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Case Report

Use of hydroxyapatite in tooth replantation radiographically followed up for 14 years: a case report

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Abstract – A lateral incisor was replanted 4 h after trauma. The tooth subsequently developed external root resorption treated with calcium hydroxide initially and with a hydroxyapatite root filling subsequently. Radiographs of the replanted tooth were obtained to follow up the patient for 14 years.

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Key words: tooth avulsion; tooth replantation; external root resorption; hydroxyapatite

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Tooth avulsion, the full exarticulation of a tooth from its alveolar socket, is a dental emergency that often affects the anterior teeth and is more frequent in children. The success of replantation greatly depends on when and how this procedure is performed (1). One of the most frequent complications after replantation is root resorption. The root surface of the avulsed tooth is damaged, and such damage is a chemotactic factor for resorptive cells (2). Resorption is significantly associated with the stage of root development, extra-alveolar tooth storage and length of time the tooth is kept out of the alveolar socket (1). Root resorption does not have any distinguishing clinical features, and, therefore, its diagnosis is based on radiographs of the resorptive cavity (3,4). As treatment success depends on an early diagnosis (5), several diagnostic methods have been studied (5–7). Dentin changes are usually subtle and become evident on radiographs obtained longitudinally (8). As soon as resorption is diagnosed, treatment should be initiated and directed towards the removal of the stimulus that triggers and maintains the process (9). Adequate endodontic therapy may control inflammatory root resorption, but no efficient treatment for replacement resorption has been established so far.

The purpose of this study is to report on a case of a tooth replanted 14 years ago, which developed external root resorption and was treated with hydroxyapatite (HA) root filling.

Case report

A male patient, F.P., an undergraduate student in Dental School, was asked about a slight hardening in his upper lateral incisor. According to his clinical records, he reported that in August 1990, when he was 12 years old, he suffered trauma to his maxillary teeth with avulsion of the maxillary right lateral incisor. He was taken to a hospital for treatment of several injuries. Four hours later, he was taken to the family dentist's office, where the tooth was replanted and splinted (Fig. 1). Before replantation, the tooth was stored dry. Radiographic follow-up at

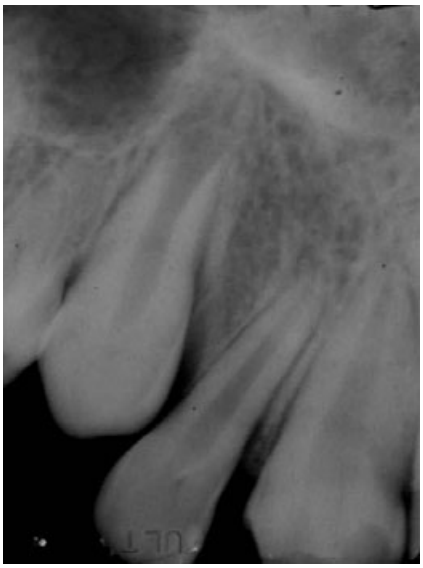

Fig. 1. Radiograph of replanted tooth in August 1990.

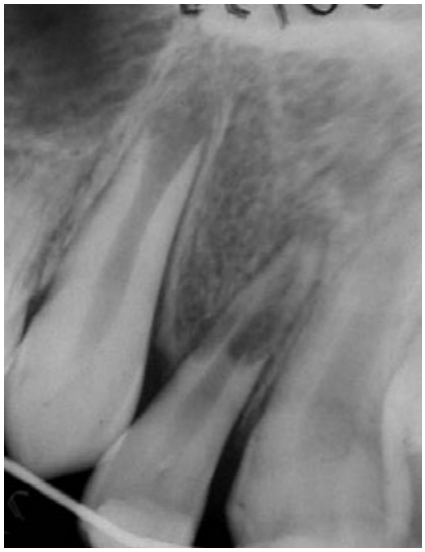

Fig. 2. Radiograph taken on November 11, 1990, external root resorption.

