

Prevalence of Dens Invaginatus in Maxillary Lateral Incisors in Patients Visiting Peshawar Dental College and Hospital

Iftikhar Akbar¹, Rizwan Qureshi², Saifa Rashad³, Marghalara Noor⁴

Received: 26 Jul 2023 / Revised: 25 Nov 2023 / Accepted: 03 Dec 2023 / Published online: 27 Jan 2024

Copyright © 2024 The Author(s). Published by Foundation University Journal of Dentistry.

ABSTRACT

Objective: Dens Invaginatus is a developmental abnormality that may be found in any tooth but is most commonly noticed in maxillary lateral incisors. This study aimed to find out the prevalence of Dens Invaginatus in maxillary lateral incisors in patients reporting to Peshawar Dental College.

Materials and Methods: The study design was descriptive cross-sectional and conducted in Peshawar Dental College in the Department of Operative Dentistry and Endodontics from December 2021 to May 2022. Four hundred and twenty-eight patients' maxillary lateral incisors were examined clinically for any pit or groove on the palatal surface. Teeth with any clinically detected pit or groove were then confirmed radiographically and the questionnaire was filled. The chi-square test was used to analyze variables such as gender, type and whether dens invaginatus involvement was unilateral or bilateral. $P \leq 0.05$ was set significant.

Results: Dens Invaginatus was found in 25 of 428 subjects, with a prevalence of 5.8%. The age of the patients ranged from 12 to 71 years with a mean age of 35 ± 13 years. There were 11 (4.6%) females and 14 (7%) males with Dens Invaginatus. Type I (71%) was the most frequently seen, type II (16%), and type III was seen in 13% of patients. Dens Invaginatus were noticed on both sides in 14 (7%) patients and on one side in 11 (4.6%) patients.

Conclusion: The prevalence of Dens Invaginatus in maxillary lateral incisors was 5.8% in Peshawar region. Lateral Incisors were more bilaterally involved. Type 1 Dens Invaginatus were more commonly involved which requires minimal intervention to seal them.

Keywords: Dens Invaginatus, Lateral incisors, Peshawar, Prevalence

¹Professor and Head, ^{3,4}Resident FCPS-II, Department of Operative Dentistry and Endodontics, Peshawar Dental College, Peshawar, Pakistan

²Assistant Professor and Head, Department of Operative Dentistry and Endodontics, Rawal Institute of Health Sciences, Islamabad, Pakistan

Corresponding author:

Iftikhar Akbar, Department of Operative Dentistry and Endodontics, Peshawar Dental College, Warsak Road, Peshawar, Pakistan.
Email: driftikhar156@hotmail.com

This work is licensed under the Creative Commons Attribution-NonCommercial 4.0 International License. To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc/4.0/>

All copyrights © are reserved with The Author(s). FUJD is an open-access peer-reviewed journal; which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. FUJD does not allow the commercial use of any published article. All articles published represent the view of the authors and do not reflect the official policy of FUJD.

How to cite this Article:

Akbar I, Qureshi R, Rashad S, Noor M. Prevalence of Dens Invaginatus in Maxillary Lateral Incisors in Patients Visiting Peshawar Dental College and Hospital. Found Univ J Dent. 2024;4(1): 42-46

INTRODUCTION

Developmental anomalies put at risk the teeth to pulpal and periapical pathosis and create considerable challenges to endodontic treatment. These anomalies affect the density and mineralization of the hard tissues of the tooth, alter pulpal size, generate unreachable zones to routine oral care measures thereby providing a safe opportunity for microorganisms, and add complication to endodontic intervention. These developmental anomalies affect the disease progress and treatment outcomes.¹

Dens invaginatus (DI) is a developmental abnormality occurring because of the enamel organ invagination into the dental papilla, beginning at the crown and sometimes extending into the root before calcification occurs.² The other names of DI are dens in dent and dens telescope. It was first described by a dentist Socrates in 1856.³ Maxillary lateral incisors is the most common tooth involved (90%) than central incisors, canines and premolars, frequently with bilateral occurrence (43%).^{4,5} The severity varies from a pit to complicated abnormalities in the tooth.⁶ The exact cause of DI is not vivid. There have been many theories advocated regarding the etiological factors involved in causing this abnormality.⁷ These may include trauma, infection and growth force from neighbouring tissues during tooth development,³ stimulation of internal enamel epithelium growth into the papilla and joining of the two tooth germs.⁷ Genetic factors may also be involved in dens in dente.^{2,5} The infolding formed results in the accumulation of a large number of organic debris in the pocket that leads to dental caries involving the crown and rapidly progressing into the root causing pulpal and periapical pathosis.^{2,3}

