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Prevalence of pulp calcifications in posterior teeth assessed by cone-beam computed tomography in patients treated at a radiology center

Mayra Isaura Lavado García[1],
Jacqueline Judith Adasme Zeballos[1],
Sandra Giuliana Concori Ticona[1],
Mario George Casaretto Gamonal[2],
Santos Francisco Pinto Tejada[1],
John Paul Torres Navarro[1]

[1] Universidad Privada de Tacna. Tacna, Peru.

[2] Universidad Peruana Cayetano Heredia. Lima, Peru.

ABSTRACT

Objective: To determine the prevalence of pulp calcifications in permanent posterior teeth using cone-beam computed tomography (CBCT) at a radiology center in Tacna during the 2020–2023 period. **Materials and methods:** A non-experimental, retrospective, cross-sectional study was conducted. Training was provided by an oral and maxillofacial radiology specialist, with whom 15 CBCT scans were reviewed using standardized consensus criteria. 163 CBCT scans (FOV: 16 × 10 mm), comprising 2,060 dental units, were randomly selected and analyzed. Image analysis was performed using NNT Viewer software, evaluating each tooth in sagittal, axial, and coronal planes. The chi-square statistical test was used to assess the association between tooth condition and the presence of pulp calcifications, as well as between patient age and the occurrence of these calcifications. **Results:** Of the 163 CBCT scans evaluated, 26.2% of the 2,060 dental units presented pulp calcifications. Prevalence was higher in females and in the 17–36-year age group, although no statistically significant differences were observed. The category with the highest prevalence was "intact teeth." A significant association was found between tooth condition and the presence of pulp calcifications. **Conclusions:** Pulp calcifications are a relatively common condition in permanent posterior teeth. Their presence is more closely associated with the structural condition of the tooth rather than with factors such as age or sex.

Keywords: prevalence; dental pulp calcifications; endodontics; dental pulp stones.

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INTRODUCTION

The presence of calcifications in pulp tissue constitutes a clinically relevant finding as it may interfere with access to root canals during endodontic procedures. This alteration not only increases treatment complexity but also raises the risk of iatrogenic complications (1).

Several factors have been proposed as possible triggers of these calcifications. These include age, sex, occlusal load, the presence of deep restorations, dental wear, and chronic pulpal diseases (2).

Although diagnosis is usually incidental, pulp calcifications are considered a frequent alteration, particularly in posterior teeth. A study conducted in southwestern China reported their presence in 49.0% of patients and 7.4% of the evaluated teeth (3). Similarly, a study based on 153 clinical records of Saudi patients reported a pulp calcification prevalence of 43.1% (4). In Lima, Peru, prevalence was even higher, with calcifications identified in 83.6% of the 67 evaluated patients (5).

However, prevalence information varies considerably among studies, which may be attributable to differences in the radiographic techniques used (6). Two-dimensional techniques, such as periapical or panoramic radiography, present inherent limitations for detecting pulp calcifications smaller than 200 μm due to structural superimposition and geometric distortion, potentially leading to underestimation of their presence (7). In contrast, cone-beam computed tomography (CBCT) provides detailed three-dimensional visualization without superimposition, facilitating more accurate identification of these calcified structures. Despite these advantages, CBCT also presents certain limitations, including greater exposure to ionizing radiation, higher cost, and lower availability compared with conventional radiography. These factors should be considered when indicating its clinical use (8,9).

Accordingly, the present study is relevant as it employed CBCT to assess the prevalence of pulp calcifications in permanent posterior teeth while considering variables such as sex, age, and the condition of the dental crown. This study aimed to determine the prevalence of pulp calcifications in permanent posterior teeth using CBCT at a radiology center during the 2020–2023 period.

MATERIALS AND METHODS

This study employed a non-experimental, retrospective, cross-sectional, and analytical design. The study population consisted of 2,035 cone-beam computed tomography (CBCT) scans obtained from patients treated at a radiology center in Tacna during the 2020–2023 period. Sample size was determined using the Epidat software, and 163 tomographic studies were selected through simple random sampling, from which 2,060 teeth were analyzed. The sample size calculation considered an expected proportion of 86.7%, a 95% confidence level, and a design effect of 1.

CBCT scans were acquired using a NewTom Giano HR tomograph configured at 90 kVp, 7 mA, and a 16-second rotation time. A maximum voxel size of 0.230 mm, with a spatial resolution of 68 μm, and a field of view (FOV) of 16 × 10 mm were employed, allowing simultaneous evaluation of both jaws and visualization of a greater number of teeth.

