

# CASE REPORT

## An Impacted Central Incisor with a Severe Root Malformation

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**T**his female patient, age 7 years and 4 months, was referred by her dentist because of delayed eruption of the maxillary left central incisor. The patient had experienced a severe trauma at the age of 4½, and the dental trauma may have been overlooked at that time, since she suffered a concussion and a fracture of the skull and orbits.

### Diagnosis and Treatment Plan

Clinical and radiographic examination revealed a straight profile with a prominent chin, obtuse nasolabial angle, reversed lip relation, neutral jaw relation, posterior growth pattern, neutral occlusion of the permanent mo-

lars, and anterior forced bite resulting in a crossbite of the maxillary right central incisor (Fig. 1).

A habit of dipping her pacifier in honey and poor oral hygiene had led to rampant caries in the primary dentition, particularly the maxillary right deciduous canine, all four deciduous first molars, and the maxillary right and both mandibular deciduous second molars. The occlusal radiograph showed a malpositioned and malformed maxillary left central permanent incisor.

The following treatment plan was devised:

- Improve the oral hygiene by initiating preventive measures.
- Request extractions of the

maxillary right deciduous canine, the four deciduous first molars, and the mandibular left deciduous second molar.

- For conservative treatment of the mutilated dentition, prescribe fillings of the other three deciduous second molars.
- Eliminate the anterior forced bite.
- Extrude the maxillary left central incisor orthodontically with a removable appliance.
- After further development of the dentition, finish with fixed appliances in both arches.
- Place a fixed maxillary retainer.

The objective was to correct the anterior forced bite during extrusion of the maxillary left central incisor, since pro-

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longed maintenance of this habit could result in instability of the orofacial muscles and asymmet-

rical mandibular growth.<sup>1</sup> The patient was instructed to push a wooden spatula against the pal-

atal side of the maxillary incisors and bite down firmly for 10 minutes, three times a day.

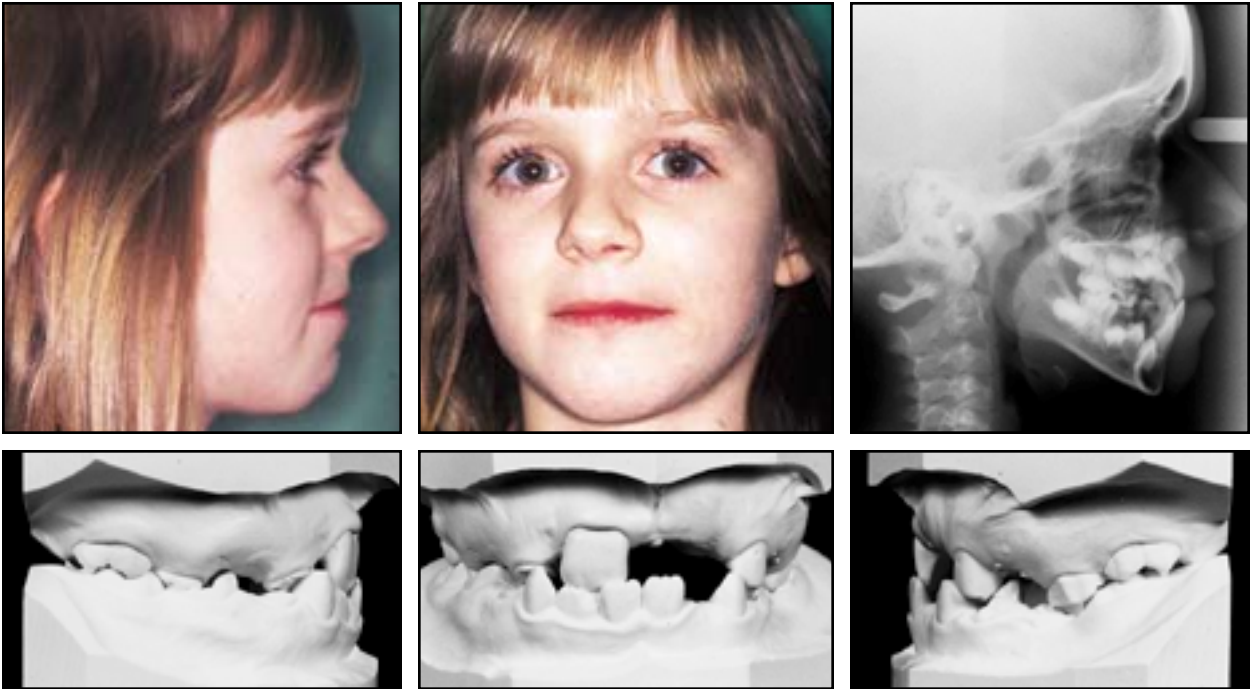


Fig. 1 7-year-old female patient before treatment.

