Prevalence of dens invaginatus in Jordanian adults

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Abstract

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Aim To assess the prevalence of dens invaginatus in a sample of Jordanian dental patients.

Methodology The data were collected from examination of 3024 radiographs from a random sample of 1660 patients showing 9377 teeth. A tooth was considered having dens invaginatus if an infolding of a radiopaque ribbon-like structure equal in density to enamel was seen extending from the cingulum into the root canal.

Results Teeth with dens invaginatus were found in 49 subjects out of 1660 subjects examined; thus, the person prevalence was 2.95%. Bilateral dens invaginatus was seen in 12 patients, whereas unilateral dens invaginatus was demonstrated in 37 patients. Dens invaginatus was detected in 61 teeth out of a total of 9377 for a tooth prevalence of 0.65%. Maxillary lateral incisors were the most common teeth affected with the condition (90% of cases).

Conclusions Dens invaginatus is not common, but it is an important anomaly. The availability of such data may alert the dental practitioner to anticipate the percentage of teeth having difficulties during endodontic treatment.

Keywords: dens invaginatus, Jordan, prevalence.

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Introduction

Dens invaginatus is a developmental malformation resulting from invagination of the surface of the crown or root before calcification. Some authors consider dens invaginatus as a deep folding of the foramen coecum during tooth development, resulting in a second apical foramen (Schulze 1985). Synonyms of this malformation are: dens in dente, invaginated odontome, dilated gestant odontome, dilated composite odontome, tooth inclusion and dentoid in dente (Hülsmann 1997).

This condition was thought to be caused by alteration in the normal growth pattern of the dental papilla during tooth development (Chen *et al.* 1998). The presumed aetiology of this condition has been related to focal growth retardation, focal growth stimulation or localized external pressure on certain areas of the tooth bud (Tsurumachi *et al.* 2002). However, this aetiology fails to explain cases of bilateral dens invaginatus (Eden *et al.* 2002).

Dens invaginatus was observed radiographically as an infolding of a radiopaque ribbon-like structure, equal in density to enamel, extending from the cingulum into the root canal and sometimes reaching the root apex (Tsurumachi *et al.* 2002). It gave the impression of a small tooth within the coronal pulp cavity (Eden *et al.* 2002).

The affected tooth may show no clinical symptoms, and in most cases, a dens invaginatus is detected by chance on a radiograph. The invagination allows entry of irritants and microorganisms into an area that is close to the pulp and may lead to pulp inflammation and necrosis. Other problems associated with the condition include abscess formation, internal resorption, tooth displacement and retention of neighbouring teeth. An invaginated tooth may present technical difficulty in its clinical management. Therefore, an early diagnosis of such an anomaly is crucial. Treatment considerations of dens invaginatus include preventive restorations of

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the defect, root canal treatment, surgical treatment of the root and extraction.

The prevalence of dens invaginatus is not described fully in the literature. A MEDLINE search was organized for all studies published, in English, between 1975 and 2002. The following keywords were used: dens invaginatus, dens indente, prevalence, incidence and occurrence. The occurrence of dens invaginatus was reported in very few studies. The prevalence of dens invaginatus was reported to range from 0.04 to 10% (Hovland & Block 1977). Ruprecht *et al.* (1987) examined Saudi patients and found 10% of them to have teeth with dens invaginatus. In another study in Saudi Arabia (Ruprecht *et al.* 1986), dens invaginatus were found in 1.7% of the patients examined. Gotoh *et al.* (1979) studied 766 maxillary lateral incisors and found 9.6% of the teeth with this anomaly. Maxillary lateral incisors are the teeth most susceptible to invagination (Tarján & Rózsa 1999).

The purpose of this study was to assess the prevalence of dens invaginatus in a sample of Jordanian dental patients and to explore the occurrence of this condition by tooth type. This will provide the dental practitioner with information about the types of teeth that are more likely to exhibit technical difficulties associated with the endodontic treatment of such teeth. This understanding will also help in identification and referral of these problematic teeth to an endodontist.

Materials and methods

The Faculty of Dentistry, Jordan University of Science and Technology's (JUST) dental archive contains 12 395 records for private dental patients and 1800 records for university employees. An initial random sample of 2111 dental records was selected. Excluding all dental records of patients less than 18 years old and those without satisfactory periapical radiographs led to a final sample comprising 1660 dental records. A total number of 3024 good-quality films showing 9377 teeth were examined.

All radiographs were read by two examiners independently in a dark room using a 10× magnifying lens and an X-ray viewer (Illuminator 5000, RP Beard Ltd, London, UK). A tooth was considered having dens invaginatus if an infolding of a radiopaque ribbon-like structure equal in density to enamel was seen extending from the cingulum into the root canal.

Prior to the investigation, calibration of both examiners was undertaken during a period of 2 weeks by reading 100 radiographs containing 10 different cases of dens invaginatus. Complete inter- and intraexaminer reliability was achieved (100% agreement).

All radiographs exhibiting this criterion were examined twice by each examiner, then examined by both examiners together, and a combined decision was made to either consider the tooth having the condition or not. No inconsistencies between the two examiners occurred during the examination. The observations were recorded on a data sheet prepared for this study.

Results

A total number of 3024 periapical films were examined showing 9377 teeth. Of the teeth examined, 5633 (60.1%) were from males and 3744 (39.9%) from females. Ages ranged between 18 and 69 years, with a mean age of 25.1 years (SD = 8.05).

