radiography revealed slight root resorption of the incisors (Figure 15).

Retention

Orthodontic treatment of severe crowding of the anterior teeth requires a prolonged or even permanent retention. The patient was instructed to use a removable retainer for the maxillary arch at night for the long term, as well as a fixed retainer for mandibular arch. Three years after removal of the multilingual appliance, the patient is still using the retainers. The facial profile and the improved occlusion have been maintained. The overbite and overjet are almost ideal (Figures 16 and 17).

Discussion

Extraction of upper premolars combined with a LeFort 1 maxillary advancement was, perhaps, the ideal treatment plan for this patient. As she did not want to undergo orthognathic surgery, we explored orthodontic camouflage. This required the extraction of four premolars, and use of a lingual arch appliance and multilingual bracket appliance. In the lower arch we considered two extraction plans: the lower left lateral incisor extraction or the lower second premolar extraction. Extraction of the lateral incisor may have been an easier option with a reduced treatment time. However, we chose to extract the mandibular left second premolars,



Fig. 16 Facial photographs three years post-treatment.

as it was free from occlusion and we were concerned about the chance of osseous ankylosis of this tooth. In addition, the amount of lower arch length discrepancy and anterior crossbite were correctable with the premolar extraction.

As severe anterior crowding and total cross-bite existed in this case, we could not bond the lingual brackets at the initial phase of treatment. As a result we started treatment with a lingual arch and double spring. After completion of anterior and lateral expansion of the maxillary arch, lingual brackets were placed on all teeth.

During canine retraction phase, we attached a small hook to the canine bracket, which changed the position of the retraction force to help bodily movement of the



Fig. 17 Intra-oral photographs three years post-treatment.

tooth. Both canine crowns inclined distally before treatment; therefore, we tried to upright them during treatment with only partial success. We should have attempted to place more distal tipping to upright the canine further.

The canine-to-canine figure-of-eight ligature reinforced the anterior anchorage during forward movement of the posterior teeth. Since the elastic thread applied very light forces, the movement of posterior teeth was very slow. The patient was instructed to wear the up-and-down elastics between upper and lower canine brackets to maintain anterior tooth relationships (Figure 9). Cephalo-

metric analysis revealed a slight lingual tipping of the lower incisors (Figure 11).

In conclusion, the successful treatment of this malocclusion was accomplished using a lingual appliance without surgery. Lingual inclination of mandibular incisors helped reposition lower lip and improved the aesthetic profile of the face. Though the midline was not perfect, the patient was pleased with the overall facial changes and functional occlusion. During the 3 years post-treatment period, the occlusion and facial profile have been maintained (Figures 16 and 17).