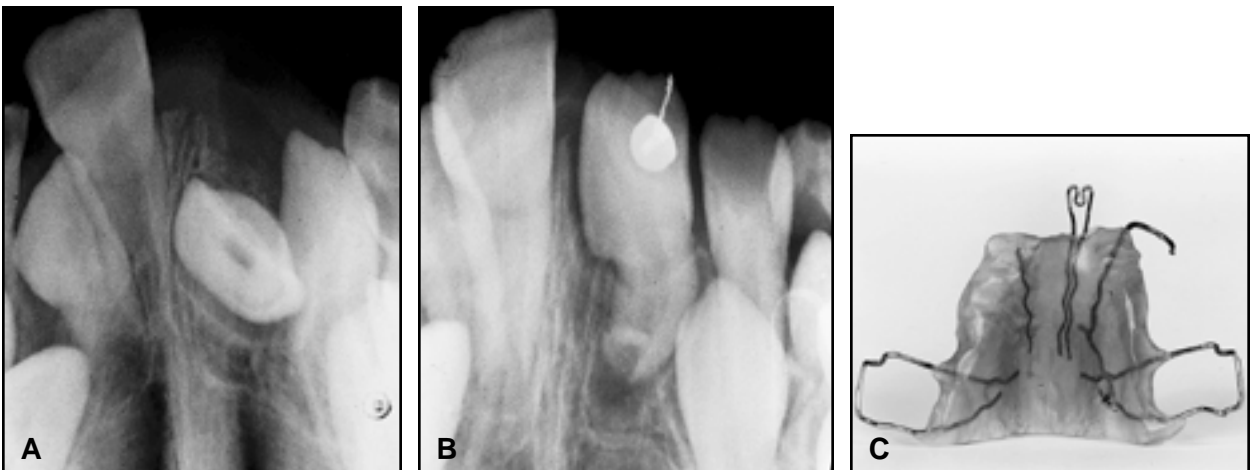


Fig. 2 A. Maxillary left central incisor before treatment. B. After surgical preparation and orthodontic extrusion. C. Removable appliance used for extrusion of incisor: bite risers on both sides and protrusion spring for right central incisor were cut off.

An orthodontic cleat was bonded to the maxillary left central incisor, and a ligature was attached for active extrusion with a removable appliance (Fig. 2). After nine months of extrusion, the cleat was replaced by a bonded palatal button. Four and a half months later, the crown was completely visible. At that time, however, a bulge could be seen in the alveolar process, cervical to the crown of the extruded tooth. A 90° labial root deviation was revealed by the lateral headfilm, with the apex of the tooth perforating the labial cortical bone (Fig. 3).

The malformed incisor had to be extracted (Fig. 4), which

necessitated a change in our treatment plan. The patient still had a straight profile with a prominent chin and a neutral molar occlusion, but the maxillary left permanent canine was transposed apically between the left central and lateral incisors (Fig. 5), and the mandibular left second premolar was impacted. We decided to maintain the neutral occlusion and extract three compensatory teeth—the maxillary first premolars and the mandibular left second premolar. Thus, we aimed to achieve a Class I molar relationship with the following arrangement:

17	16	15	13	12	11	23	22	24	25	26	27
47	46	45	43	42	41	31	32	33	34	36	37

### Treatment Progress

Extrusion of the maxillary canine took 17 months with a removable appliance. Fixed appliances were placed for finishing first in the maxillary arch, and two months later in the mandibular arch. Despite repeated oral hygiene instructions, tooth-brushing compliance was extremely poor; we therefore decided to remove the brackets prematurely, after 12 months in the maxillary arch and 10 months in the mandibular arch. Once the maxillary left canine had been reshaped with a composite build-up, however, the patient had a pleasant esthetic result (Fig. 6).

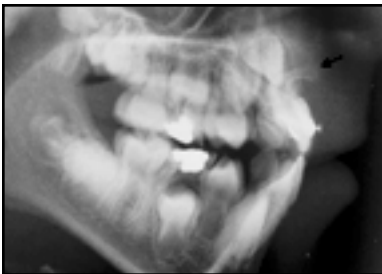


Fig. 3 Vestibular root angulation of maxillary left central incisor and perforation of labial cortical bone.



