Type III dens invaginatus in a mandibular incisor: a case report of a conventional endodontic treatment

C.C. Monteiro-Jardel,a Flávio R.F. Alves,b Rio de Janeiro, Brazil

ESTÁCIO DE SÁ UNIVERSITY

This article presents one of the few reported cases of endodontic treatment of class III dens invaginatus involving mandibular incisor. Due to invagination extending through the root, supposedly communicating laterally with the periodontal ligament space through the pseudoforamen, this case was classified as Oehlers type IIIA. The periradicular radiolucency was evident around the root apex with 5.0 × 3.0 mm diameter. The conventional chemical and mechanical preparation with hand files and 2.5% sodium hypochlorite combined with intracanal dressing with calcium hydroxide for 6 weeks was able to promote the regression of lesion noted at 1-year follow-up. This case reinforces the precept that knowledge about the biologic aspects of endodontics combined with adherence to technical standards are able to resolve complex cases without the need of additional resources. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011;111:e29-e32)

An appropriate definition for dens invaginatus was presented by Hülsmann1 and adapted by Alani and Bishop2: “a developmental anomaly resulting in a deepening or invagination of the enamel organ into the dental papilla before calcification of the dental tissues.” It is a rare malformation of the teeth, showing a broad spectrum of morphologic variations in size and form of the crowns and roots. Radiographically, it presents infolding of enamel and dentin.1 The most frequently affected tooth is the permanent maxillary lateral incisor.1 Of the affected teeth, 90% are lateral incisors.2

The etiology of this malformation remains controversial, and the literature suggests some possibilities: stimulation and subsequent proliferation and ingrowth of cells of the enamel organ into the dental papilla; retardation of a focal group of cells, with those surrounding continuing to proliferate normally during dental development; external factors (external forces, trauma, and infection); and genetic factors.2

Three invagination categories were proposed by Oehlers3 to separate the different types of dens invaginatus by the radiographic appearance of invagination: type I: minimal invagination, enamel lined, confined within the crown of the tooth and does not extend beyond the level of the external amelo-cemental junction; type II: enamel lined, extends into the pulp chamber but remains within the root canal with no communication with the periodontal ligament; type IIIA: extends through the root and communicates laterally with the periodontal ligament space through a pseudoforamen, usually no communication with the pulp, which lies compressed within the root; type IIIB: extends through the root and communicates with the periodontal ligament at the apical foramen, usually no communication with the pulp.

Teeth with dens invaginatus are more prone to caries, because of deductions created as a result of altered morphology of the crown. In cases in which the bacterial invasion has reached the pulp and necrosis is established, endodontic treatment may be difficult, especially in type III invaginations because they are more complicated. Depending on the case, the endodontist may limit the endodontic therapy to the invaginated portion, preserving pulp vitality when there is no communication of the invagination with the pulp,4,5 or perform endodontic treatment in both the invagination and the root canal6-8 when the cavities communicate. In these complex cases, the first challenge is location of root canal openings, owing to the limited access. In nonsurgical endodontic therapy, the complete debridement of the root canal system is also compromised. Some areas may be completely untouchable by instrumentation and not sealed by root filling material. If nonsurgical endodontic therapy fails, a combined approach with apical surgery may be indicated.9

The present case report describes the nonsurgical treatment of a periapical lesion associated with type III dens invaginatus with conventional technique, intracanal dressing with calcium hydroxide, and finally filling with gutta-percha and root canal sealer.
A 42-year-old woman was referred by her dentist for endodontic treatment of the mandibular left lateral incisor. The patient’s medical history was noncontributory. On clinical examination, the endodontist found an anomaly of the crown, with a conical morphology. The soft tissues around the tooth were free of pathologic signs. Vitality tests showed no response to cold (ice stick) or heat (heated gutta-percha) application. The patient was asymptomatic. Periapical radiographic examination confirmed the diagnosis of dens invaginatus by a radiolucent pocket surrounded by a radiopaque enamel border in the crown. The invagination extended through the root, supposedly communicated laterally with the periodontal ligament space through a pseudo-forsamen, as a “pseudocanal,” and apparently did not communicate with the “normal canal” (Fig. 1, A and B). Owing to these characteristics, the invagination was classified as Oehlers type IIIA.3 A periradicular radiolucency was evident around the root apex. The lesion diameter was 5.0 × 3.0 mm.

At the first visit, the pulp chamber of the “normal canal” was opened with a spheric diamond bur (1013; KG Sorensen, Cotia, Brazil) and a safe-tipped diamond bur (3083; KG Sorensen). This canal was irrigated with 2.5% sodium hypochlorite and explored with K-file #10 (Dentsply/Maillefer, Ballaigues, Switzerland). After this, the invagination was opened and the “pseudocanal” explored in a similar way. At the end of preparation, the same access cavity allowed the viewing of 2 canals. After this step, Gates-Glidden burs #1 to #4 in order of increasing diameter were used to open up the cervical and middle thirds of the “normal canal” and “pseudocanal” to 5 mm short of the root length. A 2.5% sodium hypochlorite solution was used for irrigation and renewed at each change of instrument. The pulp space was dressed with formocresol on cotton and closed.