Almost equal numbers of maxillary (4713) and mandibular teeth (4664) were screened. The number of individual tooth type was comparable, so the per tooth prevalence of dens invaginatus is meaningful. Dens invaginatus were detected in 61 teeth out of a total of 9377 to give a tooth prevalence of 0.65%. The prevalence of dens invaginatus among different tooth types is presented in Table 1. The 61 teeth exhibiting dens invaginatus were all in the maxillary arch, so the maxillary

Table 1 The prevalence of dens invaginatus among different tooth types

Tooth type	No. of teeth examined	No. of teeth with dens invaginatus	Prevalence
Maxillary			
Central incisor	528	0	0.0
Lateral Incisor	460	55	8.7
Canine	425	2	0.5
First premolar	507	2	0.0
Second premolar	639	0	0.0
First molar	783	0	0.3
Second molar	704	0	0.0
Third molar	606	2	0.3
Subtotal	4713	61	1.29
Mandibular			
Central incisor	386	0	0.0
Lateral Incisor	428	0	0.0
Canine	392	0	0.0
First premolar	490	0	0.0
Second premolar	643	0	0.0
First molar	867	0	0.0
Second molar	787	0	0.0
Third molar	671	0	0.0
Subtotal	4664	0	0.0
Total	9377	61	0.65

Table 2 Distribution of teeth with and without dens invaginatus by sex

Sex	No. of teeth (% of teeth)		
	With dens invaginatus	Normal teeth	Total
Male	39 (0.69)	5594(99.31)	5633
Females	22 (0.59)	3722 (99.41)	3744
Total	61 (0.65)	9316 (99.35)	9377

P-value = 0.316.

Table 3 Distribution of patients with dens invaginatus

	Male	Female	Total
Patients with			
Dens invaginatus	33	16	49
None (all normal teeth)	964	647	1611
Total	997	663	1660
Percentage	3.31	2.41	2.95
Patients with			
Double dens invaginatus	6	6	12
Single dens invaginatus	27	10	37
Total	33	16	49
Percentage of double dens invaginatus (out of those with dens invaginatus)	18.18	37.50	24.49

tooth prevalence was 1.29%. Maxillary lateral incisors were the most common teeth affected with the condition (90% of cases). Maxillary canines, first premolars and third molars were approximately equally affected and constituted the other 10%.

The distribution of dens invaginatus according to the gender of the patients is presented in Table 2. Males had more dens invaginatus (64%) than females (36%); however, the difference was not statically significant using chi-square test (*P*-value = 0.32).

Teeth with dens invaginatus were found in 49 subjects (33 males and 16 females) out of 1660 subjects examined; thus, the person prevalence was 2.95%. Bilateral dens invaginatus was seen in 12 patients, whereas 37 patients had unilateral dens invaginatus (Table 3).

Discussion

The periapical radiographs used in this study were taken for a variety of purposes, including dental screening and diagnosis of dental problems. Neither did all records contain full-mouth periapical radiographs nor were they for fully dentate patients. The periapical films used in this study represent two to three films per person, and this does not constitute a review of the whole mouth of the subjects examined. This study investigated dens invaginatus in adults; no attempt was made to include radiographs for permanent teeth in children. The results reflect the prevalence of dens invaginatus only in patients who attended dental clinics at JUST. However, there is no reason to believe that this group of patients is different from other Jordanian adults. No data were found to indicate genetic, social and geographical differences in the prevalence of dens invaginatus among other nations.

The results indicated that 90% of the cases were in maxillary lateral incisors. Dens invaginatus were found in 49 subjects out of 1660 subjects screened. Of the subjects examined, a maximum of 460 (28%) had radiographs available of their maxillary lateral incisors. Therefore, the person prevalence of the condition (2.95%) was probably underestimated.

Most of the literature dealing with dens invaginatus was case reports. There were few studies designed to assess the prevalence of den invaginatus. Gotoh *et al.* (1979) investigated the occurrence of dens invaginatus in a selected sample of dental students. They reported the presence of dens invaginatus in 102 bilateral and 46 unilateral maxillary lateral incisors. The reported prevalence of dens invaginatus in maxillary lateral incisors in their study (9.66%) was approximately close to the results of the present study (8.7%). The authors did not report person prevalence of dens invaginatus or the prevalence of the condition in other tooth types.

The occurrence of dens invaginatus in the maxillary incisors from 300 dental charts was also reported by Ruprecht *et al.* (1987). The prevalence of dens invaginatus in maxillary incisors combined was reported to be around 9.5%. The authors did not break down the prevalence of dens invaginatus into maxillary central and lateral incisors. In the present study, no dens invaginatus were observed in the 528 central incisors examined.

In the present study, the person prevalence of dens invaginatus was 2.95%. This is consistent with results of two other studies (Grahnen *et al.* 1959, Ulmansky & Hermel 1964). Grahnen *et al.* (1959) reported a 2.7% person prevalence of dens invaginatus while Ulmansky & Hermel (1964) reported it to be 2%. No other study was found to address the prevalence of dens invaginatus in canines, premolars and molars. This is the first study to assess the prevalence of dens invaginatus in each type of tooth in the maxillary and mandibular arches. Comparison of the present results with those from previous studies should be undertaken with caution because of differences in the study design, sample size and geographical location.

Teeth with dens invaginatus were reported to be more prone to dental caries and pulp necrosis (Tsurumachi

et al. 2002, Gonçalves *et al.* 2002). Consequently, the availability of such data may alert the dental practitioner to anticipate the percentage of teeth having this condition.

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