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Spontaneous re-eruption of a permanent maxillary central incisor after 15 years of ankylosis – a case report

CASE REPORT

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Abstract – Intrusion injuries are considered among the most severe forms of dental trauma, potentially leading to ankylosis as a late consequence. In 1991, a 7-year-old boy suffered a traumatic intrusion leading to an infraposition of tooth 21 along with its immobility. Based on the clinical findings, including bright-sounding percussion testing, disappearance of the periodontal space and a failed attempt at orthodontic movement, a diagnosis of ankylosis was made. Following prosthetic restoration of the infrapositioned tooth, spontaneous re-eruption occurred 15 years later. With the help of a partial multibracket appliance, the tooth could be adjusted to occlusal level and was then restored to the patient's satisfaction. Radiographically, it was demonstrated that extrusion of the tooth had been accompanied by a significant gain in local alveolar bone volume. While a wait-and-see strategy cannot be recommended as a treatment option following ankylosis, considering that spontaneous re-eruption after several years is an extremely rare finding, elucidating the mechanisms at work in spontaneous re-eruption at a cellular level might create an opportunity for iatrogenic triggering of re-eruption, thus paving the way to new forms of therapy.

Boys 6–12 years old are frequently affected by traumatic dental injuries (TDI), which is particularly true of the maxillary central incisors (1–4). Intrusion injuries, which are when teeth are moved into the alveolus by axial impact, occur in 0.3–1.9% of TDI (1, 5–7). Intruded anterior teeth have essentially three treatment options: orthodontic extrusion, surgical repositioning, or a wait-and-see strategy in anticipation of spontaneous re-eruption (8). The likelihood of spontaneous re-eruption is highest if a tooth whose root growth has not been completed is involved in mild intrusion (1, 6, 9–14). Another point to consider with intrusion injuries is the potential of late sequelae like pulp necrosis, pulp canal obliteration, disturbance to the continued development of the root, inflammatory root resorption, and ankylosis-related (replacement) resorption (4, 8, 9, 14).

Few treatment options are available for ankylosed teeth (4, 12, 15–20). As documented in the current Cochrane Review (21), no evidence-based data from randomized clinical trials are available to judge which approach to ankylosed permanent teeth in the anterior segment is the most effective and predictable.

This report describes the surprising case of a young man who, after suffering an intrusion injury of a permanent central incisor with subsequent ankylosis in childhood, experienced spontaneous re-eruption of the ankylosed tooth 15 years later.

Case report

The patient first presented at the Center of Dentistry and Oral and Maxillofacial Surgery, University Hospital Tuebingen, Germany in 2002. He was 18 years old and inquired about options to correct infraocclusion of his tooth 21.

He reported having had a TDI to the anterior segment with intrusion of tooth 21 in 1991 at the age of 7. He had immediately sought emergency treatment with his dental practitioner, who chose to adopt a wait-and-see strategy in anticipation of spontaneous re-eruption of the intruded tooth. About 3 months later, the use of an orthodontic removable plate appliance did not succeed in actively extruding tooth 21 from its infraocclusal level, despite the patient's good compliance and despite his extended use of the appliance over several weeks. Treatment was discontinued with the suspected diagnosis of ankylosis (20, 22). In 2002, 11 years after trauma, the patient presented at the Department of Prosthodontics,

Fig. 1. Periapical radiograph of intruded permanent left maxillary central incisor obtained at initial presentation. A missing periodontal gap and a pulp of the intruded teeth can be seen.

University Hospital Tuebingen for consultation about treatment options for restoration of tooth 21. The clinical and radiographic examinations revealed that the tooth 21 was covered by an inadequate resin restoration in the incisal area and that its coronal position was below the level of the adjacent teeth (Fig. 1). Percussion gave a typically bright sound suggesting that ankylosis was indeed present. Another indication of ankylosis, namely a characteristically indistinct or missing periodontal space (23), could be identified on the periapical radiograph obtained (Fig. 1). It could also be seen that the root canal of the left central incisor had become obliterated and the apex appeared to be closed.

Of the various treatment options available, the patient opted against a surgical procedure. His preference was for a conservative crown restoration, despite the fact that an esthetically compromised outcome could be anticipated because of the infraocclusal position of the tooth and the non-symmetrical hight of the gingival margin. A metal-ceramic crown was delivered in March 2003. The patient was 19 at the time.

