

# CASE REPORT

## Treatment of an Impacted and Inverted Upper Premolar

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**T**he upper and lower third molars and upper canines are the most commonly impacted teeth in the permanent dentition. Impaction can be horizontal, vertical, mesioangular, distoangular, or inverted.<sup>1-3</sup> Inverted impaction has been reported in a variety of teeth, including incisors, canines, molars, and supernumerary teeth (most commonly a mesiodens).<sup>4-6</sup>

Although inverted premolar impactions are extremely rare,

one author reported surgical removal of an inverted upper premolar followed by reimplantation in an upright position.<sup>7</sup> In another case of an impacted and inverted lower second premolar tooth germ, surgical uprighting was performed and the deciduous lower second molar was preserved.<sup>8</sup> Our case report demonstrates successful orthodontic treatment of an impacted and inverted upper premolar without extraction or reimplantation.

### Diagnosis and Treatment Plan

A 14-year-old female presented with the chief complaint of prolonged retention of a second deciduous molar (Fig. 1). She had bilateral Class I canine and molar relationships and a balanced facial pattern. A retained upper left second deciduous molar was found in the position of the missing second premolar. Radiography revealed an impacted and



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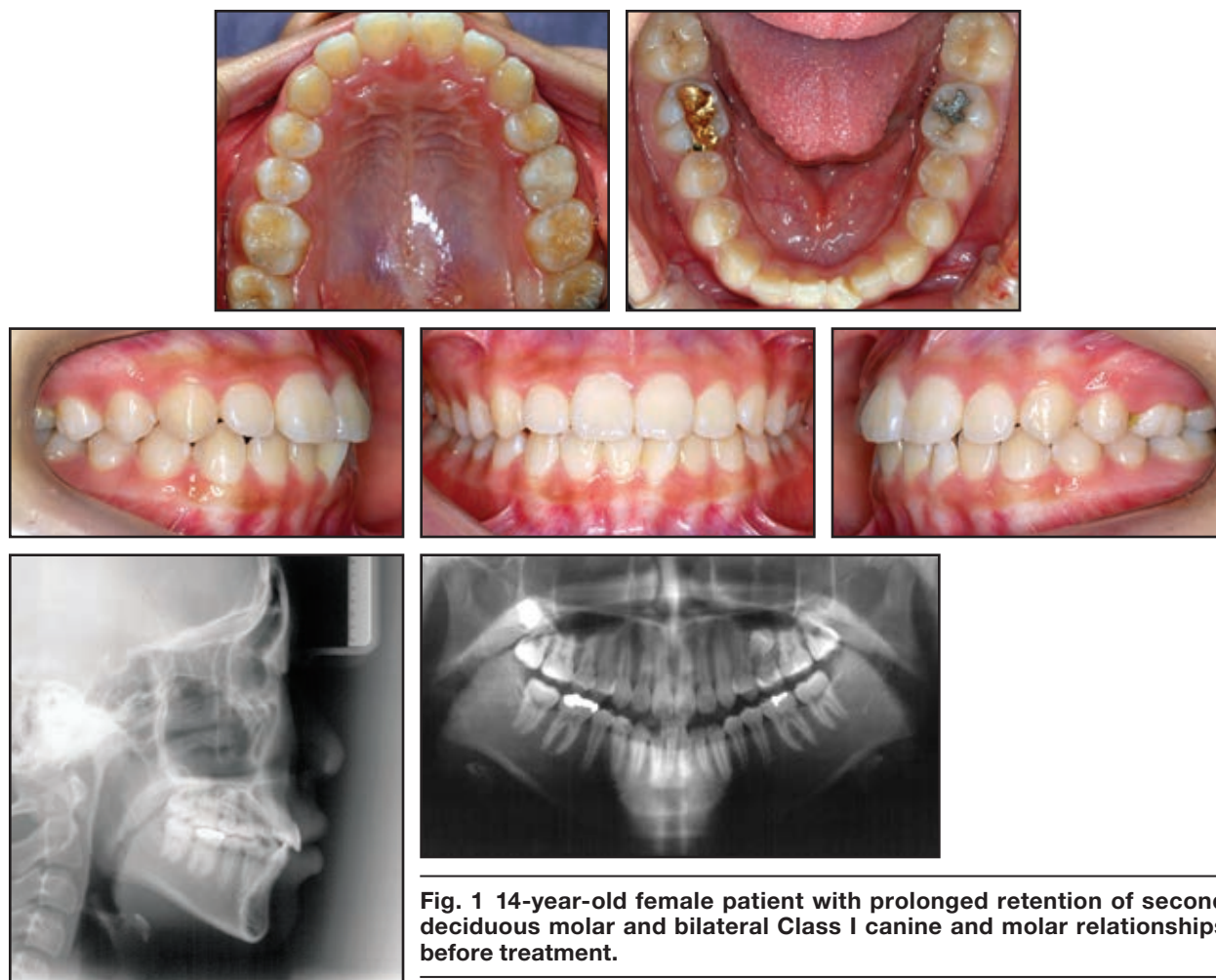


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**Fig. 1** 14-year-old female patient with prolonged retention of second deciduous molar and bilateral Class I canine and molar relationships before treatment.

inverted upper left second premolar, with the crown facing toward the maxillary sinus floor.

