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Case Report

Multidisciplinary Management of an External Communicating Resorption Caused by the Ectopic Eruption of a Maxilar Canine

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Abstract

Root resorption is the decomposition, destruction and subsequent loss of the dental root structure. Root resorption caused by odontoclasts during the exfoliation of the deciduous teeth is a natural process that leads to the eruption of the permanent teeth. However, resorption can also occur in the permanent dentition due to trauma, excessive occlusal load, cysts, tumors, orthodontic treatments and ectopic eruption of adjacent teeth. Taking as a reference the properties of the MTA, Biodentine (Septodont, Saint-Maur-des-Fosses, France) was developed, a material based on calcium silicate, which may be a valid option since it acts as a substitute for dentin, of antibacterial action, of which no cytotoxicity, genotoxicity or mutagenicity have been reported. When compared to the MTA it presents better physical and biological properties, better handling, fast setting time, greater resistance to compression, early synthesis of reparative dentin. Its powdered components are tricalcium silicate, dicalcium silicate, and calcium carbonate as filler and zirconium oxide acting as radiopacifier, on the other hand, the liquid component contains calcium chloride, water and a reducing agent. In the present case we describe the multidisciplinary management of external communicating resorption of the left upper lateral incisor, caused by the ectopic eruption of the left upper canine, by using Biodentine as a sealant of the sequel, orthodontic replacement within the work plan designed in a timely manner and the subsequent rehabilitation with a fiberglass post and light curing resin.

Keywords: *Endodontics; Biodentine; Bioceramic; Ectopic Growth; Root Resorption; Orthodontics*

Introduction

Root resorption is the decomposition, destruction and subsequent loss of the dental root structure. Root resorption caused by odontoclasts during the exfoliation of the deciduous teeth is a natural process that leads to the eruption of the permanent teeth. However, resorption can also occur in the permanent dentition due to trauma, excessive occlusal load, cysts, tumors, orthodontic treatments and ectopic eruption of adjacent teeth [1].

The ectopic eruption is defined as an abnormal position of the tooth, which alters its eruptive trajectory and can lead to its impaction against an adjacent tooth. After the third molars, the canines are the teeth that present the most anomalies in their eruption path. Being trapped in the bone can produce complications such as displacement of the teeth, loss of vitality of the adjacent incisors, shortening of the dental arch, formation of follicular cysts, canine ankylosis, recurrent infections, recurrent pain, internal resorption, external resorption of the canine and adjacent teeth, or combinations of these factors [2].

The prevalence of ectopic eruption of maxillary canines is 1 - 3%, it is more frequent in women than in men, and it has been reported that 50% of the cases of root resorption of the maxillary lateral incisors and maxillary central incisors occur as an adverse effect [2]. The canine, the maxillary lateral incisors and maxillary central incisors are located in an area of high aesthetic and functional demand, so it is important to carry out an early diagnosis and an early intervention, which allow us to generate therapeutic strategies that can improve the

prognosis of affected parts and minimize possible sequels. The root resorption of the lateral incisor can be diagnosed radiographically at an early stage, but the process of resorption can remain asymptomatic, even in cases in which the pulp is affected [3]. When it is diagnosed at an advanced stage, the treatment and prognosis are so complex that can be able to lead to the extraction of the affected tooth.

For the sealing and restoration of root resorption, various materials have been used, such as: calcium silicate-based cements such as mineral trioxide aggregate (MTA), glass ionomer cement, calcium enriched mixture, etc. The MTA (ProRoot MTA, Dentsply, Tusa, OK USA) developed by Torabinejad and Contributors, is a bioactive material that since the early nineties has been used for various applications in endodontics. The MTA is indicated to restore defects of internal and external resorptions, horizontal root fractures, sealing of perforations, pulp therapy in permanent and deciduous teeth, apical sealing of the root canal in teeth with mature and immature apices. It has been shown that MTA is biocompatible, stimulates mineralization and promotes crystalline deposits similar to apatite [4,5].

TTaking as a reference the properties of the MTA, Biodentine (Septodont, Saint-Maur-des-Fosses, France) was developed. A calcium silicate based material, which may be a valid option since it acts as a substitute of dentin, for its antibacterial action and no reported cytotoxicity, genotoxicity or mutagenicity. When compared to the MTA, it presents better physical and biological properties, better handling, fast setting time, greater resistance to compression and early synthesis of reparative dentin. Its powdered components are tricalcium silicate, dicalcium silicate, calcium carbonate as filler and zirconium oxide as a radioopacifiant; on the other hand, the liquid component contains calcium chloride, water and a reducing agent [6-10].