Oehlers classified DI into three categories as shown in Figure 1. In type 1 the lesion remains confined in the crown and does not cross the cemento-enamel junction (CEJ). Type 2 is partial invagination in which the lesion extends into the root and crosses the cement enamel junction. The pulp may or may not be involved. Type 3 is further divided into 2 subclasses; class 3a lesions reach out into the root and meet up with the periodontal ligament through the lateral foramen. Class 3b lesions also reach out into the root and meet up with the periodontal ligament through the apical foramen.^{2,4}

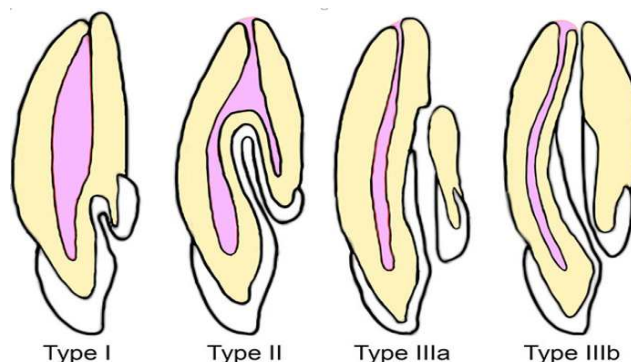


Figure 1: Oehlers' Classification of Dens Invaginatus

DI has a prevalence that ranges between 0.3%-10%. DI are more prevalent than germination (0.3%) and taurodontism (0.3%).² The prevalence of DI among different populations is (Saudi Arabia 7.3 %, Turkish 2.5 %, Japan 4 % USA 4 %, Sweden 3 % and Mexico 10 %).⁷ Early detection of DI is important to take preventive measures to avoid complications associated with invaginatus which may range from caries to pulpal involvement and to challenging endodontic cases.⁸

This study aimed to find out the prevalence of DI in maxillary lateral incisors because it can pose challenges for dental treatment. The invagination may harbour bacteria, making the tooth more susceptible to caries. Furthermore, no such studies have been conducted in the Peshawar region; therefore, this study will help reveal the existence of such cases in the region.

MATERIALS AND METHODS

The approval of this study was taken from the Institutional Review Board (Prime/IRB/2021-339) of Prime Foundation. This descriptive cross-sectional study was conducted at the Department of Operative Dentistry and Endodontics of Peshawar Dental College & Hospital from December 2021 to May 2022. The study encompassed individuals of both genders, with ages between 12 and 71 years. Patients with other developmental anomalies and pregnant patients were not included in the study. Informed consent was signed from the patients and their lateral incisors and palatal surface were examined clinically for any pit or groove. Teeth with any clinically detected pit or groove were then confirmed by a periapical radiograph. Periapical radiographs were taken of both lateral incisors and the questionnaires were filled.

The WHO sample size calculator was used to determine

the sample size. The estimated population proportion was taken as 0.2% with a confidence level at the standard of 99% and a 0.05 margin of error was set as indicated. The sample size was taken four hundred and twenty-eight (428) patients, selected from the OPD of the Department of Operative Dentistry and Endodontics. The data was entered and analyzed in SPSS version 20.0. The chi-square test was employed to analyze variables such as gender, type, and whether dens invaginatus involvement was unilateral or bilateral. $P \leq 0.05$ was set significant.

RESULTS

Four hundred and twenty-eight patients (428), 188 male and 240 female with a mean age of 35 ± 13 years were studied. DI was found in 25 of 428 patients, with a frequency of 5.8% as shown in Table 1. Using chi-square analysis, no significant difference was found regarding the frequency of DI ($p = 0.226$). Table 2 shows the placement of DI according to gender. DI was found in 11 (4.6%) females and 14 (7%) males. Type I (71%) was the most frequently seen, then type II (16%), and type III was seen in 13% of patients. Using chi-square analysis, no significant relation was found between gender and type of DI ($X^2 = 0.220$; $df = 1$; $p = 0.210$).

Table 3: presents unilateral or bilateral occurrence of

DI. DI were noticed on both sides in 14 patients and on one side in 11 patients. Analyzing using chi-square no significant relation was found between the unilateral and bilateral occurrence of DI ($X^2 = 0.220$; $df = 1$; $p = 0.210$).

DISCUSSION

The literature reveals significant variations in the prevalence of DI across diverse populations. Notably, this study indicated a prevalence of 5.8%. In a study involving 3020 Swedish children, a prevalence of 2.7% was reported.⁹ Hamasha et al. found a prevalence of 2.9% in Jordanian dental patients.¹⁰ While Ulmansky and Hermel reported a prevalence of 2%,¹¹ Cakici et al. reported a prevalence of 1.3% and Kirzioğlu and Ceylan¹³ demonstrated a prevalence of 12% in the Turkish population. A study in Israel yielded a prevalence rate of 26%.¹⁴ DI was identified in 13.5% of the Indian population.¹⁵ These variations in prevalence could stem from ethnic differences, variances in diagnostic criteria, and differences in analytical methods.

