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CASE REPORT

Treatment of an Unusual Crossbite with an Impacted Mandibular Second Premolar

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A 14-year-old female presented with the chief complaints of retroclined upper front teeth and dissatisfaction with her smile (Fig. 1). Clinical examination revealed a Class I molar relationship with severe crossbite of the right central and lateral incisors and a milder crossbite of the right second premolar and first molar. In the maxillary arch, the right canine had erupted ectopically, and the right first premolar was rotated 90°, reducing the available arch length. The dental midline was shifted 1.5mm to the right. In the mandibular arch, spacing was noted in the anterior region, and gingival recession was present at both central incisors. The left second deciduous molar was retained, and the right second premolar had an unusual morphology. The patient's oral hygiene was fair, but the periodontium was healthy except for the lower incisor recession. The profile was mildly convex, the lips were competent, and the facial height was normal.

Cephalometric analysis indicated normal growth with a skeletal Class I pattern (Table 1). Cast analysis revealed arch-length discrepancies of –6mm and +2mm in the upper and lower arches, respectively. The panoramic radiograph showed severe dilaceration of the maxillary right lateral incisor and mild dilaceration of the maxillary left second premolar. Aside from the mandibular left second premolar, all the permanent teeth were present, including the developing third molars. A periapical radiograph of the deciduous molar revealed a developing second premolar with an open root apex that had grown to about half its final length. Although this premolar was superiorly positioned, almost inside the distal portion of the deciduous tooth's crown, a long, thin bony spicule of the mesial root was impeding exfoliation.

Treatment Plan

The treatment goals were to improve the patient's smile esthet-

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ics and periodontal health, create an efficient chewing mechanism through correction of the crossbite and derotation of the rotated premolar, align the ectopically erupted canine, establish normal overjet and overbite, and coordinate the midlines.

Even though the patient was 14 years old, the dental age of the unerupted second premolar was only about 10-11. Therefore, it was decided not to extract the second deciduous molar, but to wait for normal exfoliation, or at

TABLE 1
CEPHALOMETRIC DATA

	Norm	Pre-treatment	Post-Treatment
SNA	82°	84°	85°
SNB	79°	84°	83°
ANB	3°	0°	2°
Wits appraisal	0mm	–4mm	–1mm
Upper incisor to maxillary plane	108°	115°	116°
Lower incisor to mandibular plane	92°	90°	88°
Interincisal angle	133°	132°	129°
Maxillomandibular plane angle	27°	24°	26°
Upper anterior facial height		50mm	50mm
Lower anterior facial height		60mm	62mm
Facial height ratio	55.0%	54.5%	55.3%
Lower incisor to APo line	0-2mm	3mm	1.5mm
Lower lip to Ricketts E-Plane	–2mm	–3mm	–2mm
Upper lip to E-line	–2 to –3mm	–5mm	–4mm