In the present case we describe the management of external root resorption with of the left maxillary lateral incisor caused by the ectopic eruption of the left maxillary canine, by using Biodentine as a sealant for the radicular sequel, and the subsequent rehabilitation of the tooth with a fiberglass post and light curing resin.

Clinical Case Report

Female patient, 12 years old, ASA I. The patient was referred by a pediatric dentist. Radiographically the tooth 1.3 is retained intraosseous, impacted on the distal area of the root of the tooth 1.2, generating an external root resorption that communicate with the root canal. Also is observed the periodontal ligament of tooth 1.2 slightly thickened (Figure 1). Clinically, the tooth 1.3 is not present and tooth 1.2 is asymptomatic, which respond positively to both heat and cold sensitivity tests and negative to percussion and palpation.

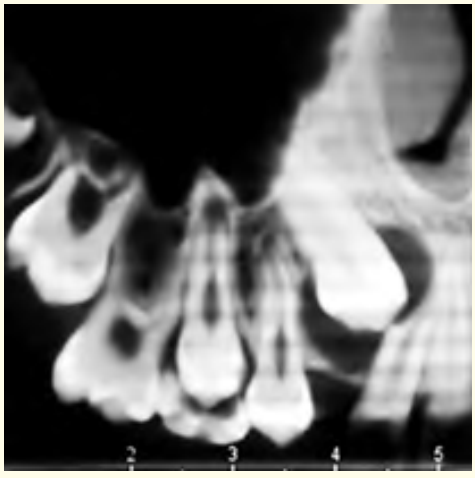


Figure 1: *Initial tomography.*

The following diagnoses were made: Tooth number 1.2: vital pulp with external root resorption that communicates the periodontium with the pulp tissue, and tooth number 1.3: impacted in the distal middle third of the root of tooth 1.2, being retained by it intraosseously in the maxilla.

A multidisciplinary Treatment Plan was proposed. The objectives of this proposal are firstly the cleaning, shaping and sealing of the root canal system, the sealing of the perforations in the root and later, positioning the tooth 1.3 inside the dental arch and thus return the functionality to it. We divide it into the following stages:

1. Surgical resorption approach.
2. Biopulpectomy of the tooth 1.2.
3. External resorption surgical sealing.
4. Rehabilitation of tooth 1.2.
5. Orthodontic traction of tooth 1.3.

The maxillo-facial surgeon following the previously established work plan, begins anesthetizing the area with an infiltrative technique, to subsequently make a Newman-type flap by distal of the tooth 1.4 to mesial of the tooth 1.1, accessing and clearing the area of resorption for further treatment (Figure 2).

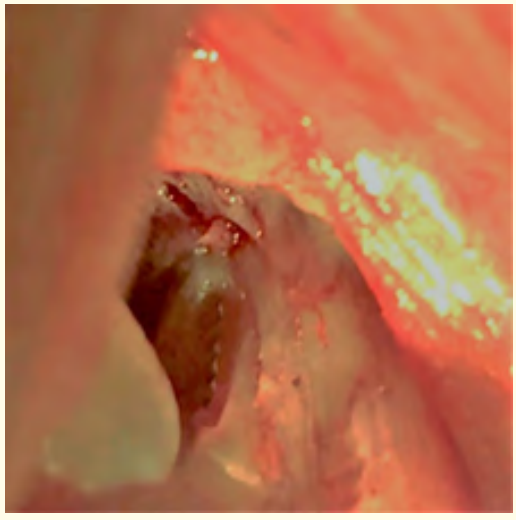


Figure 2: *Surgical access to the reabsorption zone, where the passage of the file is observed.*

Then the endodontist, previous absolute isolation, performs the endodontic access from the palatal surface of the tooth 1.2, linking the apical and cervical third through the external root resorption as shown in Figure 2. The root canal was prepared chemically and mechanically, with the Protaper Next (Dentsply-Maillefer rotary system, Ballaigues, Switzerland), and was irrigated with negative apical pressure technique with abundant 2.5% sodium hypochlorite. Then the root canal was dried with sterile paper tips and the apical third was sealed with a single cone technique (guttapercha 6%) and BioRoot (Septodont, Saint-Maur-des-Fosses, France), a bioceramic sealer. Then the gutta-percha cone was cut in the apical third with the Touch and Heat system (EIE / Analytic, Redmond, WA, USA) (Figure 3).

