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From Invagination To Healing -Retreatment Of Dens Invaginatus – A Case Report

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Abstract

Dens invaginatus is a rare developmental anomaly that often presents significant challenges in endodontic management, particularly in advanced forms such as Type III. This case report describes a challenging case of retreatment of a Type III dens invaginatus with infected periapical cyst.The invagination was found to have opening in the periapical region, separate pseudoopenings laterally and tooth radiographically revealed resorption . Retreatment was done with proper irrigation and activation protocols. The invagination was treated as a separate canal . Tooth was apically sealed using mineral trioxide aggregate (MTA) and subsequently backfilled with an bioceramic sealer. Periapical surgical removal of cyst was performed with precision and platelet-rich fibrin (PRF) was placed in the defect to enhance healing. Clinical and radiographic evaluation at 1 year follow-up demonstrated satisfactory periapical healing and resolution of symptoms. This case highlights the effectiveness of Calcium silicate based materials in complex endodontic retreatment and the adjunctive role of PRF in promoting periapical tissue regeneration.

Keywords: NIL

Introduction

Dens invaginatus is a developmental anomaly that may present with a complex root canal anatomy. Etiology of dens invaginatus is infolding of the enamel organ into the dental papilla during the stage of tooth formation. Invagination may be restricted to the pulp chamber, extend to the root, or in extreme cases to the apex. 1 Most accepted classification is ohlers classification which includes,Type I which is a enamel lined minor invagination that remains in the crown, not extending beyond the cementoenamel junction. Type II is enamel lined invagination that goes beyond the cementoenamel junction forming a blind sac inside the root and it may or may not communicate with the dental pulp.Type IIIa is invagination that extends through the root and opens laterally in the periodontal tissues. Type IIIb is a invagination that extends through the root and opens apically in the periapical tissues.2 Dens Invaginatus – may be dilated, peg-shaped, barrel-shaped or normal crown morphology.3 Exaggerated palatal cingula, talon cusps, notching of the incisal edges with palatal grooving or a deep foramen coecum may also be present.The affected teeth typically display a radiolucent sac surrounded by a radiopaque enamel border (tooth within a tooth appearance). This sac can range in presentation, from a fissure to a tear-shaped loop for Type I configurations, to more extensive and unusual shapes for Type III configurations. 4 Prevalence of dens invaginatus is 0.3–10%. A study by Kirzioglu and Ceyhan et al evaluated 2477 patients, from those, 87.8% had regular anatomy. 11.3% showed Type I configurations, whereas Types II and III were present only in 0.7% and 0.8%.5 There are several challenges in endodontically treating dens invaginatus includes,Irregular canal morphology, presence of additional canals,blind sacs, Many cases show minimal or no signs and symptoms. Invaginated enamel and dentin are often thin or defective , this leads to early pulpal infection and periapical pathology.Complex anatomy makes it Challenging to perform chemomechanical preparation , disinfection and obturation of the tooth.

Case Report

30 -year-old female patient came to the Department of conservative dentistry and endodontics with Chief Complaint of Swelling and frequent pus discharge from gums in relation to upper front tooth since1 year. Patient gives a history of Root canal treatment done 1 year ago on upper front tooth. Patient noticed frequent swelling and pus discharge from gums in relation to the tooth despite the treatment.(FIGURE 1) Clinical Examination revealed A diffuse swelling in the periapical region of 12,11 extending to the upper right labial sulcus involving gingiva and alveolar mucosa, surface appeared erythematous .Sinus opening present in gingiva related to 12, 11 region.The tooth was non vital , not tender to percussion and presented no mobility. Radiographic findings revealed incomplete root canal treatment in tooth 12 (dens invaginatus) with periapical radiolucency (FIGURE 3). The invagination extending beyond the CEJ toward apex of lateral incisor . Cyst involving tooth 12, 11 (completely obliterated , previously root canal attempted , mesial pdl space of 13.Dens invaginatus presented with invagination opening periapically,open apex, root canal displaced laterally with lateral pseudo-opening and resorption. Detailed evaluation of cyst extension and tooth morphology using CBCT revealed ,Well defined and corticated radiolucent lesion with respect to roots of 11 ,12, mesial pdl space of 13. Labial and palatal cortical expansion and multiple perforations noted. 11 shows calcified canal . Lesion extending 14 mm superioinferiorly, 13 mm buccopalatally and 15mm mesiodistally (FIGURE 4 AND FIGURE 5)

