

Reimplantation of an Inverted Maxillary Premolar: Case Report of a Multidisciplinary Treatment Approach

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Inversion of premolars is an extremely rare condition, which usually requires extraction. This case report describes the inversion of an impacted maxillary second premolar in an 11-year-old male, and the multidisciplinary treatment approach for bringing the tooth into a normal position within the arch. In order to provide sufficient space for surgical reimplantation of the tooth, the mesially-drifted neighbouring maxillary first molar was first endodontically treated, followed by orthodontic distalization of the tooth. The inverted tooth was removed surgically and reimplanted without the use of splints for stabilization. After a 12-month follow-up period, the tooth maintained its vitality without any root resorption.

Reimplantation of impacted inverted premolars can be a viable treatment alternative to extraction

Keywords: Tooth reimplantation, impaction, premolar

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INTRODUCTION

Tooth impaction is a frequently observed anomaly of eruption in dental practice. The teeth most commonly impacted are the mandibular third permanent molars, maxillary permanent canines, and occasionally; the premolars.¹ Impaction can be horizontal, vertical, mesioangular, distoangular or inverted, the latter of which is extremely rare.²

Inversion has been defined as “the malposition of a tooth in which the tooth has reversed and is positioned upside down.”² Inverted impaction has been reported in different groups of teeth including incisors,³ canines,⁴ molars,⁵ supernumerary teeth,⁶ and most frequently; the mesiodens.⁶ Inversion of premolars is a very rare condition with only a few

cases reported in the literature.^{2,7,8}

Some of the etiological factors that may result in an inverted impaction are:⁹ (i) Systemic conditions (e.g., nutritional or endocrine disorders), (ii) Previous trauma/stimulation to the affected site during tooth growth, (iii) Abnormal location of tooth bud during the developmental stage, and (iv) Inflammation of the follicular tooth sac. Teeth which have been impacted transversely may also be further inverted by some external force.⁹

Although inverted impacted teeth may remain in position for years without clinical manifestations, many complications can be associated with such teeth, including delayed or ectopic eruption, crowding, diastema, eruption into the nasal floor, formation of primordial or follicular cysts with bone destruction, pain and swelling at the site and resorption of the adjacent root.¹⁰

If extraction is not appropriate, the other treatment approach of inverted impacted teeth is reimplantation. Careful manipulation of the root and socket, proper stabilization of the reimplanted tooth and good post-operative care are important factors to improve its success.¹¹ Andreasen *et al*¹² assessed the healing after tooth reimplantation through the monitoring of pulpal and periodontal healing as well as root development. The two most important tools in the assessment of healing appear to be radiographic examination and evaluation of pulp sensitivity.

This case report demonstrates the successful multidisciplinary treatment outcome of a rare case of an inverted impact premolar.

CASE REPORT

An 11-year-old male was referred to the Pediatric Dentistry

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clinic with a chief complaint of pain in his maxillary left first permanent molar. The medical history of the patient was non-contributory; including previous experience of trauma.

Intraoral examination showed a deep carious lesion in the maxillary left first permanent molar with a carious pulp exposure, which confirmed the patient's chief complaint (Figure 1). The tooth had drifted mesially to an extent that occupied more than one third of the eruption space of the second premolar. Periapical radiograph of the molar confirmed the clinical diagnosis of endodontic involvement, along with inversion of the second premolar (Figure 1). Following consultations with the oral surgery and orthodontics departments, endodontic therapy of the maxillary molar was initiated. Final obturation of the root canals was accomplished three weeks later, using cold laterally-compacted gutta-percha (Dentsply-Maillefer, Ballaigues, Switzerland) and AH Plus sealer (Dentsply); and the cavity was temporarily restored with resin-modified glass-ionomer cement (Vitremer, 3M/ESPE, Seefeld, Germany).