Acquisition parameters were standardized and uniformly applied to all patients, ensuring image homogeneity and comparability of the results.

The primary study variable was the presence of pulp calcifications, assessed according to the condition of the dental crown (intact, carious, restored, or exhibiting attrition) based on tomographic findings. In addition, sociodemographic factors such as age and sex were included. For data collection, a structured form was designed in two sections: the first for sociodemographic information and the second for recording the characteristics of pulp calcifications and their indicators.

Inclusion criteria comprised patients aged 17 years and older, permanent teeth presenting one of the following conditions—intact, carious, restored, or with signs of attrition—and with at least 50% of teeth belonging to the posterior region. Teeth with root resorption, those previously subjected to root canal treatment, with pulpal involvement, upper and lower third molars, as well as CBCT scans presenting distortions that precluded adequate interpretation (noise, presence of crowns, or posts), were excluded.

Training for the identification of pulp calcifications was conducted by a specialist in oral and maxillofacial radiology. For standardization purposes, 15 CBCT scans were jointly reviewed by the expert and the researcher. Reliability of the recordings was assessed using the Kappa index, yielding a value of 0.857 for both intraobserver and interobserver agreement.

Statistical analysis was performed using SPSS software version 27. Descriptive statistics were applied through frequency tables and cross-tabulations to characterize the variables according to the presence of calcifications, sex, age, and dental crown condition. For inferential analysis, the chi-square test was used to determine the relationship between sex and age, as well as between dental crown condition and the presence of pulp calcifications.

The study was approved by the Ethics Committee of Universidad Privada de Tacna under registration

number 188-12-2023. Similarly, patient data confidentiality and anonymization were ensured in accordance with the ethical principles of research.

RESULTS

Table 1 shows that, among the total number of patients evaluated (n = 163), 55.9% were female and 44.1% were male. Pulp calcifications were identified in 84.0% of patients, distributed as 47.9% among women and 36.1% among men (Figures 1 and 2). However, the chi-square test (p = 0.514) indicated no statistically significant association between sex and the presence of pulp calcifications.

Table 1. Distribution of pulp calcifications in permanent posterior teeth according to sex and age, Tacna, Peru, 2020–2023 (n = 163).

Variables	Pulp calcifications				Total	
	Present		Absent			
	n	%	n	%	n	%
Sex[a]						
Female	78	47.9	13	8.0	91	55.9
Male	59	36.1	13	8.0	72	44.1
Age[b]						
17–36 years	56	34.4	10	6.1	66	40.5
37–56 years	52	31.9	11	6.7	63	38.6
57–77 years	29	17.7	5	3.2	34	20.9
Total	137	84.0	26	16.0	163	100.0

[a] Chi-square test = 0.514; [b] Chi-square test = 0.915.