Figure 1

Figure 2

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Figure 3

Figure 4

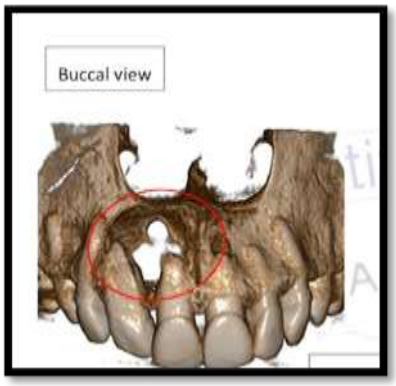

Figure 5

Treatment Plan

Multiple tooth isolation was done (FIGURE 2). Retreatment of Tooth 12 (Dens Invaginatus) involved removal of previous root canal filling material (gutta percha) with H file. Working length was established for both the canal and invagination (FIGURE 6), both treated as two enviornments.The invagination was considered as a separate canal ,biomechanical preparation was done to rotary file size of 6% 20 (Rotoflex) .The pulp canal displaced laterally was biomechanically prepared to rotary file size of 4%25 (Rotoflex blue).

1% sodium hypochlorite, saline, EDTA were used as irrigants. 1% sodium hypochlorite followed by thorough activation with sonic activator (Super endo sonic) was performed to improve the efficacy of the

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biomechanical preparation. The canal and blind sac was also irrigated with 17% EDTA solution with side vented 26 gauge needle to remove the smear layer. Final irrigation was done using normal saline to avoid irritating the periapical tissues. Activating irrigants was done for 30-60 seconds, moving the tip gently within the canal to enhance fluid dynamics. Repeat activation cycles to maximize irrigant penetration into the invagination (ballooning defect) and the canal space. Tooth 11 with Obliterated Canal,successfully negotiated with meticulous technique (Ultasonics and C plus File). Working length was established.Irrigation and activation protocol was performed as previously mentioned. Single cone obturation of the tooth was done with help of bioceramic sealer. (FIGURE 7,8,9).The lesion was found to be involving the mesial pdl space of 13, access opening was done and working length established. Irrigation ,disinfection and obturation carried out to ensure complete management of the affected region.

Interappointment Calcium hydroxide mixed with chlorhexidine was used as an intracanal medicament placed in all the involved teeth for two weeks to promote disinfection and healing, followed by which the obturation was performed. MTA (Mineral Trioxide Aggregate) used to create an apical barrier for dens invaginatus. MTA provides biocompatibility, excellent sealing ability, and promotes periapical healing. Rest of the canal and invagination obturated with Cerefill RCS sealer- bioceramic sealer and gutta-percha. Surgical access to periapical region of 12,11 .Following disinfection of the operation site and administration of local anaesthesia, crevicular flap was raised (figure 10). The granulomatous lesion was removed by curettage. Complete removal of periapical cyst lining and apicoectomy was planned to eliminate pathology apicoectomy was done and PRF placed in the defect to promote healing and regeneration. (FIGURE 11, 12)

Clinical and radiographic monitoring was scheduled at 3, 6, and 12 months.1 year follow up revealed absence of sinus opening, swelling or pus discharge. Patient was asymptomatic and comfortable, progressive bone fill and resolution of cystic lesion was seen. (FIGURE13, 14)