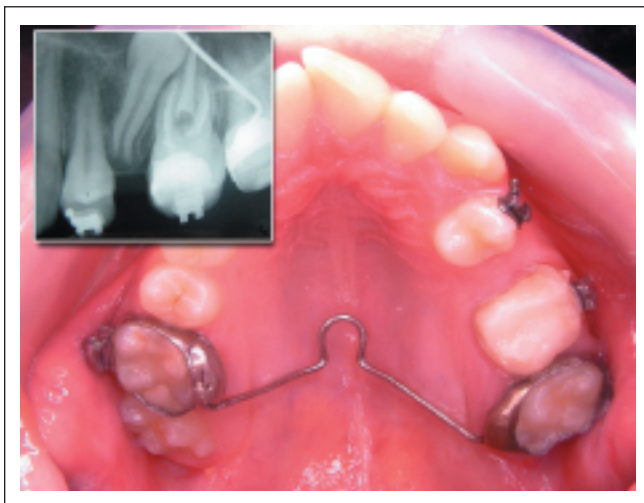


Figure 1. View of the carious maxillary molar at initial visit. Inner picture: Radiographic view of the carious molar and impact inverted second premolar.

The next two phases of the treatment plan was to create adequate space and to eventually carry the left second premolar to its normal position after reimplantation. For this purpose, initial levelling was performed with 0.16-inch Ni-Ti arch wire, followed by 0.16-inch stainless steel wire with push coil spring (NUBRYT Niti Open Coil Spring DENTSPLY GAC INTERNATIONAL, DENTSPLY INTERNATIONAL INC. USA) Following distalization, a transpalatal arch was used as an anchorage appliance (Figure 2). Space gain was accomplished in three months. Special care was paid to adjust the mesiodistal dimension of the reimplantation site, so that it would be similar or equal to the mesiodistal dimension of the inverted premolar crown¹² measured on digitized radiographs using image analysis software (ImageJ for MacOSX; V.1.34, National Institutes of Health, MD, USA).

To expose the maxillary left second premolar, a mucoperiosteal flap was elevated and the buccal cortical bone was removed surgically. The impacted tooth was found to be in an inverted position as diagnosed radiographically (Figure

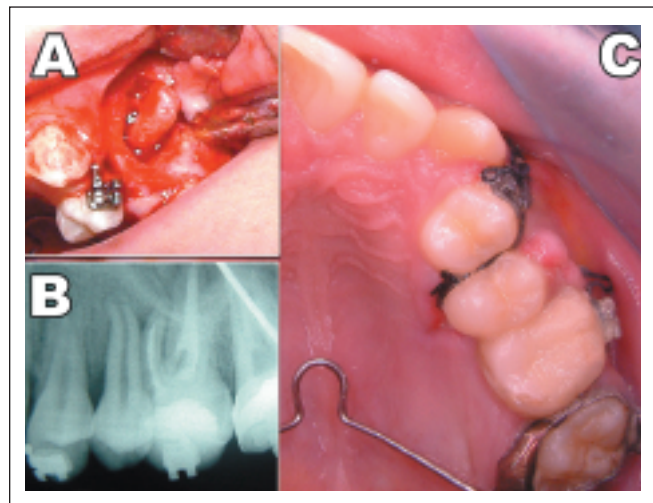


Figure 2. Preoperative clinical and radiographic view of the reimplantation site. Note the extent of space regaining.



Figure 3. A. Surgical removal of the inverted premolar. One week post-operative radiographic (B) and clinical (C) view of the premolar.

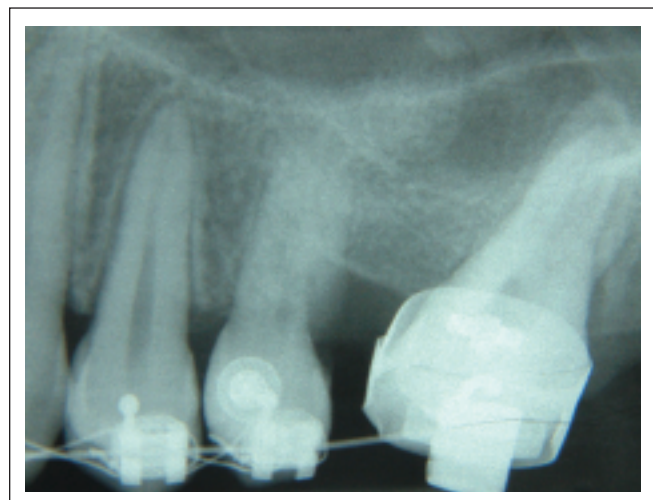


Figure 4. Occlusal and lateral view of the reimplanted premolar after 12 months.