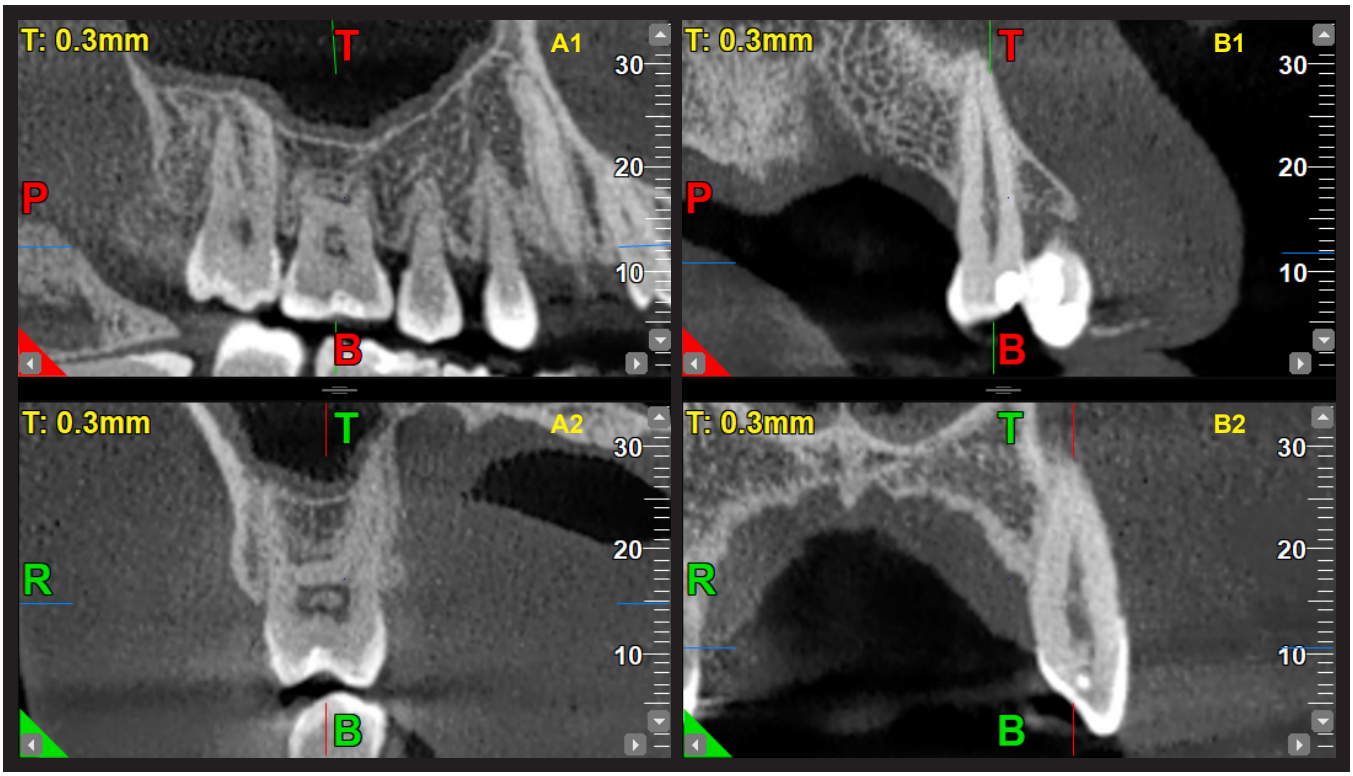

Figure 1. Pulp calcifications on coronal and sagittal sections. **A1 and A2:** Coronal and sagittal sections of tooth 16 showing the presence of calcification within the pulp chamber. **B1 and B2:** Coronal and sagittal sections of tooth 25 showing the presence of calcification in the middle third of the root canal.