Fig. 4 Extracted maxillary left central incisor.

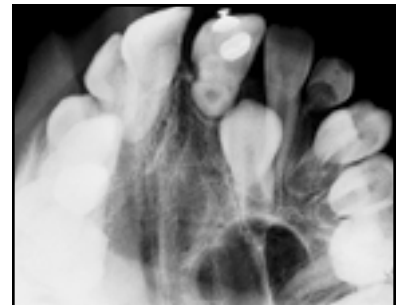


Fig. 5 Transposed maxillary left canine.

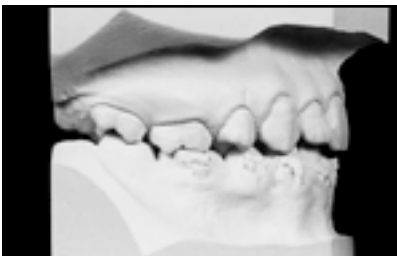


Fig. 6 After premature end of active orthodontic treatment, showing composite build-up of canine transposed to position of maxillary left central incisor.

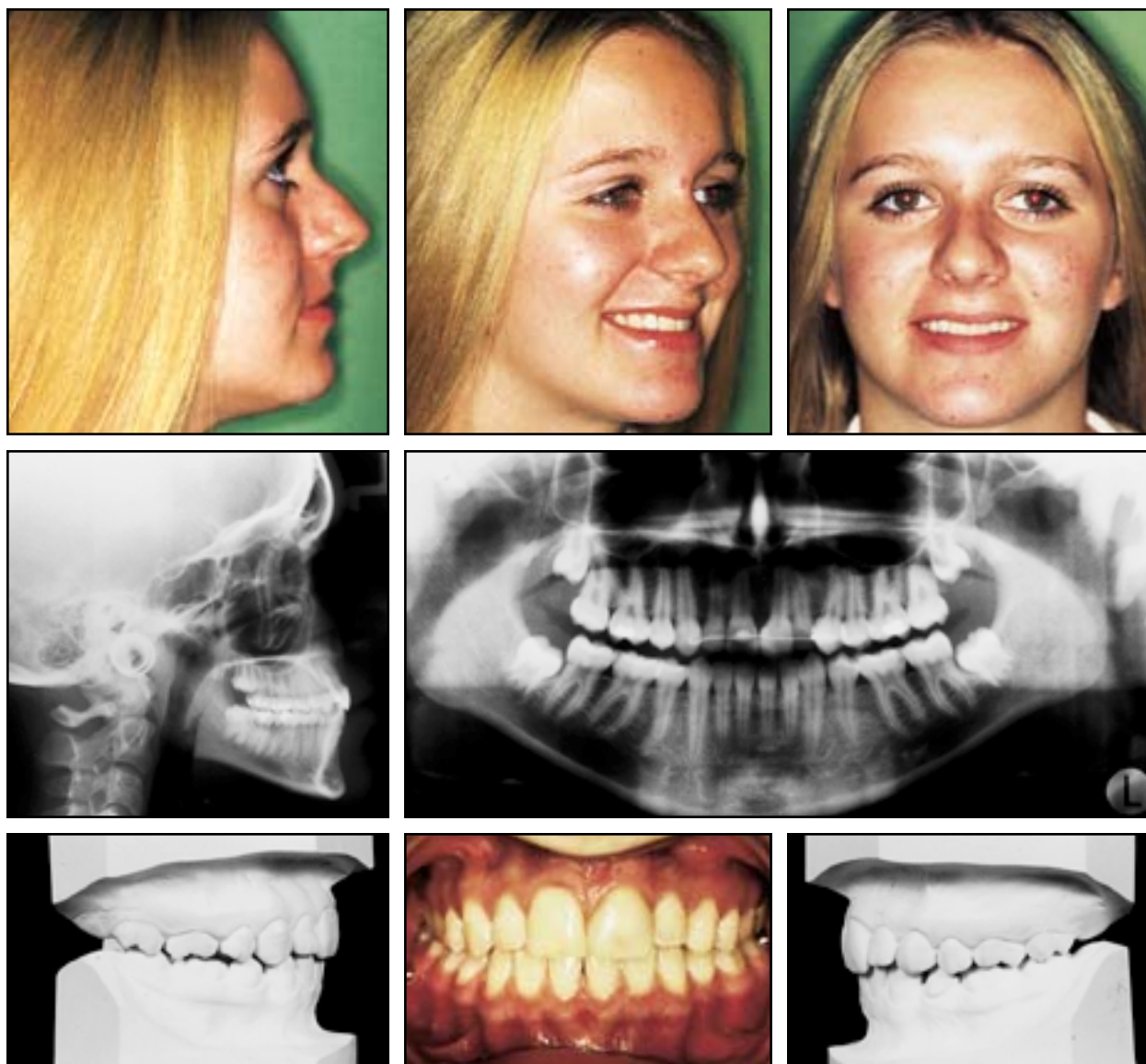


Fig. 7 Patient after five years of retention.

A twisted-wire retainer was bonded to the six maxillary anterior teeth, but because of the poor oral hygiene, we decided not to place a mandibular retainer. To achieve better anterior contact and a proper sagittal molar relationship, a bionator was prescribed to be worn every night for five months and then every other night for three months.

Five years after bracket removal, the maxillary fixed retainer was still present, and the patient showed good anterior contact and a good sagittal relationship (Fig. 7).

## Discussion

We presumed that the delayed eruption and abnormal shape of the maxillary left central incisor had resulted from the patient's severe trauma at age 4<sup>1/2</sup>. We believed that the shock had been partially absorbed by the primary incisors, without visible damage, but that it had caused displacement and/or damage of the permanent incisor.<sup>2,3</sup> Of course, we could not prove a causal relationship; in fact, there are several factors indicating that this malformation might not have been caused by

trauma:

1. There seemed to be no histological abnormalities in the hard tissues of the vestibularly angulated teeth.<sup>4,5</sup>
2. Morphological alteration of the incisor can be distinguished from a dilaceration, which is a marked deviation of the long axis of the root produced by a traumatic non-axial displacement of the tooth.<sup>6,7</sup> Our patient's vestibular root angulation had a severe curvature, indicating a gradual change in the direction of root growth without displacement of the tooth germ. Scar tissue from early loss of primary



teeth can change the eruption path of a tooth without displacing the Hertwig root sheath.<sup>5</sup>

3. Similar cases have been reported with no history of trauma.<sup>8</sup>

4. The abnormality may be gender-specific, since it is seen six times more often in girls than in boys.<sup>9</sup>

5. It is currently believed that ectopic development of a tooth bud can lead to a vestibular root angulation.<sup>8</sup>