Another 3 years later (in 2006), he presented for consultation again. Despite the fact that contact with the opposing dentition had been established with the new crown, he reported having experienced elongation of the tooth for a few months. His dentist had been forced to repeatedly reduce the incisal edge. The clinical examination revealed that the previously subgingival margin of the crown was now located around 2 mm above the gingival level (Fig. 2a–c). Mobility testing showed it to be within physiologic limits. After 3 months, elongation of the tooth had proceeded by yet another 2 mm. With the aim of a preprosthetic elongation of tooth 21 and its surrounding gingival margin, the patient was referred to the Department of Orthodontics, University Hospital Tuebingen. Within a few months using a partial multibracket appliance in the maxilla (Fig. 3), the previously ankylosed tooth could be extruded by several millimeters. The restorative treatment provided after 10 months of orthodontic treatment in the form of a bonded (VariolinkII; Ivoclar Vivadent, Ellwangen, Germany) lithium-disilicate all-ceramic crown (IPS e.max press with e.max Ceram; Ivoclar

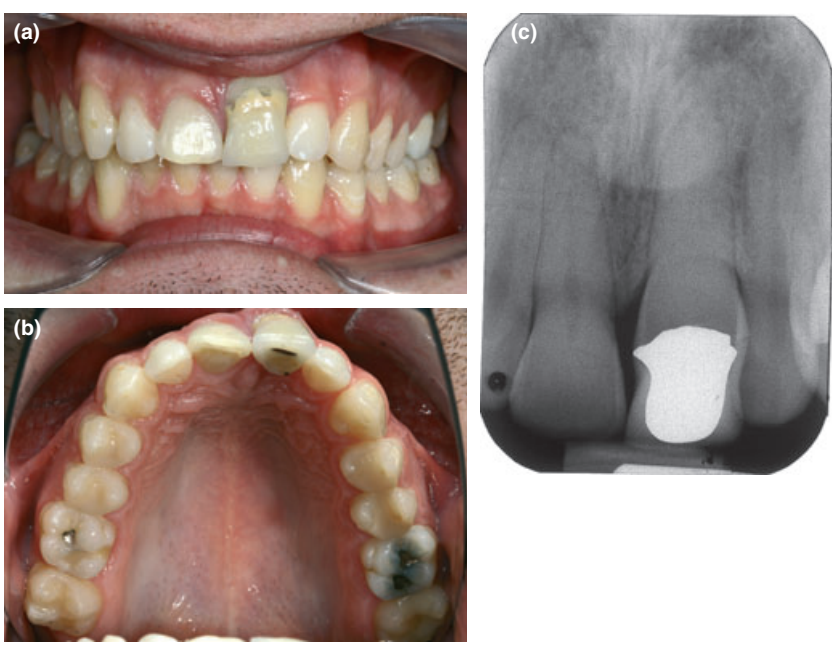

Fig. 2. (a, b) Intraoral views of the 23-year-old patient before the beginning of orthodontic treatment. Note the clearly inadequate crown restoration of infrapositioned tooth 21. (c) Periapical radiograph taken after spontaneous re-eruption of the tooth 21. A periodontal gap is remarkable.

Fig. 3. Intraoral view of the patient taken a few weeks into orthodontic treatment. A few millimeters of extrusion have been accomplished by this time.

Vivadent) provided satisfactory esthetics (Fig. 4a,b). Finally, a customized fixed retainer wire was inserted for long-term retention of the treatment outcome (Fig. 4b). Part of the palatal surface was excluded from glaze firing to improve the union between the resin bonder and the all-ceramic crown. The radiographs obtained at different times (Figs 1, 2c and 4c) illustrate the considerable gain of alveolar bone that was attained by the extrusive orthodontic force applied.

Discussion

The disappearance of the normal periodontal space (Fig. 1), the characteristic bright sound, and the absence of tooth movement with orthodontic treatment was presumably because of ankylosis (15, 16). These characteristics for an ankylosis are additionally supported by the local growth stagnation of the alveolar bone, leading to vertical and horizontal lack of alveolar bone growth. The periapical films taken at follow-up visits several years later showed that the pulp canal had become obliterated and the apex had closed, which is a sign of continued pulp vitality. Therefore, it is not excluded that other possible mechanisms may have prevented the tooth eruption (24). However, exceptional and for the first time described is the fact that a spontaneous re-eruption occurred after 15 years. Cases of temporary reversible ankylosis are only known to occur in the presence of a very small bony contact area not exceeding few square millimeters (23). Mamber (11) reported a case of spontaneous eruption of an ankylosed anterior tooth in a 11-year-old boy, which, however, occurred as early as 2 months after discontinuing an attempt at orthodontic extrusion. Sapir (19) hypothesized that mild injuries to the periodontal ligament might allow the root surface to be repopulated by periodontal ligament cells, thus leading to resolution of the ankylosis.