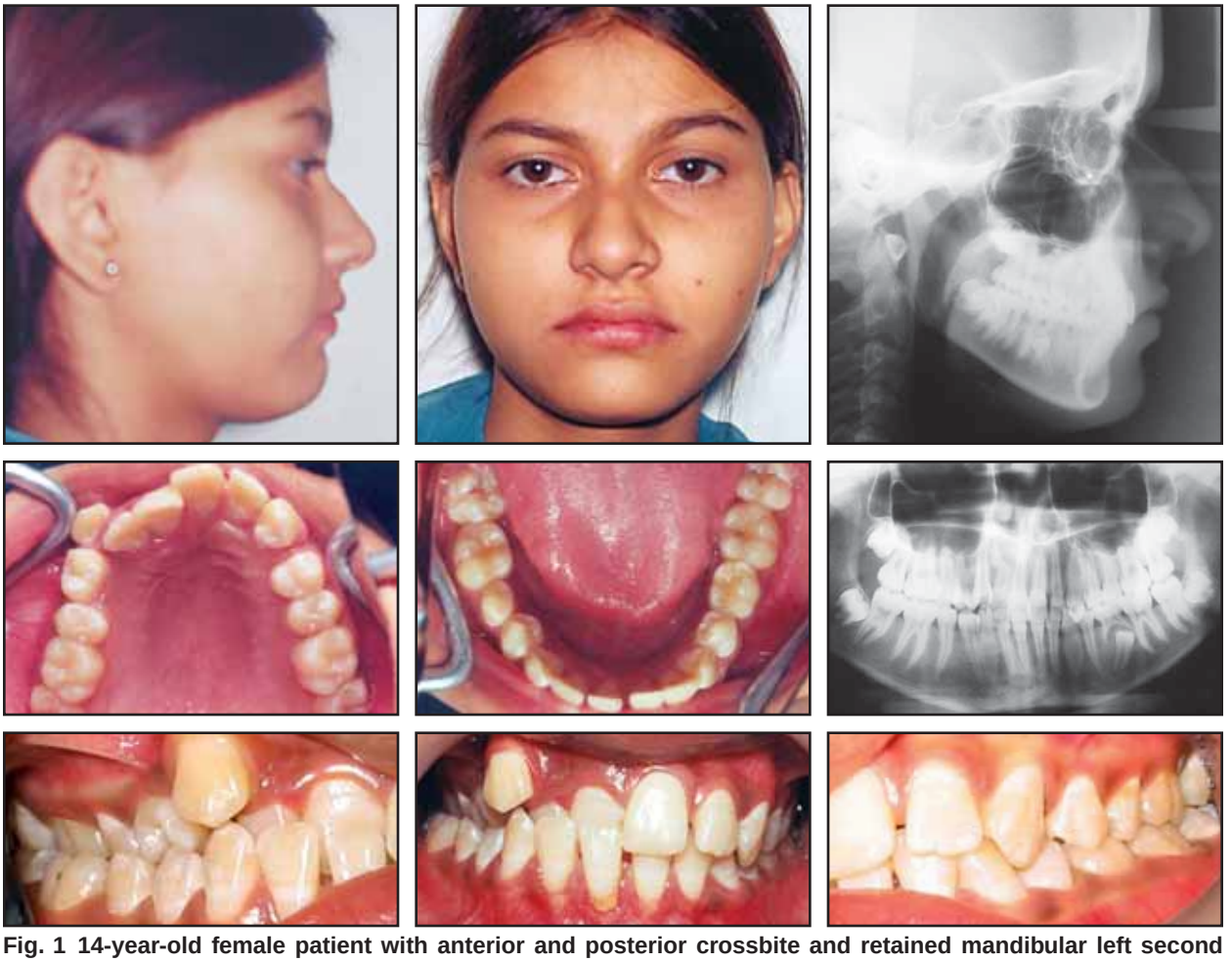

Fig. 1 14-year-old female patient with anterior and posterior crossbite and retained mandibular left second deciduous molar before treatment.

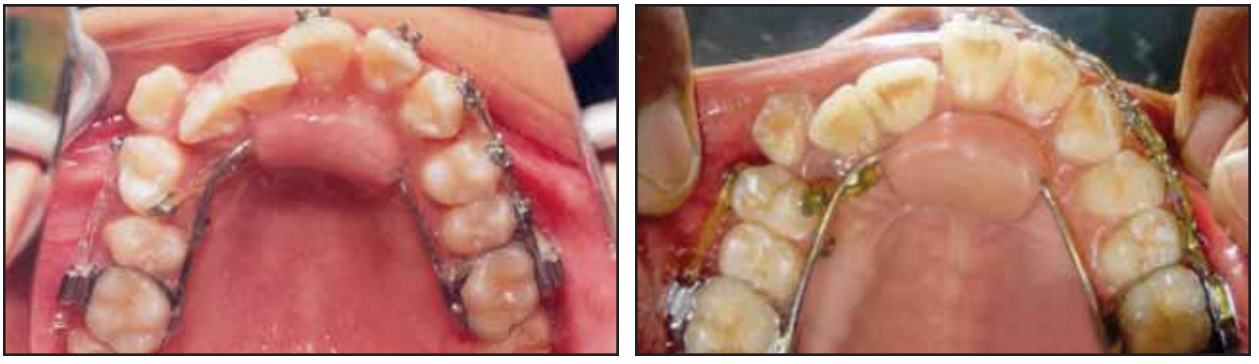

Fig. 2 Force couple generated to derotate premolar.