The prevalence of dens invaginatus was somewhat higher in men than in women in the current investigation. These results are in agreement with another study that was previously published for patients with Jordanian ancestry. The prevalence for males and

Table 1: Frequency of Dens Invaginatus in Patients

| | Frequency | Percent | <i>p</i> -value |
|---|-----------|---------|-----------------|
| Patient with Dens Invaginatus | 25 | 5.8 | 0.226 |
| Patient without Dens Invaginatus | 403 | 94.2 | |
| Total | 428 | 100 | |

Table 2: Distribution of Dens Invaginatus in patients according to gender

| | Gender | | Total | <i>p</i> -value |
|---|-----------|------------|-----------|-----------------|
| | Male | Female | | |
| Patient with Dens Invaginatus | 14 (7) | 11 (4.6) | 25 (6) | 0.210 |
| Patient without Dens Invaginatus | 174 (93) | 229 (95.4) | 403 (94) | |
| Total | 188 (100) | 240 (100) | 428 (100) | |

Table 3: Unilateral and Bilateral Frequency of Dens Invaginatus in the study group

| Dens in Dente | Frequency (%) | <i>p</i> -value |
|------------------------------------|---------------|-----------------|
| Bilateral Dens Invaginatus | 14 (3.3%) | 0.210 |
| Unilateral Dens Invaginatus | 11 (2.6%) | |
| Total | 428 (100%) | |

females was in 9 teeth (0.29%) and 3 teeth (0.008%), respectively.¹⁰ However, additional research in the Turkish population found that both men and women experienced dens invaginatus on an equal basis.^{12,13}

The presence of bilateral dens invaginatus was found by many authors. In the current study, the dens invaginatus was present bilaterally in 3.2% of cases, which was very different from studies conducted in Turkey¹² (23.1%) and Jordan¹⁰ (24.49%). These differences might be because of variations in the sample size, patient choice, and the materials, and procedures used. So, more studies are required to explain the matter.

Maxillary lateral incisors with a deep pit must be clinically checked for DI even if there are no symptoms and due to often bilateral existence, lateral incisors should be bilaterally clinically examined. DI anomalies are commonly discovered by chance. It is not commonly found by patients unless clinical signs appear, such as an acute apical abscess or sinus tract. Most cases are found on radiographs.^{15,16}

Oehlers proposed the most widely accepted classification of DI. Type I is a minor invagination that occurs within the crown and does not extend beyond the cemento-enamel junction. In Type II, invagination reaches the root but eventually develops into a blind sac with or without a pulp connection. Type III refers to an invagination that extends from the root to the apical area and creates a second foramen in the periodontal or apical region.^{2,4} In the current investigation, type I DI was most observed (71%), type II (16%), while type III DI was found in 13% of patients. The results of this study are in harmony with previous literature. One study showed the most commonly seen type of dens invaginatus was type I (73%) followed by type II (20%) while 7% of patients had type III dens invaginatus,⁹ while the other study reported type I being the most common (79%), type II (15%) and type III (5%).¹² Additionally, Alani and Bishop⁹ reported 79% of the teeth with dens invaginatus being type I. A study on the Turkish population showed that type I was the most common type of dens invaginatus with a prevalence of 81.25%.¹³

Sealing or restoration, root canal, periapical surgery, intentional replantation, and removal of the tooth are among the treatments available for invaginated teeth.^{17,18} Irrespective of the periapical lesion's size, surgical

therapy should only be carried out after nonsurgical root canal treatment has failed. The treatment method should not be determined by the periradicular lesion's size.¹⁹⁻²¹

One restriction of the study was that the sample size taken was comparatively smaller and may not represent the true picture of this population. Therefore, the data should be used with care as it may not represent the actual figures. Future studies should be conducted on CBCT imaging as it is an indispensable tool for the diagnosis and treatment of DI. Further extensive multicenter studies are required to find out the prevalence of dens in dente in the population.

CONCLUSION

This study showed the prevalence of DI to be 5.8% in this region with maxillary lateral incisors most commonly involved. Lateral Incisors were more bilaterally involved. Type I dens in dente were more commonly involved which requires minimal intervention to seal them.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

The ethical approval is provided by the Institutional Review Board of PRIME Foundation (Ref: PRIME/IRB/2021-339).

FUNDING DISCLOSURE

The author(s) received no financial support for the research, authorship, and/or publication of this article.

