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Root canal treatment of dens invaginatus and fused tooth

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A dental developmental anomaly is defined as an isolated aberration in tooth form, caused by a disturbance or abnormality which occurred during tooth development. There are numerous types of dental anomalies, and a considerable variation in the extent of the defects occurs with each type.

Teeth with these anomalies pose unique challenges. Since the defects are not always apparent clinically, they can confuse diagnosticians investigating the etiology of pulpal pathosis. When endodontic treatment is required, the defects often hinder access cavity preparation and canal instrumentation. Treatment planning also becomes more challenging, since the defects can create complicated periodontal problems, and the malformed teeth can be difficult to restore, particularly those weakened by endodontic therapy.

Fusion is defined as the joining of two developing tooth germs resulting in a single large tooth structure. The incidence of fusion is $< 1\%$ in the Caucasian population, and it is believed that physical force or pressure produces contact of the developing teeth.

Clinically and radiographically, a fused tooth usually appears as one large crown with at least partially separated roots and root canals. There may be a vertical groove in the tooth crown delineating the originally separate crowns.

Dens invaginatus is a deep surface invagination of the crown or root that is lined by enamel. Teeth in both maxillary and mandibular arches may be affected, but the permanent maxillary lateral incisor is the tooth most commonly involved. Studies have revealed an incidence ranging from 0.25% to as high as 10%. The invagination ranges from a slight pitting to an anomaly occupying most of the crown and root.

The invagination frequently communicates with the oral cavity, allowing the entry of irritants and microorganism either directly into pulpal tissues or into an area that is deparated from pulpal tissues by only a thin layer of enamel and dentin. This continuous ingress of irritants and the subsequent inflammation usually lead to necrosis of the adjacent pulp tissue and then to periapical or periodontal abscesses. If the invagination extends from the crown to the periradicular tissue and has no communication with the root canal system, the pulp may remain vital.

Recommended treatment of fused tooth and dens invaginatus has been reported in the endodontic literature. This case report describes the endodontic treatment of a maxillary laterl incisors having fused crown and dens invaginatus.

CASE 1

On July 8, 2000, a 10-year-old female was referred to the Conservative department, College of Dentistry, Seoul National university for evaluation of maxillary left lateral incisor after I & D treatment. She had complained of dull, localized, continuous pain and there was extra-oral swelling. Intra-oral examination showed maxillary left lateral incisor was access opening state and periodontal status was normal. An initial diagnostic radiograph was obtained(Fig. 1). A tooth appeared to have three roots with periapical lesion. So root canal therapy was initiated.

After rubber dam isolation, canal irrigation with NaOCl was performed and calcium hydroxide was introduced

Fig. 1. An initial diagnostic radiograph.

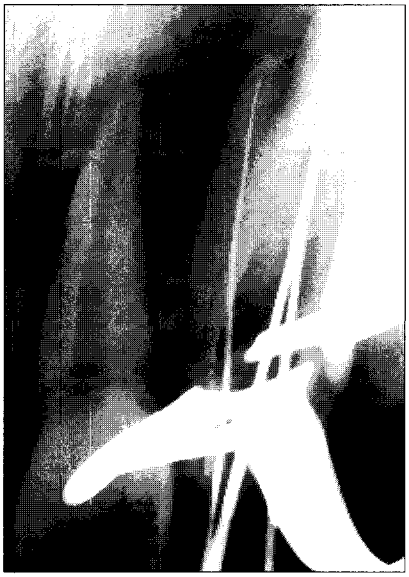

Fig. 2. Working length determination.

Fig. 3. Master cone selection.

Fig. 4. Root canal obturation and middle canal perforation repair with MTA.

Fig. 5. Follow up radiograph after 4 months.

into canal system. Antibiotics and antiinflammatory agent were prescribed and the patient was instructed to return to the clinic if additional swelling occurred or she experienced any discomfort. At next appointment, the patient was asymptomatic with absence of clinical signs and extra-oral swelling also subsided. Files were placed and working length were established(Fig. 2). After cleaning and shaping with profile, the calcium hydoxide dressing was introduced into the canal. It was changed twice, in the first and second months.

On October 25, root canal obturation with System B and obtula II was performed. At that time, middle canal perforation was obturated with MTA(Fig. 3, 4).

The patient was evaluated 4 months after root canal therapy. The 4 month follow-up radiograph exhibited resolution of the periapical radiolucency(Fig. 5). Also, the patient was asymptomatic.

CASE 2

On November 24, 1998, an 18-year-old female with no contributory health problem presented for root canal treatment on the maxillary left lateral incisor with access opening state. There was no previous trauma to the teeth or jaws. According to the patient, she had gotten root canal therapy during tooth eruption.

Intra-oral examination revealed peg lateralis, discoloration of maxillary left lateral incisor. Also radiographic examination showed dens invaginatus and periapical lesion(Fig. 6). There was no percussion sensitivity and mobility was within normal limits.

The first day, canal irrigation was performed. And then on December 16, working length for both canals were determined radiographically(Fig. 7). The canals were then instrumented, and calcium hydroxide was placed as intracanal medication. After 3 months of calcium hydroxide dressing, endodontic surgery was planned.

At the fifth appointment, 4 months after the first visit, root canal filling was carried out(Fig. 8). 2days later, microscopic periapical surgery and retrograde filling with Super EBA were performed(Fig. 9). And a composit restoration was placed to achieve an esthetic result.

Fig. 6. Radiograph showing dense invaginatus and periapical lesion.

Fig. 7. Working length determination.

Fig. 8. Root canal obturation.

Fig. 9. Microscopic periapical surgery and retrograde filling with Super EBA.

Discussion

Fusion and dens invaginatus are developmental alterations in the shape of teeth. Fusion should, if possible, be differentiated clinically from gemination. The latter term signifies an attempt at splitting of a single tooth bud to form additional tooth. The twinning has been used if the division is complete, resulting in a supernumerary tooth. Although it may seem logical to count the teeth in the arch to differentiate between fusion and gemination, this method is not foolproof because it fails to take into account the possible presence of a supernumerary tooth either participating in the process or removed from it. However, in terms of treatment, differentiation between fusion and gemination may not be critically important. These teeth are easily identified clinically and radiographically. The most interesting aspect of this case 1 is root perforation by practitioner error. So the practitioner should be prepared for unusual chamber and canal morphology when endodontically treating these teeth.

A tooth is suspected of having dens invaginatus by virtue of its unusual coronal lingual pit morphology. Radiographic examination will confirm dens invaginatus. Morphologically, a deep invaginated lingual pit renders the tooth more susceptible to caries, with a potential for pulpitis, necrosis, and a periapical manifestation.

Treatment of teeth with dens invaginatus ranges from conservative restorative procedure (if diagnosed early) to nonsurgical root canal therapy, surgery, or extraction. Root canal treatment of such teeth is often complicated by the unusual forms and location of invaginated and pulpal spaces that complicate thorough debridement.

However, most patients are unaware of the situation until they have pulp necrosis or until apical pathosis manifests itself clinically. Therefore regular dental examinations and preventive measures are therefore necessary when an invaginated tooth is identified.

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