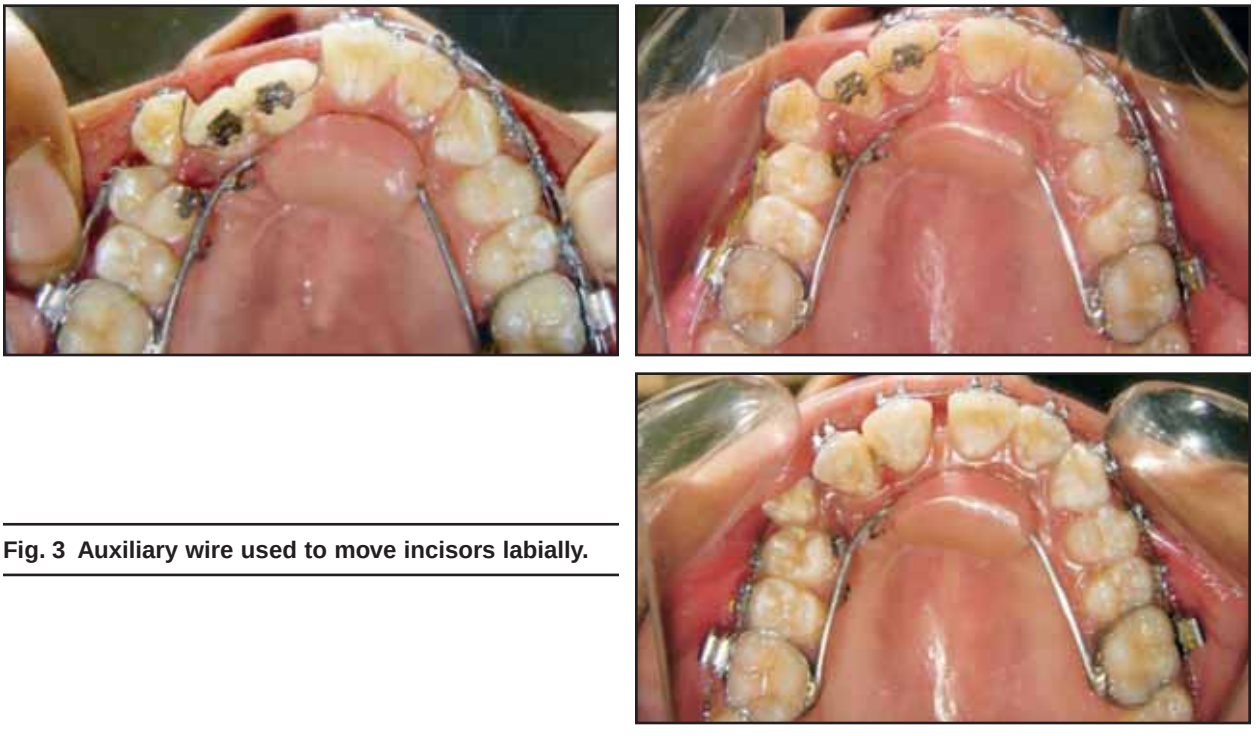

Fig. 3 Auxiliary wire used to move incisors labially.

least until the root of the second premolar was two-thirds formed.

Treatment Progress

Because of the patient's arch-length discrepancy and good facial esthetics, we chose nonextraction treatment with preadjusted, Roth-prescription .022" × .028" edgewise appliances. The maxillary arch was treated first. A Nance holding arch with a soldered hook on the right side was placed, and buttons were bonded labial and lingual to the rotated premolar. A force couple of about 50g was generated to derotate the premolar, using an elastomeric chain* that was changed every three weeks (Fig. 2). On the opposite side, a superelastic .016" nickel titanium wire was placed to align the segment from central

*Ortho Organizers, Inc., 1619 S. Rancho Santa Fe Road, San Marcos, CA 92069; www.orthoorganizers.com..

Fig. 4 Extension plate inserted to provide clearance for labially moving incisors.