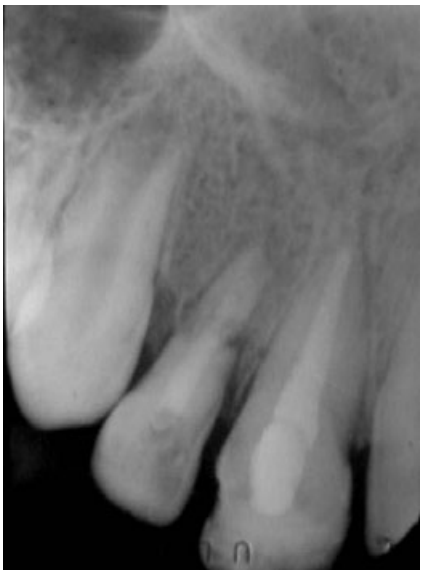

Fig. 3. Radiograph taken at 4 months (December 18, 1990). Use of hydroxyapatite.

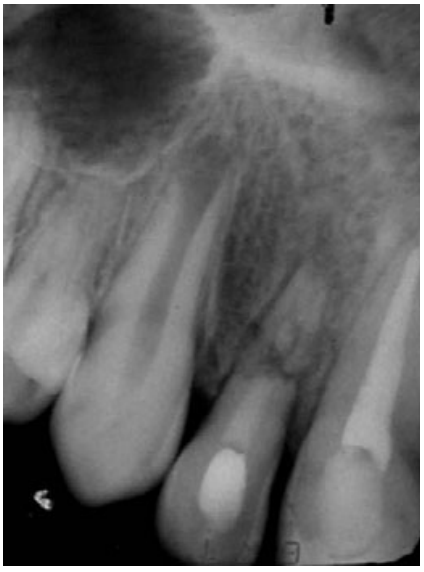

Fig. 4. Radiograph taken 7 months after replantation (March 1991).

15 and 30 days after replantation did not detect resorption. The patient returned to the office only 65 days after replantation, and radiographic examination revealed extensive external root resorption (Fig. 2). The dentist treated it with three applications of calcium hydroxide, with changes every 10 days. However, results were not satisfactory, and resorption progressed rapidly. After obtaining family consent, the dentist used fine-grained HA canal filling on December 12, 1990, in an attempt to save the tooth. According to the dentist's report, calcium hydroxide paste was removed and the canal was irrigated. HA was mixed with lincomycin and introduced into the canal with a plastic amalgam carrier. The same dentist has followed up the case clinically and radiographically for 14 years (Fig. 3–10).

Discussion

In this case, the tooth was kept dry and out of the alveolar socket for a long time, which, according to Andreasen & Andreasen (10), would alone be an indication for treatment to prevent resorption. HA filling was applied in the canal 4 months after

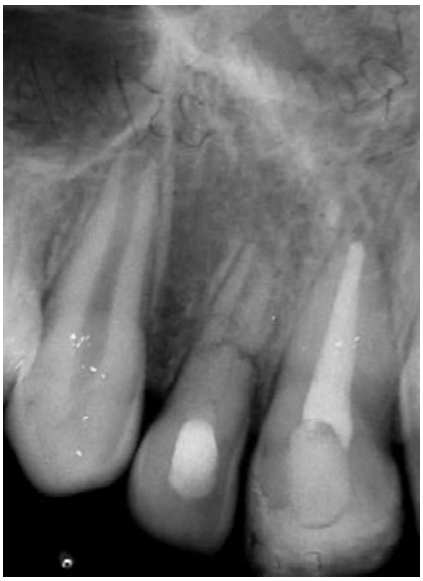

Fig. 5. Radiograph taken in March 1992.

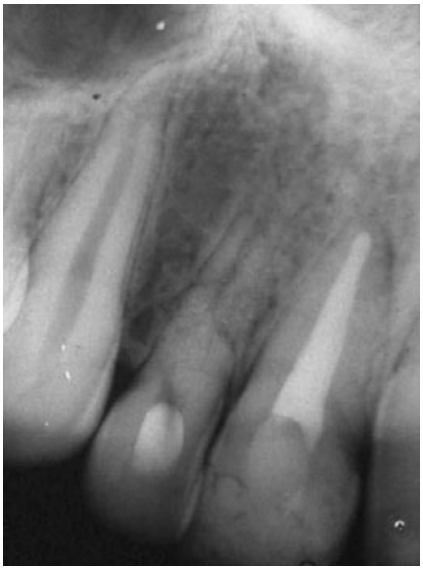

Fig. 6. Radiograph taken at 4 years (November 94).