(a)  (b) 

Figure 3: *(a) Removal of the nerve bundle package, demonstrating that the dental organ is vital. (b) Odontometry.*

In this way, through the surgical access, the apical third of the canal is sealed, dedicating efforts to reconstruct with Biodentine the defect caused by cemental resorption (Figures 4 and 5).

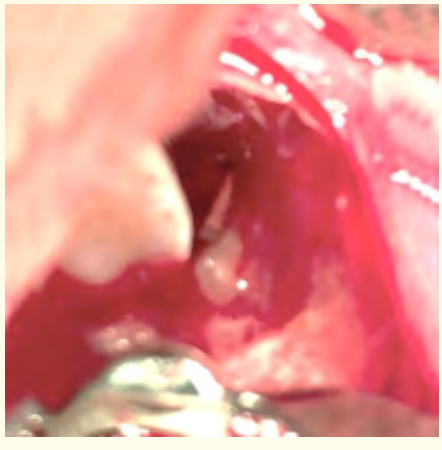
(a)  (b) 

Figure 4: *(a) Conometry (b) BioRoot RCS cement from Septodont.*

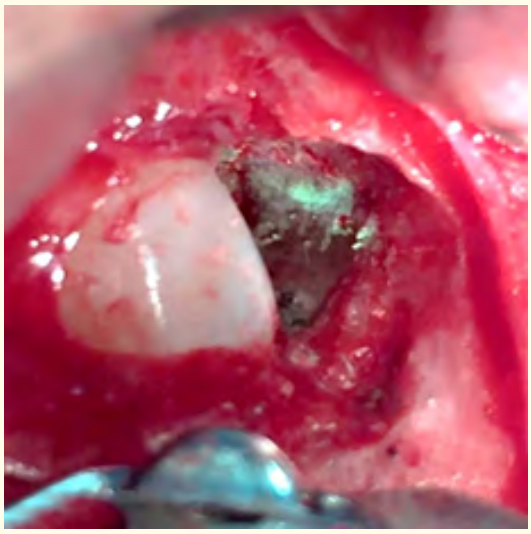
(a)  (b) 

Figure 5: *(a) Sealing external resorption. (B) Biiodentine employee.*

Once the defect is reconstructed, the remaining thirds and endodontic access are rehabilitated, cementing a fiberglass post (Relyx Fiber Post of 3M ESPE), with cement (RelyX U200), acid etching (3M ESPE Scotchbond) and adhesive (3M) ESPE Single Bond Universal) with light curing resin (Filtex Z350 XT from 3M ESPE), providing the tooth with the necessary flexion to rejoin the stomatognathic system without problems (Figure 6).

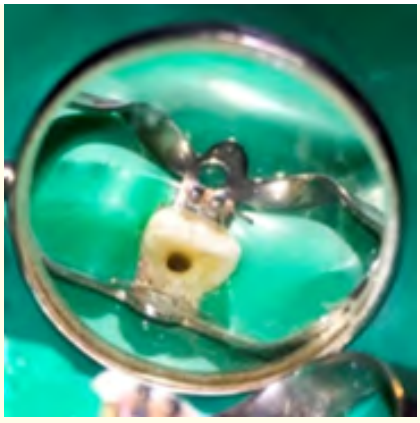
(a)  (b)  (c) 

Figure 6: *(a) Canal preparation for rehabilitation (3M ESPE Scotchbond acid et bonding Single Bond Universal), (b) Relyx Fiber Post fiber post test, (c). Placement of 3M Filtex Z350 XT resin ESPE.*

Finally, the orthodontist intervenes, placing the additives to begin with the orthodontic surgical displacement? of the tooth 1.3 towards the corresponding place in the arch, following the initial planning (Figure 7).

(a)  (b) 

Figure 7: *(a) Placement of the abutments and (b) reposition of the flap.*

By way of summary in Figure 8 the radiographic evolution of the case is shown. (Fig 8a) Initial X-ray, where it could be presumed that the cemental resorption communicated the periodontium with the pulp canal. (Fig 8b) Immediate postoperative, the apical third and the obturation of the external cemental resorption are observed and (Fig 8c) control a year after surgery, the sealing of the canal of the apical third, the repair of the bone tissue and finally the displacement of the canine in process.