Figure 6

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Figure 7

Figure 8

Figure 9

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Figure 10

Figure 11

Figure 12

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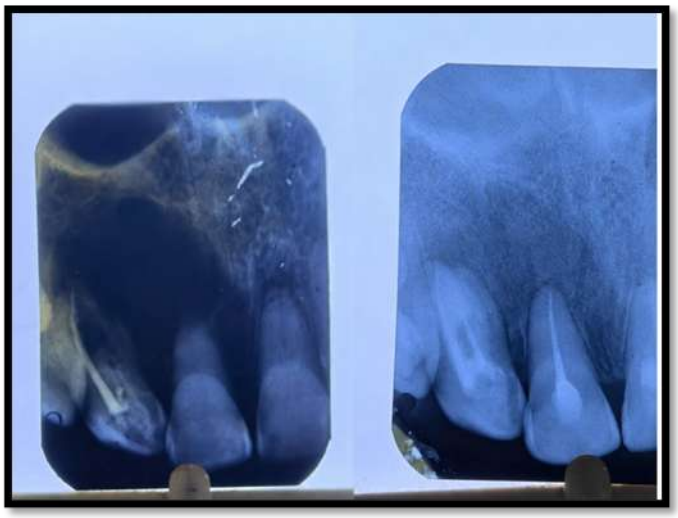
Figure 13

Figure 14



Discussion

Dens invaginatus Type III is characterized by an extensive enamel lined invagination that penetrates through the entire root, communicating with the lateral periodontal tissues or periapical tissues. The invagination acts as niche for bacterial growth and may jeopardize the status of main canal and most of the time root canal treatment becomes difficult.

The prevalence of dens invaginatus is in range of 0.04 to 10 percentage. With maxillary lateral incisor most affected. In virtually all cases of dens invaginatus, it is recommended to approach the invagination, regardless of the pulp condition, either to prevent pulp pathology or to help treat a tooth with necrotic pulp with or without apical periodontitis5.If conditions indicate that the pulp is vital and not inflamed- seal the entrance of the invagination or perform a minimal preparation with a small bur and fill it to prevent saliva penetration and bacterial colonization. In some instances, the invagination may be entirely removed by using an ultrasonic instrument to facilitate root canal access. There are also instances where 2 access cavities are prepared, one for the invagination and the other for the true canal.In most teeth with type II and all teeth with type III, the invagination should be treated as a root canal6. Supplementary disinfection steps is required after chemomechanical procedures, including activation of irrigants and an interappointment intracanal medication. This case

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proved more challenge because of preexisting rootcanal treated dens invaginatus. The invagination presented communication with periapical tissue. Radiograph also revealed lateral pseudo openings of the canal. The radiolucent blind sac and periapical communication of invagination became a challenge in disinfection. Thus a manual or rotary instrumentation can be used independently in such cases but irrigant agitation is of ultimate importance for cleaning the complex canal system of Dens Invaginatus. Conventional irrigation often fails to reach the intricacies of the invaginated canal system7-9. Sonic agitation increases fluid dynamics, allowing irrigants to reach lateral canals, fins, the radiolucent blind sac and irregularities that are otherwise inaccessible. Sonic activation enhances irrigant flow into the invagination and ballooning defect.The agitation helps break down microbial biofilms, which are common in invaginated teeth. Thorough disinfection complements the sealing ability of MTA and bioceramic sealer, improving long-term prognosis. In the present case the remaining canal space and invagination were obturated with Cerafill RCS bioceramic sealer in combination with gutta-percha, which allowed for a three-dimensional seal. Cerafill RCS is a bioceramic root canal sealer designed for permanent root canal obturation. It is a premixed, injectable calcium silicate–based material with strong biocompatibility, radiopacity, and antimicrobial properties, making it suitable for modern endodontic practice.

It is a Alumina-free calcium silicate–based bioceramic material. Available as ready-to-use premixed syringe for direct application. Bioceramic sealers are advantageous in such cases because they exhibit bioactivity, promote hydroxyapatite formation, and bond chemically with dentin, thereby enhancing the long-term prognosis. Their flowability also facilitates penetration into irregular canal anatomy, which is particularly relevant in invaginated teeth. Many materials like blood clot, platelet-rich plasma and PRF, collagen scaffolds, polyglycolic acid,polylactic glycolic acid are suggested as scaffold to place beyond apex. PRF has shown to be the most successful on basis of biocompatibility and growth factor release. PRF causes maintained release of growth factors such as platelet derived growth factor, transforming growth factor β1 for atleast 1week and up to 28 days which are known to promote proliferation of mesenchymal stem cells to help regeneration of tissues.

Conclusion

This case demonstrates how multimodal endodontic and surgical management, using calcium silicate based material and PRF, can successfully resolve even the most challenging dens invaginatus cases.

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