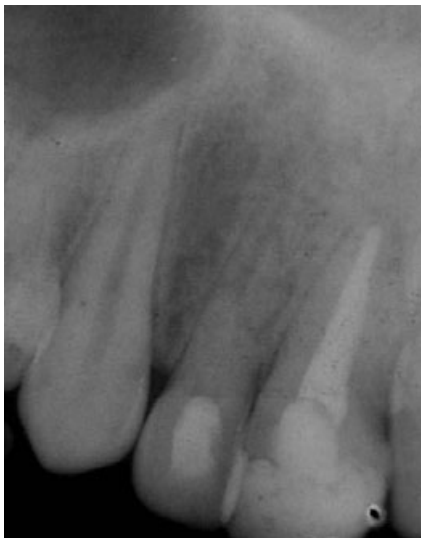

Fig. 7. Radiograph taken at 6 years (July 1996).

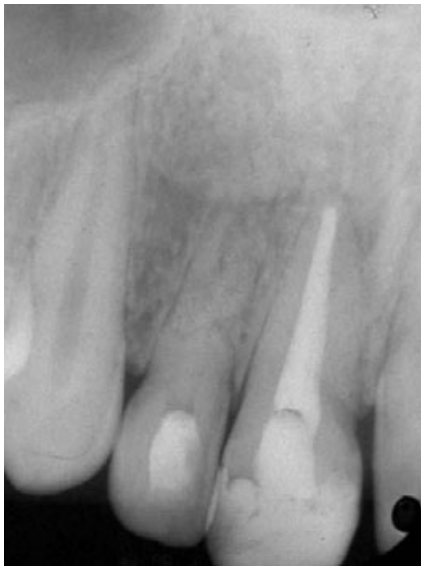

Fig. 8. Radiograph taken at 9 years (May 1999).

replantation (Fig. 3; December 18, 1990). Radiographs seem to indicate loss of material in the apical third of the root (Fig. 4; March 25, 1992); the periodontal ligament can be visualized. A follow-up radiograph revealed a root fracture. Ten months later HA was applied again. Follow-up radiographs in subsequent years showed the periodontal ligament, and revealed that the root outline changed, probably because of the fracture or obturating material extravasation. The extensive damage to the ligament, replantation trauma and the long splinting period are factors that seem to have contributed to the occurrence of replacement resorption, but a definite evaluation is difficult to make. According to Barrett & Kenny (11), ankylosis is difficult to identify by means of radiographs because of overlapping structures and medullary spaces. Moreover, the periodontal ligament can be seen around the root even when root form and outline are changed.

HA is a biocompatible, osteoconductive material primarily used for bone reconstruction (12). Recent studies (13) with cultured human gingival fibroblasts found that HA promotes cell growth and fibroblast metabolism as well as collagen synthesis, and hence is perfectly biocompatible. HA has also been used as a pulp-capping agent and in pulpotomies (14, 15), but no reports of its use in cases of external

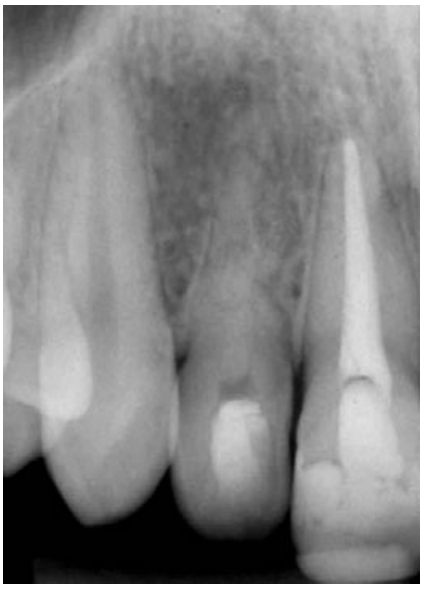

Fig. 9. Radiograph taken at 12 years (September 2002).