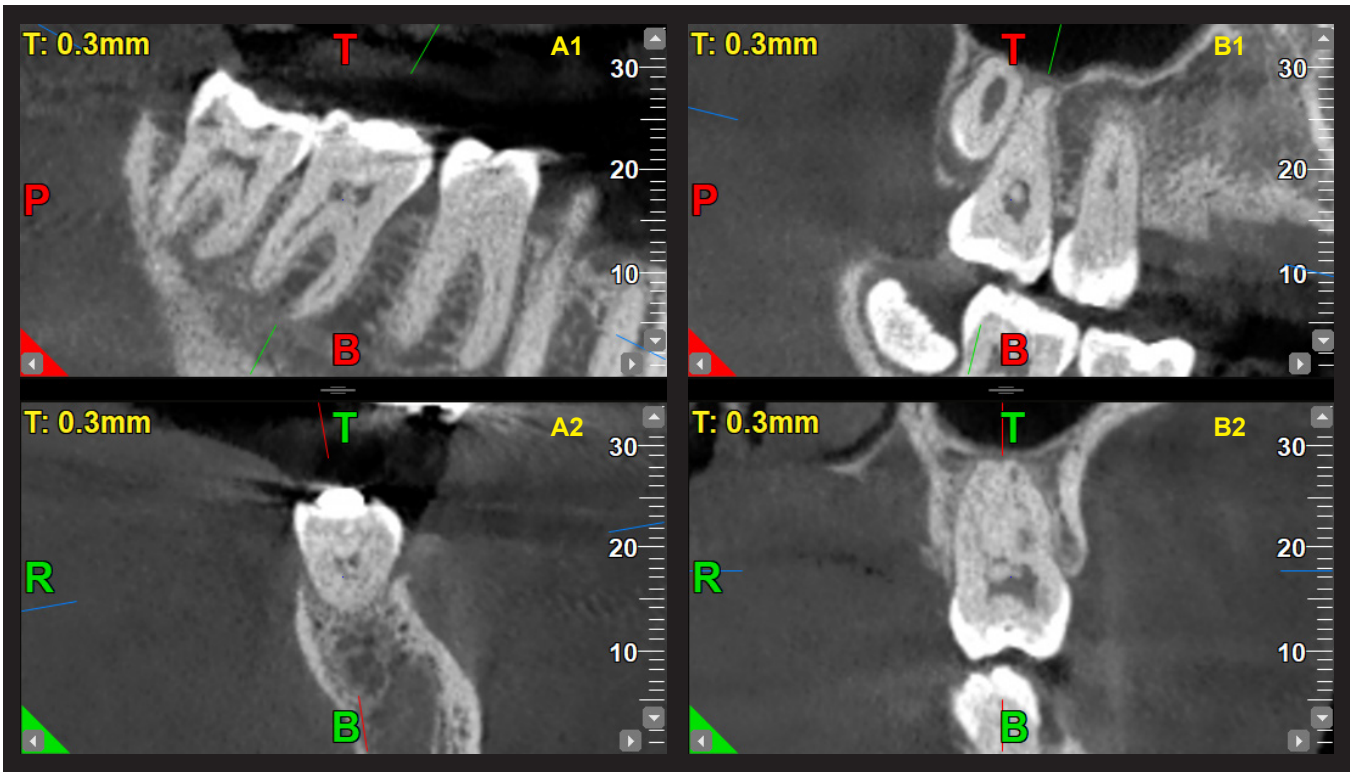

Figure 2. Pulp calcifications on coronal and sagittal sections. **A1 and A2:** Coronal and sagittal sections of tooth 36 showing the presence of calcification within the pulp chamber. **B1 and B2:** Coronal and sagittal sections of tooth 27 showing the presence of calcification within the pulp chamber.

Regarding age, 40.5% of the patients were between 17 and 36 years old, 38.6% were between 37 and 56 years old, and 20.9% were between 57 and 77 years old. Among patients with pulp calcifications, 34.4% belonged to the first age group, 31.9% to the second, and 17.7% to the third. Similarly, the chi-square test (p = 0.915) indicated no statistically significant association between age and the presence of pulp calcifications.

However, it should be considered as a study limitation that, due to the simple random sampling design, the distribution of participants across age groups was not homogeneous, which may have influenced the representation of the oldest age group (57–77 years). Consequently, the actual frequency of pulp calcifications in this group may have been either overestimated or underestimated.

Table 2 shows that, among the total number of teeth analyzed (n = 2,060), most were classified as intact (77.6%), followed by restored teeth (19.7%), whereas the carious and attrition categories accounted for smaller proportions (1.5% and 1.2%, respectively). Pulp calcifications were detected in 26.2% of the teeth evaluated, occurring more frequently in intact teeth (17.5%) and restored teeth (7.6%), and less frequently in teeth with attrition (0.7%) and carious teeth (0.4%). However, the low proportion of teeth with caries and attrition represents another limitation of the study, as it may have restricted the ability to identify more precise associations between these conditions and the presence of pulp calcifications, potentially leading to an underestimation or overestimation of their true effect.

Table 2. Distribution of the prevalence of pulp calcifications in permanent posterior teeth according to tooth condition, Tacna, Peru, 2020–2023 (n = 2,060).

Tooth condition*	Pulp calcifications				Total	
	Present		Absent			
	n	%	n	%	n	%
Intact	361	17.5	1,239	60.1	1,600	77.6
Carious	9	0.4	23	1.1	32	1.5
Restored	156	7.6	250	12.1	406	19.7
With attrition	12	0.7	10	0.5	22	1.2
Total	538	26.2	1,522	73.8	2,060	100.0

* Chi-square test = 0.000.

DISCUSSION

This retrospective study, conducted in a Peruvian population using cone-beam computed tomography (CBCT), demonstrated a pulp calcification prevalence of 26.2%, a value comparable to that reported by Calero-Hinostroza et al. (5), who found a prevalence of 30.8%. These findings represent a relevant contribution considering the limited evidence available in the national literature regarding this condition. Similarly, they underscore the importance of recognizing the presence of pulp calcifications in Peruvian dental practice, particularly during endodontic treatment planning, given that these calcifications may obstruct root canals and increase the complexity of clinical procedures.

When comparing these findings with international studies, notable differences were observed: 88.3% in Valencia (10), 49% in China (3), 52.1% in Saudi Arabia (11), 46.9% in Iran (12), and 18.6% in Yemen (13). These discrepancies may be attributed to methodological factors, such as the imaging modality employed, as well as biological and sociodemographic differences specific to each population.

Regarding sex and age, no statistically significant differences were identified, partially consistent with the findings of Kalaji et al. (13) and Mirah et al. (14). However, other studies, such as those by Zhang et al. (3) and Sezgin et al. (15), reported a higher prevalence among women and a progressive increase with age. These differences suggest the potential influence of hormonal, biological, and dental care access factors, which could be explored in future research involving the Peruvian population.