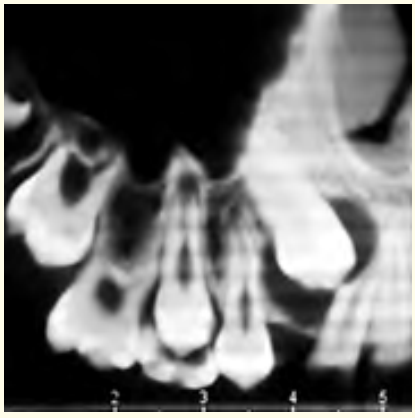
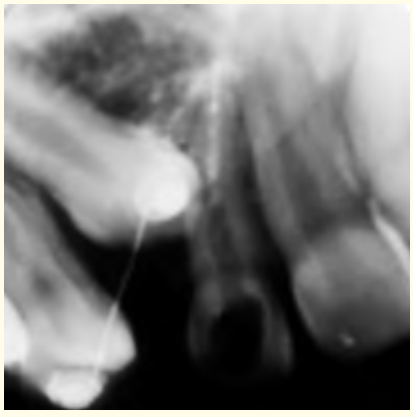
(a)  (b)  (c) 

Figure 8: *(a) Initial radiography. (b) Immediate postoperative radiography and. (c) X-ray of the control per year.*

The favorable evolution was observed in the last clinical and radiographic control completed 2 years after the surgical therapy (Figure 9). Both teeth involved are asymptomatic and fully functional.

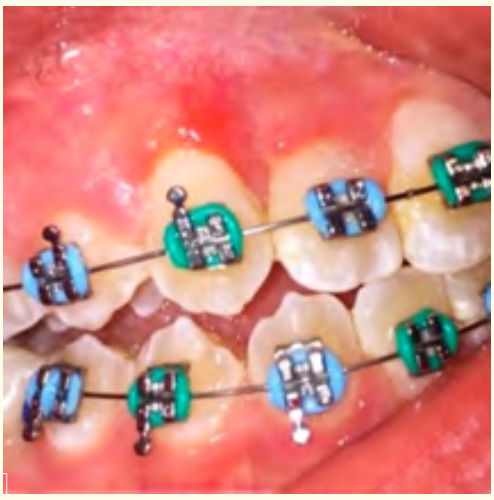
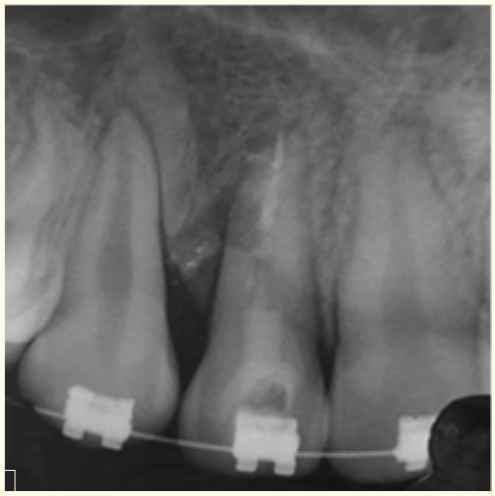
(a)  (b) 

Figure 9: *(a) Clinical control and (b) radiographic after 2 years of surgical therapy.*

Discussion

The treatment of cemental resorption generates, until today, different opinions among endodontists, orthodontists, rehabilitators, implantologists, clinicians and scientists [4,7,9,11,12].

Local and general factors are related to the impact of maxillar permanent canines and to the resorption that this causes, such as; traumatisms, prolonged retention or premature loss of the primary canine, agenesis or alteration in the form of lateral incisors, chronic inflammation of the pulp, periodontal tissues or both, abnormal position of the dental germ, localized pathology such as cysts, neoplasms, odontomas and supernumeraries, ankylosis , idiopathic origin, slow-growing tumors such as giant cell tumors, osteosclerosis and other fibro-osseous lesions, iatrogenic, naso-respiratory problems, variation in the size of the tooth root, variation in the time of root formation, sequence of abnormal eruption, systemic diseases (hyperparathyroidism), narrow arch form, immune factors and inheritance [2,13,14].