At the second visit, after 7 days, the chemical and mechanical preparation was completed using the crown-down technique proposed by Fava10 with nickel-titanium hand files in the “normal canal,” creating an apical stop with a #55 file, and with stainless steel files in the “pseudocanal,” supplemented by instrumenting the walls with a Hedström file #40. The length of work in both canals was set to 2 mm beyond the radiographic apex, and the remaining apical portion was intensely explored with stainless steel K-files (#20) during preparation. Smear layer was removed through irrigation with EDTA for 3 minutes in both canals, followed by application of 2.5% sodium hypochlorite for 1 minute. The 2 canals were dried and an intracanal dressing with a slurry of calcium hydroxide in distilled water was applied with a Lentulo spiral. This medication remained in the canals for 21 days and was then reapplied for another 21 days.

At the last visit, the root canal filling was performed after removal of intracanal dressing and a rinse with EDTA for 3 minutes, followed by rinsing with saline and drying with absorbent sterilized paper points. The root canals were filled with cold laterally compacted gutta-percha and Sealer 26 (Dentsply, Petrópolis, Brazil; Fig. 1, B).

One year after treatment, the patient was reexamined. There was no significant change either in the treated tooth or in the adjacent soft tissues. The patient was...
asymptomatic and did not report postoperative pain. Periapical radiographic examination obtained during retreatment of the adjacent incisor, revealed reduction the diameter of the lesion, now with discrete radiolucency (Fig. 1, C). The patient was no longer available for further recalls.

**DISCUSSION**

Dens invaginatus is an anomaly of dental development that may precipitate a connection of the pulp space with the oral cavity. As a result, is not uncomon that the affected tooth requires endodontic treatment which often is complicated due to the complex anatomy. In general, the more complex cases are those of Oehlerls type III, where the invagination extends along the root, increasing the chances of establishing periradicular pathosis. Several endodontic treatment options of dens invaginatus have been reported, including nonsurgical, surgical, and combined approaches.

In the present case, we chose nonsurgical root canal treatment, because that should be attempted first, regardless of the size of the periradicular lesion. As commonly happens in cases of dens invaginatus, our difficulties of treatment begin with the crown access. By making the access cavity to the “normal canal” and the “pseudocanal” separately it was easier to correctly locate the 2 canals. The removal of the central conical dentin mass was difficult but successful even though we did not have access to a microscope. An operating microscope could have simplified the process.

Root canal debridement of root canals of this type is difficult, because of the unpredictable shape and narrow access. Nickel-titanium hand files were essential for the preparation of the “normal canal,” as well as the use of Hedström files for complete debridement of the walls of the “pseudocanal.” Profuse irrigation with sodium hypochlorite in combination with mechanical debridement is a proven antimicrobial regimen and includes the ability to dissolve organic tissues. Some authors suggest irrigation supported by ultrasonics for these cases.

The application of the calcium hydroxide slurry as an intracanal dressing and maintenance for a long period of time may have contributed to the rapid healing observed. Although it has limited antimicrobial activity, this medication is able to support periradicular healing and reduce the external inflammatory resorption, because it increases the pH in surrounding dentin and periradicular tissues. Segura et al. found that calcium hydroxide inhibited macrophages from adhering to the dentin surface.

In a search (January 16, 2010) of the Pubmed database, we found only 5 reports on endodontic treatment of class III dens invaginatus in lower incisors. The case reported by Carvalho-Sousa et al. is what most resembles the present case in terms of root canal structure, this case was treated similarly to the present, with hand instrumentation (crown-down method using Gates-Glidden drills and K-files), intracanal dressing with calcium hydroxide in a polyethylene glycol vehicle maintained for 6 months, and filling with gutta-percha and cement. Regarding the modality of treatment, in 3 cases the choice was for nonsurgical treatment, and in the other 2 conventional therapy was combined with surgery. It is worth noting, however, that the choice of conservative endodontic treatment (nonsurgical) has been reported in a much larger number of studies, at least twice as many, than the option for a combined approach. In the present case, the conventional chemical and mechanical preparation with hand files and 2.5% sodium hypochlorite combined with intracanal dressing with calcium hydroxide for 6 weeks resulted in a substantial regression of the lesion noted at the 1-year follow-up.

The case described here reinforces the precept that knowledge about the biologic aspects of endodontics combined with compliance with technical standards established in the literature is able to treat complex cases without the need additional resources.

**REFERENCES**


Reprint requests:
Flávio Rodrigues Ferreira Alves
Almirante Tamandaré, 1000/108(4)
Petrópolis, RJ
Brazil 25610-040
flaviofalves@uol.com.br