Asian Journal of Dental Sciences

3(2): 26-30, 2020; Article no.AJDS.57445

Unilateral Dens Invaginatus in Immature Maxillary Central Incisor: A Case Report

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Authors' contributions

This work was carried out in collaboration among all authors. Author NSAS designed the study and wrote the first draft of the manuscript. Authors SHH and NAR managed the literature searches. Author ASH revised the manuscript. All authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Armando Montesinos Flores, National Autonomous University of Mexico, Mexico
Reviewers:
(1) José Rubén Herrera-Atoche, Autonomous University of Yucatan, Mexico.
(2) Kapil Kshirsagar, D Y Patil Dental School, India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/57445

Case Report

Received 15 March 2020
Accepted 21 May 2020
Published 30 May 2020

ABSTRACT

Introduction: Dens invaginatus (DI) is a rare developmental malformation occurring as a result of the invagination of the enamel organ. The aetiology of this anomaly remains unclear. However, the knowledge of classification and anatomical variations of teeth with DI are very significant for the best treatment. The most commonly affected tooth is the maxillary lateral incisor. The treatment varies depending on the severity of the case. This paper presents a case of DI on an immature permanent maxillary central incisor.
Case Report: An eight-year-old healthy Malay girl came to the paediatric dental clinic for regular dental check-up. The intra-oral examination revealed presence of deep pit on the permanent maxillary left central incisor. The radiograph showed the presence of invaginatus confined within the crown indicating DI. The tooth partially erupted with the open apex. The best treatment option was the placement of fissure sealant on the affected tooth.
Conclusions: A thorough examination, early diagnosis, and proper treatment are important to prevent any dental complication that may associate with this anomaly.

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Keywords: Dens invaginatus; dens in dente; maxillary central incisor; dental anomalies; children.

1. INTRODUCTION

Dens invaginatus (DI) is a developmental malformation where the enamel organ invaginates into the dental papilla during the soft tissue development. As the hard tissues are formed, the invaginated enamel organ produces a small tooth within the future pulp chamber [1]. It is also known as dens in dente, dilated composite odontoma, dilated gestantodontome, invaginated odontoma, tooth inclusion, and also dentoid in dente [2].

The aetiology of dens invaginatus is controversial and remains unclear but it may involve environmental or genetic factors [3]. Several theories have been illustrated from the past few decades to explain the aetiology of the dens invaginatus malformation. According to T. Seema et al, few aetiologies have been proposed since 1934 which are failure of growth of the internal enamel epithelium while the surrounding of normal epithelium continues to proliferate and engulf the static area that results in the invagination suggested by Kronfeld (1934) [1]. Next is the rapid proliferation of the internal enamel epithelium invading the dental papilla that results in the invagination that was proposed by Rushton (1937) [1]. Other than that, Oehlers (1957) believed that the formation of the enamel lined channel ending at the cingulum or occasionally at the incisal tip is due to the distortion of the enamel organ during the tooth development and subsequent protrusion of a part of the enamel organ. The latter might be associated with the irregular crown form [4]. The result of external forces exerting an effect on the tooth germ during development also suggested by Atkinson (1943) as the aetiology that causes this malformation [1]. Moreover, T. Seema et al also believed that genetic factors might be the cause of the malformation as well [1].

There are few classifications that were documented since the past few decades, however, Oehlers classification is the most popular [5]. The classification was based on the extent of the apical migration of the invagination [4]. **Type I:** The invaginatus confines within the crown not extending beyond the cementoenamel junction. **Type II:** The invaginatus invades the root but remains confined as a blind sac which may or may not have communication with the dental pulp. Type III A: The invagination extends through the root and communicates laterally with the periodontal ligament space through a pseudo-foramen. There is usually no communication with the pulp, which lies compressed within the root. Type III B: The invagination extends through the root and communicates with the periodontal ligament at the apical foramen. There is usually no communication with the pulp. In Type III lesions, inflammation might occur if there is an infection within the invagination within the periodontal tissues giving rise to 'peri-invagination periodontitis'.