Fig. 5 Alignment of canine with nickel titanium overlay wire. Note improvement in gingival health compared to pretreatment records.

incisor to first molar, with a figure-8 bend made in the wire to close the minor spaces. Brackets were then bonded to the lingual surfaces of the right central and lateral incisors, and an .014" copper nickel titanium auxiliary wire** was ligated to move the incisors labially[1] (Fig. 3). An occlusal extension plate was inserted temporarily in the lower arch to provide clearance for the labially moving incisors (Fig. 4). This plate was extended posteriorly to the terminal molars on both sides to prevent eruption of the posterior teeth and further bite opening.

On the left side, an .018" × .025" stainless steel wire segment was ligated to maintain the archform and provide sufficient anchorage to counteract reaction forces from the incisor movement. Special care was taken in positioning the bracket on the dilacerated right lateral incisor to prevent unwanted mesiodistal movement that could jeopardize the roots of adjacent teeth. Although trauma has been suggested as an etiologic factor in dilaceration, many patients have no history of trauma,[2] as in the present case.

The anterior crossbite was corrected in about three and a half months. The lingual brackets were then removed, and labial brackets were bonded for further refinement. An .016" copper nickel titanium wire** was ligated without engaging the canines. As the incisors were aligned and the archform began to take shape, an .020" stainless steel archwire with a step bend bypassing the ectopic upper right canine was inserted, along with an .016" superelastic nickel titanium overlay wire[3] (Fig. 5). The step bend was covered with plastic tubing to prevent soft-tissue injury.

With the correction of the anterior crossbite, the spaces between the lower incisors closed spontaneously, and gingival health in the incisor region improved markedly (Fig. 5). Once the ectopic canine was aligned in the arch, the Nance appliance was removed, and an .019" × .025" stainless steel wire with an accentuated 1st-order bend mesial to

**Ormco/"A" Company Orthodontics, 1717 W. Collins Ave., Orange, CA 92867; www.ormco.com.

Fig. 6 Serial periapical radiographs before surgical exposure of mandibular left second premolar.

Fig. 7 Surgical exposure of left second premolar crown and application of eruptive force using "slingshot" mechanics.

the first molar and an expanded archform was placed to correct the posterior crossbite.

When the root of the mandibular left second premolar was two-thirds formed, the deciduous molar was extracted. It was expected that this would allow rapid, normal eruption of the premolar, because the tooth was only mildly tilted and was relatively high in the alveolus.[4] Although serial periapical radiographs showed signs of passive eruption (Fig. 6), however, self-correction had not occurred after five months.

Before surgical exposure of the impacted tooth, the mandibular arch was bonded and aligned. An .018" × .025" stainless steel wire with steel tubing in the left second premolar region was then ligated. A full-thickness mucoperiosteal flap was elevated in the area of the impacted premolar. A button was bonded to the exposed surface, and an extrusive force of 25-30g was applied to the premolar using "slingshot" elastic thread[4] (Fig. 7). Although space is never a problem in these cases because the mesiodistal crown width of the second premolar is less than that of its healthy predecessor, a space-holding device, such as the steel tubing shown here, should be used to prevent molar tipping.

After initial eruption of the premolar (Fig. 8), an .018" × .025" stainless steel wire with a step bend bypassing the second premolar was inserted, along with an .016" copper nickel titanium overlay wire.**[1] The crown was gradually translated into the dental arch (Fig. 8), while the root was moved through the bone (Fig. 9).

Finishing was performed using lighter wires with vertical elastics. After 23 months of active treatment, bonded lower lingual and wraparound upper retainers were delivered. A circumferential supracrestal fibrotomy was performed around the upper right first premolar to prevent rotational relapse.[5] The incisal edges of the right central and lateral

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Fig. 8 Occlusal alignment of mandibular left second premolar.