The treatment plan called for extraction of the retained deciduous teeth, space maintenance by fixed orthodontic treatment, and surgical exposure and traction of the impacted tooth into its proper position. Treatment was planned only for the upper dentition because of the patient's concerns about cost.

### Treatment Progress

An  $.018" \times .022"$  MBT-prescription Inspire ICE\* clear fixed appliance was bonded in the upper arch. After three months of initial leveling on  $.014"$ ,  $.016"$ , and  $.016" \times .022"$  G4\*\* nickel titanium archwires, an  $.016" \times .022"$  stainless steel archwire was inserted. The patient was then referred for extraction of the retained tooth and exposure of the

impacted premolar by an oral surgeon. A metal lingual button was bonded to the impacted tooth, and a twisted stainless steel ligature wire was tied to the attachment (Fig. 2). The ligature wire was drawn inferiorly through the sutured edges of the flap, so that the surgical site could be completely closed.

After seven days of healing, orthodontic treatment was resumed. Traction was applied to



**Fig. 2** After three months of upper leveling and alignment, metal lingual button bonded to impacted upper left second premolar, and twisted stainless steel ligature wire tied to attachment.



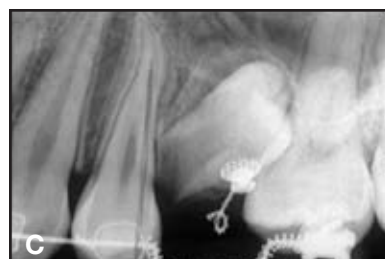
**Fig. 3** After one week of healing, stepdown bend made in main .016" x .022" stainless steel archwire to increase distance for eruption force application; open-coil spring inserted between first molar and first premolar to open space for second premolar.

the twisted stainless steel ligature to bring about full eruption of the tooth. Since the distance between the ligature wire and the main archwire was too short to apply force, a stepdown bend was made in the archwire, and an open-coil spring was inserted between the first molar and first premolar to open and maintain adequate

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**Fig. 4** Impacted premolar after one (A), two (B), and three (C) months of eruption.

space for the second premolar (Fig. 3).

The progress of impacted tooth movement was evaluated monthly (Fig. 4). After three months, to produce more clockwise rotation of the impacted tooth, the metal button was replaced by a minitube and an .016" x .022" TMA\*\*\* auxiliary wire was bent and attached (Fig. 5). Three months later, the wire was activated to create an additional rotational moment (Fig. 6).

In another four months, the crown had been sufficiently rotated to replace the minitube with



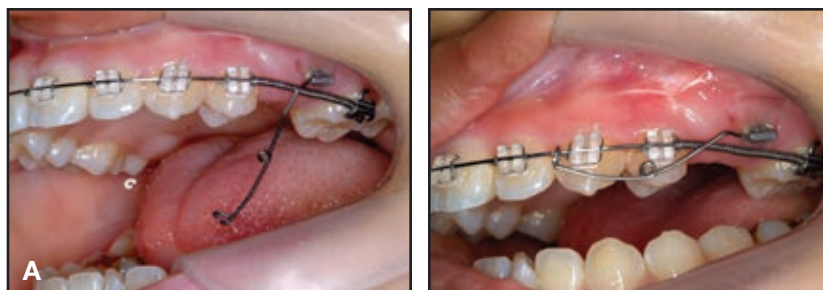
**Fig. 5** Minitube bonded to impacted premolar, and .016" x .022" TMA\*\*\* auxiliary wire bent and attached.

a bracket, and a segmental .014" nickel titanium wire was inserted for alignment (Fig. 7). The inverted upper left second premolar was successfully positioned in proper alignment within another 10 months (Fig. 8).

After a total 23 months of treatment, the fixed appliances were removed and an upper 2-2 lingual retainer wire was bonded. Follow-up records taken three years after treatment confirmed the stability of results (Fig. 9).