Clinically, DI appears at the lingual of a tooth crown presenting an anatomical pit that is susceptible to caries [6]. The invagination which is only separated by a thin layer of enamel and dentine from the pulpal tissue that allows the entry of irritants supports that this malformation can develop dental caries [7]. Without any treatment encounter, the development of dental caries can be happened rapidly and may result in pulp inflammation then followed by necrosis [6]. Radiographic examination is the most realistic way to confirm the diagnosis of such dental anomaly like DI especially periapical radiograph compared to other radiographic examinations such as bitewing or panoramic radiograph. This is because a periapical radiograph will give accurate images without major distortion especially in the anterior region [6].

The reported prevalence of permanent teeth affected with DI is between 0.3% and 10% with associated problems in 0.25- 26% of people. DI occurs often in permanent than deciduous teeth [2]. The permanent maxillary central and lateral incisors appear to be more frequently affected tooth compared to canines whereas posterior teeth are less likely to be affected [2]. It is rarely seen in mandibular teeth. The teeth with DI were reported to be more in females than males (3:1). It occurs symmetrically in about 50% of the cases of DI. Concomitant involvement of central and laterals may occur [2].

This case report presents an incidental finding of DI in a child during a dental check-up visit showing the importance of early detection and providing the treatment on time to avoid future complications such as pulp infection since this anomaly mostly is under diagnosed in the dental practice.

2. CASE REPORT

A healthy 8-years-old female reported to the Paediatric Dental clinic for a regular dental check-up. Her medical, dental and family histories were not relevant. Extra-oral examination revealed no significant findings whereas the intra-oral examination disclosed the presence of an anomaly on the permanent maxillary left central incisor. The tooth was partially erupted and comparatively narrower than right permanent maxillary central incisor with a deep pit palatally of the tooth mimicking an access cavity that was done prior to endodontic treatment (Fig. 1). Dental examination of the other teeth disclosed no noticeable abnormalities.

An intra periapical radiograph was taken for further investigation. The radiograph revealed a deep pit involving the coronal part indicating Type I Dens Invaginatus with the open apex of the affected tooth (Fig. 2). There was no periapical lesion associated with the affected tooth. Vitality test was performed and the tooth was vital. Since no pulp involvement was present, preventive restoration was planned. The mother was informed about the condition.

The oral hygiene was fair with mild gingivitis. There was multiple dental caries on primary and permanent molars. Therefore, routine scaling and oral prophylaxis, restorations on carious teeth, fissure sealant of the affected tooth with DI were performed (Fig. 3). The parents and the

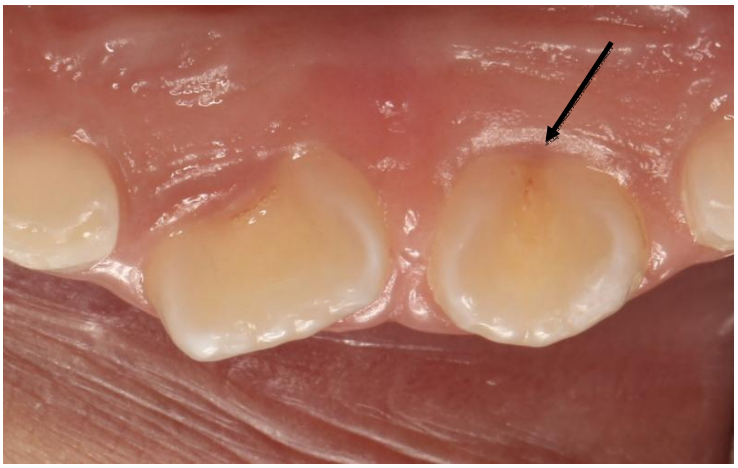

Fig. 1. Palatal surface of permanent maxillary left central incisor showing deep pit (arrow)

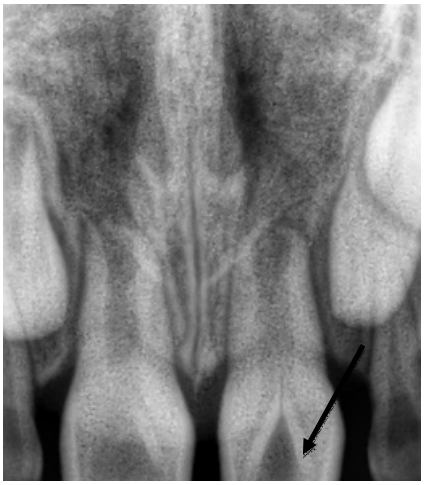

Fig. 2. Periapical radiograph of permanent maxillary left central incisor showing Type I DI (arrow) and open apex