For quite a number of years now, the principle of subjecting even hopeless teeth/roots to controlled movement in a coronal direction has been successfully applied to stimulate vertical formation of new alveolar bone for use as an implant bed (25). In addition to this new bone formation (Figs 1, 2c and 4c), the clinical views also illustrate the gain in width of attached keratinized gingiva and the vertical height of the papillae. The gingiva will move, although to a lesser extent, in the same direction as the extruded tooth (26). High forces applied to extrude a tooth quickly may (desirably) cause attachment loss (27).

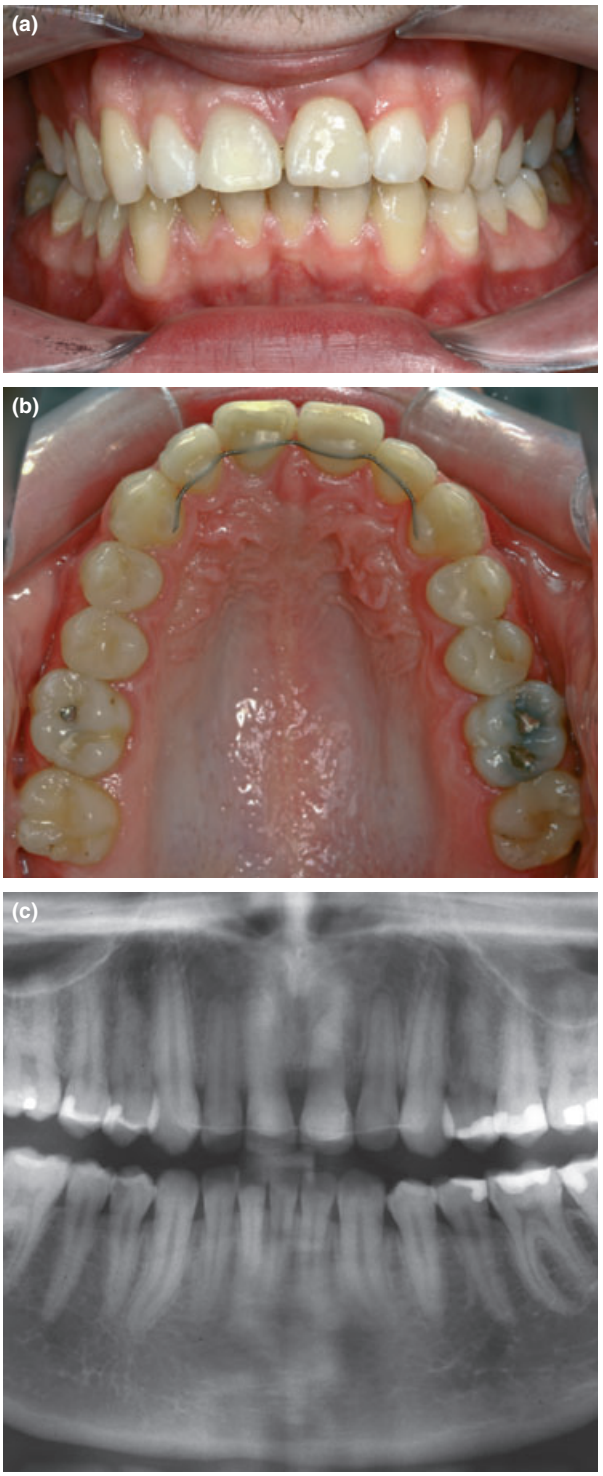

Fig. 4. (a, b) Intraoral views of the patient taken immediately after delivery of the all-ceramic crown on tooth 21. For long-term retention of the treatment outcome, a retainer of multi-braided titanium wire was bonded from canine to canine. (c) Radiograph taken upon completion of treatment. A considerable gain of alveolar bone can be seen that was attained by the extrusive orthodontic force applied.

Conclusions

To our knowledge, the present case report is the first report on spontaneous re-eruption of a permanent maxillary central incisor that had been in infraposition for 15 years following an intrusion injury. Based on all the diagnostic data available, the tooth was ankylosed. A wait-and-see strategy in anticipation of such spontaneous elongation cannot be considered a valid treatment option, as the likelihood of this eventuality is very low. However, elucidating the mechanisms of spontaneous re-eruption at the cellular level would definitely be an interesting subject of basic research in dentistry. Conceivably, iatrogenic triggering of spontaneous re-eruption can provide the basis for new treatment options.

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