## Discussion

Reimplantation is generally considered the best treatment approach for an inverted premolar.<sup>9</sup> Surgical intervention is more problematic with an inverted tooth than with other types of impactions, however, because the



**Fig. 6 A.** Three months later, auxiliary wire activated to create additional rotational moment. **B.** After 11 months of treatment.



**Fig. 7** After 13 months of treatment, minitube replaced by bracket and segmental .014" nickel titanium wire inserted for alignment.

inaccessibility of the crown necessitates extensive bone removal. Potential complications of surgical extraction, such as perforation of the maxillary sinus, should also be taken into consideration.<sup>4</sup>

Traumatic injuries and obstructions to eruption are believed to be the most common causes of impacted anterior teeth; improper oral habits, such as nail biting or fingersucking, may also contribute.<sup>10</sup> There was no history of fa-

cial or jaw trauma or TMD in our patient.

We chose to use a closed-eruption technique because it usually provides the most esthetically pleasing result.<sup>11,12</sup> Our patient's premolar had a short root due to extensive tooth movement during root development. Therefore, the greatest challenge was to produce enough clockwise force to rotate the inverted tooth nearly 180° within the alveolar bone.

Some studies have reported a relatively high prevalence of gingival defects in the area of impacted anterior teeth, which may require adjunctive post-orthodontic periodontal surgery to achieve an esthetic gingival contour.<sup>13</sup> In our patient, the gingival contour of the exposed premolar was acceptable after orthodontic treatment, and no further mucogingival surgery was recommended.