Transpositions reportedly occur in one out of every 300 orthodontic patients, but only 2% of these have maxillary canines erupting in the place of central incisors.<sup>10</sup> Such transposition seems to occur when the central incisor is displaced or lost prematurely.<sup>11</sup> Although orthodontic correction of a complete transposition is possible, the risk of damaging the roots and supporting structures of the adjacent teeth must be carefully considered.<sup>12</sup> In the present case, the possibility of damaging the root of the adjacent lateral incisor led us to decide in favor of extruding the canine into the site of the central incisor.

We considered many ways of closing the diastema at the canine site. An implant could have been used to produce a canine-guided occlusion, which has the advantage of disclusion of the other teeth in closed eccentric movements. Because implants tolerate mainly vertical and centric forces,<sup>13</sup> however, they are not well suited for replacing canines. In addition, implants are contraindicated in growing patients, because they behave like

ankylosed teeth—in other words, they do not erupt normally, so that infra-occlusion occurs rapidly as the patient grows.<sup>14,15</sup>

The space of the canine could have been filled by using a temporary prosthesis during adolescence, followed by a permanent bridge. This treatment, however, inevitably results in bone resorption at the edentulous site.<sup>16</sup>

If a suitable donor tooth had been available, auto-transplantation would have been the best solution. The great advantage of a transplanted tooth is that it preserves bone, as long as it does not become ankylosed,<sup>16</sup> and therefore can usually function as a substitute for many years. Transplantation of a mandibular premolar to the canine site would have been possible, but since there was crowding in the mandibular arch, we preferred to make three compensatory extractions and perform orthodontic space closure.

Thus, the patient was treated as an “ordinary” four-extraction case, even though the extraction of the central incisor in the left maxillary quadrant was somewhat extraordinary. A good occlusal result was achieved in four years of treatment, and earlier diagnosis of the maxillary incisor’s severe labial root angulation could probably have saved several months of treatment time.

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