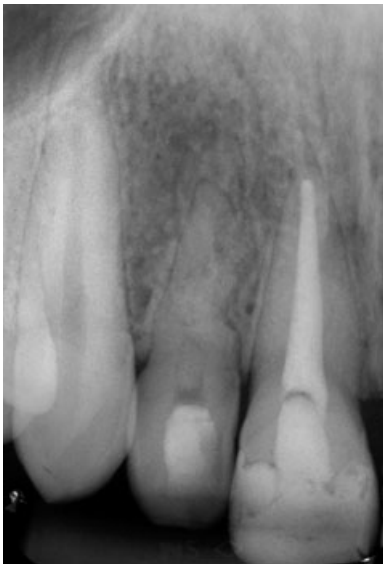

Fig. 10. Radiograph taken in June 2005.

resorption were found in the literature. The problems raised by the use of HA, such as the need for subsequent endodontic therapy or ethical issues, were not the focus of this case report. It is important to point out, however, that the patient is satisfied with the fact that his tooth has been preserved for 14 years. The purpose of this case report, rather than to prescribe the use of HA in the treatment of external root resorption, is to raise important questions that suggest the need for further studies in this area.

References

1. Andreasen JO. reimplante e transplante de dentes. São Paulo: Panamericana; 1993.
2. Tronstad L. Root resorption – etiology, terminology and clinical manifestations. Endod Dent Traumatol 1988;4:241–52.
3. Andreasen FM, Sewerin I, Mandel U, Andreasen JO. Radiographic assessment of simulated root resorption cavities. Endod Dent Traumatol 1987;3:21–7.
4. Chapnick L. External root resorption: an experimental radiographic evaluation. Oral Surg Oral Med Oral Pathol 1989;67:578–82.
5. Hintze H, Wenzel A, Andreasen FM, Sewerin I. Digital subtraction radiography for assessment of simulated root resorption cavities. Performance of conventional and reverse contrast modes. Endod Dent Traumatol 1992;8:149–54.
6. Nance RS, Tyndall D, Levin LG, Trope M. Diagnosis of external root resorption using TACT (tuned-aperture computed tomography). Endod Dent Traumatol 2000;16:24–8.
7. Ericson S, Kurol J. Incisor root resorptions due to ectopic maxillary canines imaged by computerized tomography: a comparative study in extracted teeth. Angle Orthod 2000;70:276–83.
8. Kravitz LH, Tyndall DA, Bagnell CP, Dove SB. Assessment of external root resorption using digital subtraction radiography. J Endod 1992;18:275–84.
9. Ne RF, Witherspoon DE, Gutmann JL. Tooth resorption. Quintessence Int 1999;30:9–25.
10. Andreasen JO, Andreasen FM. Traumatismo dentário. São Paulo: Panamericana; 1991.
11. Barrett EJ, Kenny DA. Avulsed permanent teeth: a review of the literature and treatment guidelines. Endod Dent Traumatol 1997;13:251–9.
12. Puricelli E. Avaliação histológica de implantes de hidroxiapatita em defeito ósseo alveolar dentado em humanos: relato de caso. Rev Fac Odontol 2002;43:34–6.
13. Ruano R, Jaeger RG, Jaeger M. Effect of a ceramic and a non-ceramic hydroxyapatite on cell growth and procollagen synthesis of cultured human gingival fibroblasts. J Periodontol 2000;71:540–5.
14. Yoshimine Y, Maeda K. Histologic evaluation of tetracalcium phosphate-based cement as a direct pulp-capping agent. Oral Surg Oral Med Oral Pathol 1995;79:351–8.
15. Jaber L, Mascres C, Donohue WB. Reaction of the dental pulp to hydroxyapatite. Oral Surg Oral Med Oral Pathol 1992;73:92–8.