AUTHORS CONTRIBUTION

Conception and design of the study: I. Akbar

Acquisition of data: R. Qureshi

Analysis and interpretation of data: S. Rashad, M. Noor

Drafting of the manuscript: I. Akbar

Critical review of the manuscript: R. Qureshi, S. Rashad, M. Noor

Approval of the final version of the manuscript to be published: I. Akbar, R. Qureshi, S. Rashad, M. Noor

REFERENCES

- Holland R, Gomes Filho JE, Cintra LT, Queiroz ÍO, Estrela C. Factors affecting the periapical healing process of endodontically treated teeth. *J Appl Oral Sci.* 2017;25(1):465–76.
- Mabrouk R, Berrezouga L, Frih N. The accuracy of CBCT in the detection of dens invaginatus in a Tunisian population. *Int J Dent.* 2021;2021(1):1-5.
- ALHumaid J, Buholayka M, Thapasum A, Alhareky M, Abdelsalam M, Bughsan A. Investigating prevalence of dental anomalies in Eastern Province of Saudi Arabia through digital orthopantomogram. *Saudi J Biol Sci.* 2021;28(5):2900–6.
- Alkadi M, Almohareb R, Mansour S, Mehanny M, Alsadhan R. Assessment of dens invaginatus and its characteristics in maxillary anterior teeth using cone-beam computed tomography. *Sci Rep.* 2021;11(1):1-8
- Chen L, Li Y, Wang H. Investigation of dens invaginatus in a Chinese subpopulation using cone-beam computed tomography. *Oral Dis.* 2021;27(7):1755–60.
- de Oliveira NG, da Silveira MT, Batista SM, Veloso SRM, Carvalho M de V, Travassos RMC. Endodontic treatment of complex dens invaginatus teeth with long term follow-up periods. *Iran Endod J.* 2018;13(2):263–6.
- K Naoto, Gomyo N, M kiyoshi. Successful pulp-preserving treatment for peri-invagination periodontitis of double dens invaginatus with Oehlers type IIIA and IIIB: A case report. *J Endod.* 2021;47(9):1515-20
- Na Li, Huihui Xu, Cunhui Kan, Jing Zhang, Song Li. Retrospective study of intentional replantation for type IIIB dens invaginatus with periapical lesions. *J Endod.* 2022;48(3):329-36.
- Alani A, Bishop K. Dens invaginatus. Part 1: classification, prevalence and aetiology. *Int Endod J.* 2008;41(12):1123–36.
- Hamasha AA, Alomari QD. Prevalence of dens invaginatus in Jordanian adults. *Int Endod J.* 2004; 37(5):307-10.
- Ricucci D, Milovidova I, Siqueira Jr JF. Unusual location of dens invaginatus causing a difficult-to-diagnose pulpal involvement. *J Endod.* 2020;46(10):1522-29.
- Cakici F, Celikoglu M, Arslan H, Topcuoglu H-S, Erdogan A-S. Assessment of the prevalence and characteristics of dens invaginatus in a sample of Turkish Anatolian population. *Med Oral Patol Oral Cir Bucal.* 2010;15(6):855-8.
- Kirzioğlu Z, Ceyhan D. The prevalence of anterior teeth with dens invaginatus in the western Mediterranean region of Turkey. *Int Endod J.* 2009;42(8):727–34.
- Kfir A, Flaisher Salem N, Natour L, Metzger Z, Sadan N, Elbahary S. Prevalence of dens invaginatus in young Israeli population and its association with clinical morphological features of maxillary incisors. *Sci Rep.* 2020; 10(1):1-8.
- Hegde V et al. Prevalence of dens invaginatus and its association with periapical lesions in a Western Indian population-a study using cone-beam computed tomography. *Clin Oral Investig.* 2022;26(9):5875-83.
- Zhang J, Wang Y, Xu L, Wu Z, Tu Y. Treatment of type III dens invaginatus in bilateral immature mandibular central incisors: A case report. *BMC Oral Health.* 2022;22(1):22-28
- YalcinTY, Kayhan KB, Yilmaz A, GökselS, Ozcan I, Yigit DH. Prevalence, classification and dental treatment requirements of dens invaginatus by cone-beam computed tomography. *PeerJ.* 2022;5(10):1-18.
- Hegde V, Morawala A, Gupta A, Khandwawala N. Dens in dente: A minimally invasive nonsurgical approach. *J Conserv Dent.* 2016;19(5):487–89.
- Chaturvedula BB, Muthukrishnan A, Bhuvanaraghan A, Sandler J, Thiruvengkatachari B. Dens invaginatus: a review and orthodontic implications. *Br Dent J.* 2021;230(6):345–50
- Siqueira JF Jr, Rôças IN, Hernández SR, Brisson-Suárez K, Baasch AC, Pérez AR, et al. Dens invaginatus: Clinical implications and antimicrobial endodontic treatment considerations. *J Endod.* 2022;48(2):161–70.
- Zhang C, Hou BX. [Reconsideration of the diagnosis and treatment for dens invaginatus]. *Zhonghua Kou Qiang Yi Xue Za Zhi.* 2020;55 (5):302-8.