Transplantation of a tooth involved in dentigerous cyst

ABSTRACT

Case report To salvage an unerupted tooth within a dentigerous cyst, the retransplantation of the unerupted premolar involved in the dentigerous cyst was performed. In the present case a dentigerous cyst with the impacted maxillary second premolar of a 10-year-old boy was removed, because of the missing eruption after marsupialisation of the premolar 4 months earlier. Covering the crown and the one third of root, the cyst was removed from the tooth, and the premolar was retransplanted into a cavity created between the premolar and first molar in the maxilla. The tooth was fixed with resin and a twisted wire for 1 month. Two years after transplantation, the tooth responded positively to pulp vitality tests but did not move toward the occlusal line, and dental X-ray showed a lamina dura, mineralisation of the pulp cavity, no root resorption and development.

Keywords Dentigerous cyst; Transplantation.

Introduction

An impacted tooth with dentigerous cyst is usually treated by marsupialisation with or without orthodontic traction for facilitating eruption [Takagi and Koyama, 1998]. However, sometimes during marsupialisation also the tooth is removed. To salvage an unerupted tooth within a dentigerous cyst, the retransplantation of unerupted premolar involved in dentigerous cyst was performed in this report.

Case report

In a 10-year-old boy followed by a paediatric dentist the panoramic X-ray showed an unerupted left maxillary second premolar with the crown involved in a possible cystic structure (Fig. 1-A). Interestingly, a panoramic X-ray taken 20 months earlier located the tooth under a deciduous tooth without a cystic structure. Computed tomography showed the unerupted left maxillary second premolar with the crown involved in a cystic structure (Fig. 1-B). The infected deciduous tooth was removed, and a Nance holding arch was placed for space maintenance between the first premolar and the first molar for the possible eruption of the impacted tooth. Three months after extraction of the deciduous tooth, the marsupialisation and biopsy of the cyst were performed from the alveolar ridge between the premolar and first molar in the maxilla. Following biopsy the cystic...
mass was diagnosed as dentigerous cyst. However, 4 months after marsupialisation the tooth did not erupt, and an orthodontic traction was difficult to place because the tooth was deeply impacted. The dentigerous cyst with the impacted maxillary second premolar were removed under general anaesthesia 8 months after the marsupialisation. The cyst covered the crown and the one third of the root. The apical foramen was open, and measured approximately 4 mm (Fig. 2-A and B). The cyst was carefully removed from the tooth (Fig. 2-C), and the premolar was transplanted into a cavity created with a fissure bur at the alveolar ridge between the premolar and first molar in the maxilla (Fig. 2-D). The premolar was fixed with adhesive resin (Multi-Bond II, Tokuyama Dental, Tokyo, Japan) and a twisted wire (Fig. 2-E).

One month after the surgery, the fixation was removed, the transplanted tooth exhibited no tooth mobility, and the pulp vitality test performed with a dental coolant (Pulper, GC, Tokyo) was positive (Fig. 2-F). Three months after transplantation, no tooth movement toward the occlusal line was observed, a Nance holding arch was placed again, a button was fixed, and the transplanted premolar was pulled with a wire for 1 month and an elastic for additional 2 months. However, the transplanted tooth did not move toward the occlusal line. No other treatment was performed, because the parents requested no further treatment. Two years after the transplantation, the tooth was found to be positive by pulp vitality test, no further eruption was also observed, and X-ray showed a lamina dura. The pulp cavity was found to be mineralised, and no root resorption or root development were observed (Fig. 3).

Discussion

Retransplantation of unerupted tooth in dentigerous cysts was first reported by Thoma in 1956. The procedure entails removal of the cyst together with the tooth, separation of the tooth from the cyst, and simple transplantation of the tooth in the same socket [Thoma. 1956]. In our surgical procedure, the premolar which was separated from the dentigerous cyst was transplanted into a surgically prepared socket. The transplanted premolar showed a positive reaction to pulp vitality test 1 month after surgery. Skoglund et al. [1981] have reported that, in their experimental study by monitoring the oxidoreductase activity of the pulp.

![Fig. 2](A and B) Lateral view of the extracted premolar with a dentigerous cyst. The cyst covered the crown and one third of the root. (C) The extracted premolar removed from the dentigerous cyst. (D) The premolar was transplanted into a newly created socket at the alveolar ridge between the first premolar and first molar. (E) The premolar was fixed by adhesive resin with a piece of twisted wire. (F) Millar image of the transplanted premolar 1 month after surgery.

![Fig. 3](X-ray images of the transplanted premolar 8 days (A), 3 months (B), 5 months (C), and 2 years (D) after surgery.)
of transplantation teeth with incomplete root in dogs, (1) the pulp of the transplanted tooth first undergoes necrosis and (2) the dead tissue then is replaced by new tissue for 30 days after transplantation. The same authors have also reported that, in experimental study on autotransplantation teeth with incomplete root in dogs, the revascularization of the transplanted tooth occurs mainly by ingrowth of new vessels and that the process is complete after 30 days in the whole pulp [Skoglund et al, 1978]. Teeth retransplanted with incomplete and complete root formation showed 96% and 15% pulp healing, respectively. The apical foramen diameter of tooth above 1 mm is known to present a low risk for pulp necrosis [Andreasen, et al., 1990a]. In this study, the apical foramen diameter was approximately 4 mm. The pulp cavity of the transplanted premolar gradually showed an unusual mineralisation, and no closure of the apical foramen or root development were observed. Andersson et al. have reported that, in an experimental study on autotransplantation of monkey teeth, at the percussion the sound is characteristically sharp (it is usually dull in sound teeth) in all teeth and no mobility is present when more than 20% of the root surface is ankylosed [Andersson, et al., 1984]. In this case, the percussion of the transplanted tooth significantly showed no sharp sound, and a slight tooth mobility was observed. Moreover, the radiographic findings showed a lamina dura and no root resorption, suggesting that the transplanted tooth had no clinical evidence of tooth ankylisis. Although an impacted tooth with dentigerous cyst has the ability to erupt [Takagi and Koyama, 1998], in this case no eruption to the occlusal line and no complete root formation were observed. There is a close correlation between eruption and development of teeth roots [Marks and Schroeder, 1996]. The possibility of arrest of root formation due to trauma to the Hertwig’s epithelial root sheath (HERS) has been shown in an experimental study [Andreasen, et al., 1988]. In this case, the vitality of HERS of the transplanted tooth might be influenced by a delayed revascularisation and inadequate nutrition after transplantation, because the transplanted tooth was located in the cavity of the cyst removed.

Based on the present report, the following procedure can be proposed:

1) odontogenic tumor should be ruled out;
2) the root of the tooth should be without damaged HERS to prevent ankylosis and root resorption after transplantation [Andreasen, et al., 1990b],
3) and adequate space for the transplanted tooth should be created by means of suitable devices such as a Nance holding arch,
4) to protect the root formation and eruption of the transplanted tooth (to protect the vitality of HERS), the socket for transplantation should be created the adequate size [Andreasen, et al., 1988].

Although no eruption was observed in this case, a multi-bracket treatment might have been able to encourage tooth eruption. The procedure described above may become an effective salvage surgical technique for treating impacted teeth in dentigerous cysts.

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References