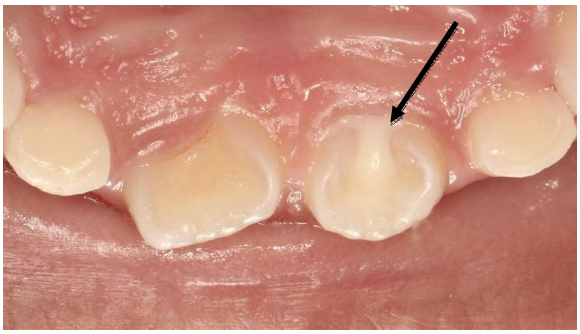

Fig. 3. The invagination is sealed with fissure sealant (arrow)

patient were informed about the condition. Written consent was obtained from the mother for the agreed dental treatment and the use of her records or photographs for publication purpose. The patient is under regular review every 3-6 months since the patient is at high caries risk.

3. DISCUSSION

Most cases of DI can be identified by chance during thorough clinical examination by the uncommon morphology of the tooth crown such as 'dilated', 'peg-shaped', or 'barrel-shaped'. or during a radiographic investigation.

Late detection may lead to pulpal involvement due to the malformation that allows the entry of any irritants into that area [8]. Serious complications such as pulp necrosis, periodontitis, or cystic changes may occur even in the absence of caries [9]. This is due to that the invagination predisposes the tooth to an early pulp death [9]. Therefore, a thorough clinical inspection and good radiographic knowledge are decisive for early detection and treatment of a tooth with DI.

Other dental anomalies such as taurodontism, microdontia, gemination, supernumerary tooth and dentinogenesis imperfecta are known to be associated with DI [10]. However, no other abnormalities were detected in the present case.

Based on the dental literature review, there were various options to manage this malformation which depend on the patient presentation including the type of invagination and the associated symptoms including function and aesthetic. It arrayed as prophylactic or preventive sealing of the invagination, root canal treatment, endodontic apical surgery, intentional replantation and the last option extraction in case of failure of endodontic therapy or in supernumerary tooth associated DI [1].

Despite maxillary lateral incisors are the most commonly affected teeth with this anomaly due to the external forces applied from the developing central incisor or canine which develops 6 months before, on the lateral incisor tooth bud [11], all other teeth must be examined carefully for the possible occurrence. According to Zengin et al, maxillary lateral incisors are the most affected teeth followed by the maxillary central incisors, whereas other teeth such as premolars, canines and molars also may be affected even it is less often [10]. Moreover, DI may be easily overlooked because of the absence of any significant clinical signs of the anomaly [12].

In this case report, there was uncommon morphology of the crown of permanent maxillary right central incisor with no pulpal involvement. Therefore, an intraoral periapical radiograph was taken to confirm the diagnosis of type I of DI. It was classified as type I because the periapical radiograph showed that the invaginationdoes not extend beyond the cementoenamel junction and is retained inside the crown [6]. The tooth was healthy and with an open apex. Preventive sealing of the invagination was carried out since it is detected early and to prevent the further involvement of pulp that might lead to pulpal necrosis and endodontic therapy which may be difficult because of aberrant anatomy [13]. Hence, early identification of a tooth affected by DI is very imperative to avoid root canal treatment as this management is challenging, especially in immature teeth. As mentioned earlier, incisors are more frequently to be affected compared to the other teeth. Thus, the palatal/lingual anatomy of those teeth must be checked carefully due to high possibility of dental infections without symptoms as the pulp chamber

is easy to be reached by the bacteria or for dental caries to be spread [10].

4. CONCLUSION

DI is considered a significant tooth malformation with diverse clinical impact. A thorough clinical examination of teeth is crucial for early detection and management of DI due to the possibility of the pulp being involved as well as periodic follow up is mandatory. Furthermore, invasive approach such as endodontic therapy and extraction can be prevented for the teeth with the open apex in children.

CONSENT

Written consent was obtained from the mother for the agreed dental treatment and the use of her records or photographs for publication purpose.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/57445