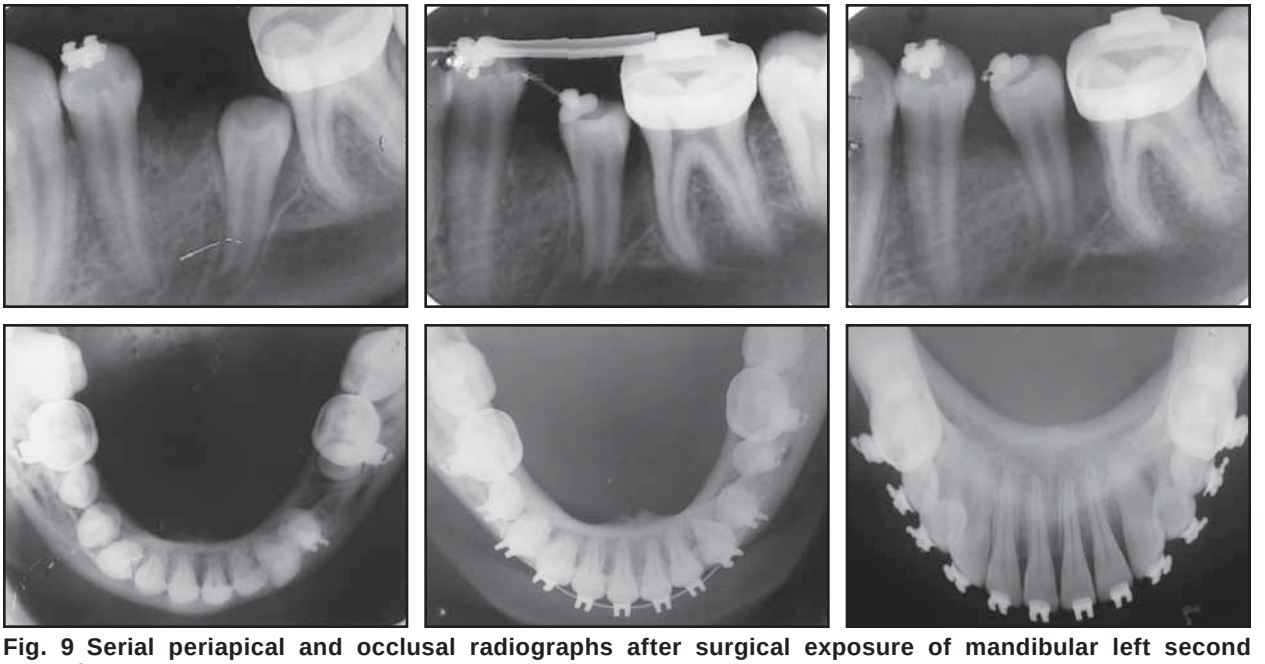

Fig. 9 Serial periapical and occlusal radiographs after surgical exposure of mandibular left second premolar.

incisors were built up with composite, since they had undergone attrition while in crossbite.

Treatment Results

Post-treatment records showed good functional and esthetic results (Fig. 10, Table 1). The post-treatment periapical radiograph of the dilacerated maxillary right lateral incisor gave no evidence of root resorption of either the canine or the lateral incisor (Fig. 11). Considering that the roots of dilacerated teeth are more prone to resorption, this demonstrates the care that was taken during the bracket positioning and movement of the lateral incisor. The tooth continues to be monitored, however, and follow-up periapical radiography was recommended. Because there was insufficient space to align the third molars properly in the arches, the patient was advised to have them extracted.

Discussion

This case shows that orthodontic repositioning can have a significant impact on overall oral health, including the alteration of