It is very important to foresee when there will not be enough space in the arch for the eruption of the permanent teeth, since the pressure of them with others, will cause in a not lesser percentage, some degree of resorption that can lead to tooth loss. The treatment plan that will be carried out in a tooth that has a communicating root resorption is very different from that in which this communication with the pulp tissue is not present (15). The biological consequences are diametrically different, being the first, the worst prognosis. Since it is not possible to treat only the communicating root resorption without producing a significant damage in the pulp tissue, it is mandatory to plan a joint endodontic treatment. However, on the root resorption that do not communicate the periodontium with the endodontium, only a surgical approach is necessary, allowing the pulp to remain healthy and unscathed.

The planning and consensus among the different professionals that should intervene in the treatment of these pathologies, is a challenge. Moreover, when a few years ago, the dentist was confined to his practice trying to perform all procedures without any collaboration. Currently this type of thinking would be untimely because the multidisciplinary work is indicated so that each specialist develops the treatment of their specialty, providing the patient with the quality of their treatment and the opportunity to keep the teeth in the mouth, functional and healthy.

Surgical access to address the area of resorption is well described in the literature and depending more on the clinical or anatomic characteristics of the area to be treated, there are no major discrepancies [16-19]. These discrepancies begin when we start the endodontics and we must decide, hypochlorite concentration, type and last file used, filling technique and material with which we will reconstruct the reabsorbed area [20]. Finally, the biggest question, will this therapy succeed?

Regarding irrigation, by using hypochlorite at lower concentrations, its effects will be lower, being able to compensate with a frequent and abundant replacement of it [21-24]. Therefore we could use 1.5% hypochlorite; 2.5% or 5.25% and get similar results. Regarding the last instrument to be used, it is well documented that the larger the diameters used, the greater the number of microorganisms removed, allowing an adequate cleaning with sodium hypochlorite thanks to the access with irrigation and suction tips [25-27]. In this case, in which the reabsorption occurs on the external surface of the root at the level of the curvature in the apical third, there are anatomical and physical characteristics that prevent a common irrigation as that anatomically normal canals have accustomed us. For this, it was chosen to clean the root canal in two portions. One, from the cameral access to the cervical edge of the reabsorption (extra surgical portion) and the second, from the apical end of the reabsorption to the apex (intra-surgical portion). On both occasions, the irrigation technique with negative apical pressure was used to minimize the possibility of extravasation of the irrigant to the periodontium [23,28,29].

Considering the previously described and thanks to the location of the resorption and anatomy of the root, it was possible to use the Protaper Next rotary system to shape the canal. Properly protecting the alveolus from the inclemency of the different materials used, it was decided to seal the canal with the use of a single gutta-percha cone with increased taper, cemented with a bioceramic-based cement such as BioRooth CRS, to be subsequently cut with the Touch and Heat system. In this way, we seal the apical third and dedicate ourselves to reconstruct the space left by the resorption.

Again we find different opinions about the material to be used for this purpose [7,9,12,30]. With the advent of bioceramics, taking advantage of the fact that the canal was sealed with a cement with the same chemical characteristics, it was decided to seal the resorption with another bioceramic material, Biodentine. This one has ideal chemical and physical characteristics, which makes it the material of choice, durable, with a flexion index like the dentine, with an adequate setting time, biocompatible and bioactive, among other characteristics [6-10].

Once the defect caused by the resorption was reconstructed, it was decided to rehabilitate the remaining thirds and the endodontic access, cementing with a fiberglass post and nanoparticle resin, providing the tooth with the flexion, resistance and aesthetics needed to reincorporate it to the stomatognathic system without problems.

Conclusion

There will always be criteria to take into account to decide the clinical procedures in these therapies. However, there is no conclusive study that supports a single treatment that gives us success without exception in all cases. On the other hand, if there is scientific evidence that would support each of the steps we carry out separately, leaving in us, the commitment to fill those missing spaces, rigorously complying with the different protocols and deciding in each case, the most appropriate to follow.

The discovery of these traumatic sequelae is always a radiographic finding with clinical clues, therefore it is important to prevent and avoid adverse sequelae. For this purpose, a protocol for timely review should be implemented, including radiographic follow-up, assessments of abnormal anatomical features such as the absence of canine eminence, among others.

Last, but not least, remember the importance of forming multidisciplinary work teams that provide the vision of each of the specialties in decision making in cases of high complexity.

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