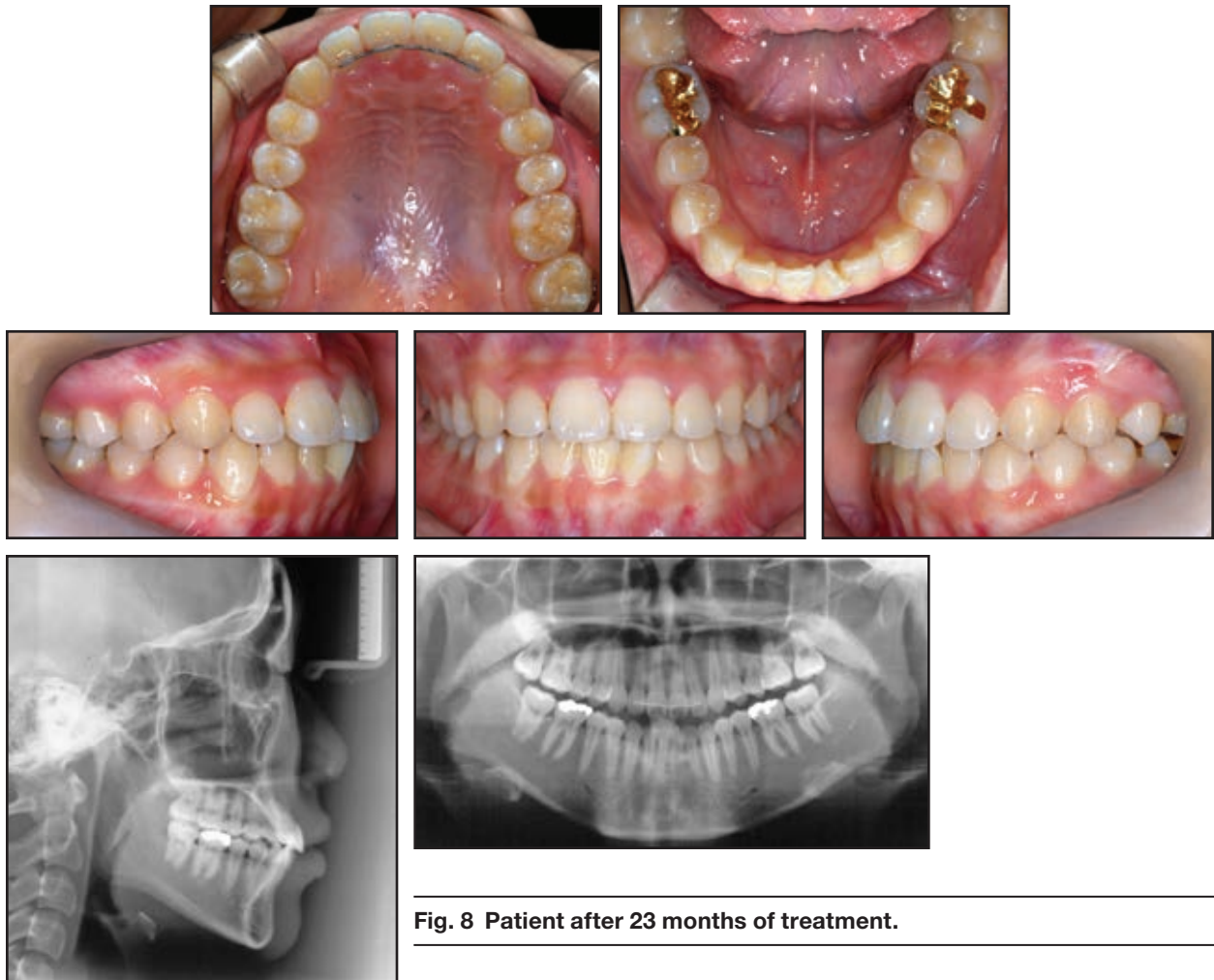


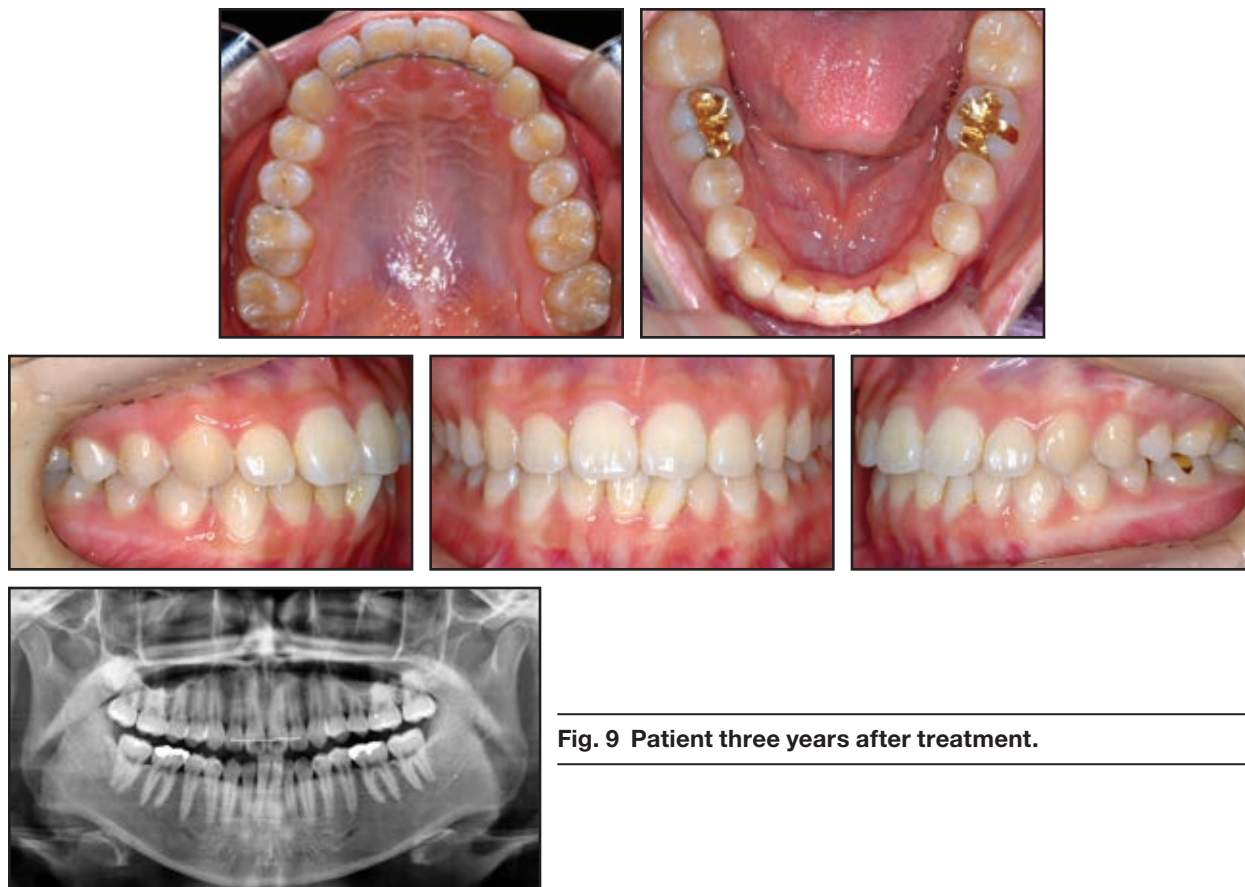
Fig. 8 Patient after 23 months of treatment.

## Conclusion

As this case illustrates, conservative surgical exposure and orthodontic treatment can be an appropriate solution for an impacted and inverted tooth if the principles of biomechanics are properly applied.

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**Fig. 9 Patient three years after treatment.**

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