3). Following careful removal and replantation of the inverted tooth, the mucoperiosteal flap was repositioned and sutured with a 4-0 vicryl atraumatic suture (Ethicon, Johnson & Johnson, Livingston, U.K.), and the implanted premolar was checked for occlusion. In accordance with the technique described by Akkocaoglu and Kasaboglu,¹¹ a surgical or orthodontic splint was not used for stabilisation of the tooth; since excellent initial stability of the implanted tooth could be achieved by frictional retention with the neighbouring teeth. Antibiotics and anti-inflammatory medication were prescribed, and the family was instructed to maintain a soft diet and good oral hygiene.

The sutures were removed one week later. The patient history, clinical findings and radiographic view of the tooth were all demonstrative of uneventful healing (Figure 3). The patient was recalled for clinical and radiographic examinations 2 weeks later, and then at 1, 3, 6, 9, and 12 months. The tooth was checked for occlusal discrepancies, ankylosis, mobility, inflammatory resorptions, and pulpal/periodontal involvement at each recall. The sixth-month radiograph of the tooth showed partial loss of the lamina dura.

At 12 months, the inverted left second premolar had been successfully positioned and aligned within the maxillary arch. The tooth showed an acceptable gingival contour, and absence of mobility (Figure 4). Radiographically, the tooth showed completed root formation, which reached the same length with the contralateral premolar (Figure 5). Clinically, the tooth was asymptomatic and showed normal response to vitality tests. The maxillary left first molar was extracted by the orthodontist at 10th month post-operative, due to estimation of poor long-term prognosis, and closure of the extraction site was initiated by orthodontic movement of the maxillary second permanent molar. The patient is still attending regular visits for completion of the orthodontic therapy.

DISCUSSION

While there is no standard treatment procedure for impact inverted permanent teeth, this case report shows that reimplantation can be considered as a viable alternative to extraction. It is, however, strongly recommended to inform the patient and parents about the possibility of failure. Progressive resorption of roots, ankylosis, pulp necrosis and infraocclusion are commonly reported problems after reimplantation.^{13,14}

In order to stabilize the replanted tooth, various splinting techniques including orthodontic brackets/wires, ligatures, sutures and bonded composite resins have been described in the literature.^{15,16} In the present case, splinting was not performed, since the mesiodistal dimension of the replantation site was adjusted orthodontically to conform to that of the inverted tooth crown; thereby providing good frictional stabilization with the adjacent teeth. Using this technique, Akkocaoglu and Kasaboglu¹¹ reported a success rate of 86%, which appears to be similar to the long-term success rate achieved with other splinting techniques (74-100%). Definitely, a good adaptation of the root with the recipient bone is a technical prerequisite in achieving good post-operative

success in this non-splinting technique.¹¹

The stage of physiological apical closure has also been cited as a critical factor in achieving good success rates after reimplantation. Schwartz *et al*¹⁴ reported that a reimplanted tooth with an open apex had a better chance of survival than a tooth with a closed apex. Although this might have contributed to the maintenance of pulp vitality in the present case, recent evidence shows that reimplanted/autotransplanted teeth with closed apices may also have considerably high potential of maintaining pulp vitality in the long term.^{11,17} For this reason, Andreasen and Hjorting-Hansen¹⁸ have recommended to initiate endodontic therapy only if a reimplanted tooth becomes symptomatic or when bone lesions develop, rather than relying on pulp tests, which fail to provide any information about re-establishment of vascular supply.¹⁹

According to Chamberlin and Goerig,²⁰ the success of reimplantation should be verified using the following criteria: (1) the tooth is fixed in its socket without residual inflammation (2) masticatory function is satisfactory and without discomfort (3) the tooth is not mobile (4) a pathologic condition is not apparent on the radiograph (5) the lamina dura appears normal on the radiographs (6) the tooth shows radiographic evidence of further growth of the tooth and (7) the depth of the sulcus, gingival contour and gingival colour are normal. In the present case, the clinical and radiographic findings of the 12-month follow-up period comply with those criteria with the exception of the loss of lamina dura. This finding was not unexpected, since it reflects normal biological processes in cementum and the periodontal ligament, and requires no treatment. Moreover, the loss of lamina dura did not affect the prognosis of the reimplanted premolar, including its favourable response to orthodontic forces.

The favourable clinical outcome obtained with the multidisciplinary approach described herein has shown that reimplantation of impacted inverted teeth can be a viable alternative to extraction in selected cases. Definitely, longer follow-up periods are necessary to draw strict conclusions on the long-term success of this procedure.

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