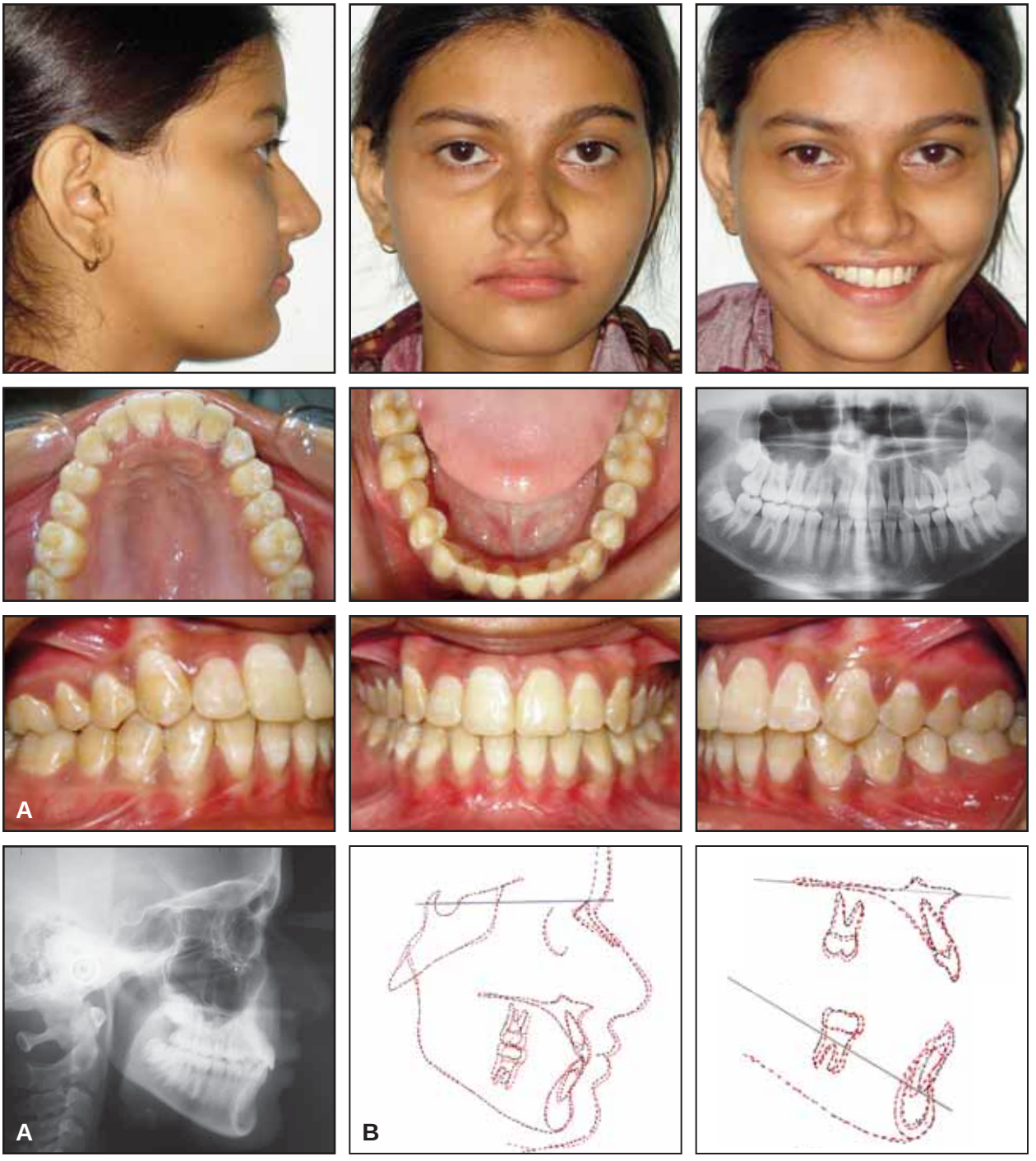

Fig. 10 A. Patient after 23 months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.

Fig. 11 Post-treatment periapical radiograph shows no root resorption of maxillary right canine or dilacerated lateral incisor.

subgingival microbiology. The patient's gingival health improved significantly, especially in the lower incisor area, without any periodontal intervention.

Loss of attachment and subsequent gingival recession have been observed in orthodontic patients, particularly in the mandibular anterior region.[6] Gingival recession caused by orthodontic treatment typically occurs after alveolar bone dehiscence induced by uncontrolled expansion, in which teeth are forced through the cortical plate. It has also been shown, however, that labial cortical bone will reform in an area of dehiscence when the tooth is retracted lingually into a proper alveolar position.[7,8]

Facial gingival dimensions are reportedly reduced by labial movement and increased by lingual movement,[9,10] as was found in the present case (Fig. 5). The outcome demonstrated proper alignment of the arches and achievement of Class I molar and canine relationships, enhancing the stability of the buccal occlusion. Light forces were used, and extra care was taken to avoid damage to the teeth and supporting structures. Patient compliance with the treatment regimen contributed to the successful outcome in this case.

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