Furthermore, previous studies have reported associations between pulp calcifications and systemic diseases such as cardiovascular disease (16) and arteriosclerosis (17). Although these variables were not addressed in this study, the need for further local research evaluating the relationship between oral and systemic health is acknowledged.

The use of CBCT enabled more precise identification of pulp calcifications compared with two-dimensional techniques such as digital panoramic radiography (DPR), by providing three-dimensional images without superimposition of anatomical structures. This finding is consistent with Tassoker et al. (18), who indicated that DPR may lead to overestimation or underestimation of pulp calcifications due to structural overlap and geometric distortion.

Among the main strengths of CBCT are its high spatial resolution, multiplanar assessment capability, and detailed visualization of the pulp system, all of which contribute to greater diagnostic reliability. Additionally, the standardization of acquisition parameters in this study promoted homogeneity and quality of the analyzed images (18). Nevertheless, CBCT also presents certain limitations, including higher cost, increased exposure to ionizing radiation compared with conventional methods, and the possible presence of artifacts caused by metallic restorations, which may compromise image interpretation. Moreover, the diagnostic quality of CBCT largely depends on technical factors such as voxel size, field of view, and proper patient positioning during image acquisition.

Overall, although CBCT represents a highly reliable tool for the assessment of pulp calcifications, its advantages should be weighed against its limitations, particularly in clinical and epidemiological settings.

A finding of particular interest was the substantial presence of calcifications in intact teeth (17.5%), which contrasts with previous studies in which the highest prevalence was observed in non-intact teeth (5–6).

This result suggests that pulp calcification formation does not depend exclusively on evident local stimuli but may also be associated with physiological processes related to pulpal aging, changes in microcirculation, local metabolic alterations, or subclinical mechanical stimuli undetectable through conventional clinical examination.

Similarly, factors such as occlusal microtrauma, parafunctional habits, variations in dentinal permeability, or low-grade inflammatory processes may progressively contribute to pulpal mineralization, even in the absence of visible crown lesions.

Among the limitations of this study are its retrospective nature, which restricts control over clinical and systemic variables, and the urban origin of the sample, which limits the extrapolation of findings to other regions of the country.

Multicenter and longitudinal studies in Peru are recommended to evaluate the influence of biological, systemic, and sociodemographic factors using standardized methodologies to generate robust evidence in order to guide clinical practice and support the development of more effective preventive and therapeutic strategies.

CONCLUSIONS

The results indicate that the presence of pulp calcifications is primarily associated with the condition of the dental crown, whereas no statistically significant relationship was identified with patient age or sex. Moreover, a higher frequency of calcifications was observed in intact and restored teeth.

These findings highlight the importance of considering the structural characteristics of teeth during clinical assessment and endodontic treatment planning, given the potential influence of pulp calcifications on the complexity of accessing and managing the root canal system.

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MILG: conceptualization, methodology, writing of the original draft. **JJAZ:** research, visualization. **SGCT:** research. **MGCG, SFPT**: research, writing - review & editing. **JPTN:** writing - review & editing.

Corresponding author:
Mayra Isaura Lavado García
mayrita12isaura@hotmail.com

REFERENCES

1. Chalikkandy SN, Bhandi S, Shawkani HA, et al. A systematic review assessing the dental pulp stone prevalence in the Saudi Arabian population. Saudi Dent J. 2023;35(7):803-11. doi:10.1016/j.sdentj.2023.07.012
2. Kumar P, Duraisamy A, Patnana A, et al. Prevalence of pulp stones in the population of Rajasthan: a cross-sectional study in a tertiary care hospital. Cureus. 2024;16(1):e51623. doi:10.7759/cureus.51623
3. Zhang W, Wang Y, Ye L, et al. Distribution and influencing factors of pulp stones based on CBCT: a retrospective observational study from southwest China. BMC Oral Health. 2024;24(1):947. doi:10.1186/s12903-024-04727-3
4. Fairozekhan AT, Ahmed SZ, Mohammed F, et al. Prevalence of pulp stones in patients visiting the dental hospital of Imam Abdulrahman Bin Faisal University: a correlative retrospective study. Cureus. 2025;17(1):e77765. doi:10.7759/cureus.77765
5. Calero-Hinostroza GG, Tinedo-López PL, García-Rupaya CR. [Prevalence and distribution of pulp stones in a group of Peruvian adults: a cone beam computed tomography study]. Odovtos. 2021;23(2):161-70. doi:10.15517/ijds.2021.44468 Spanish.
6. Sanz JL, Callado L, Mantale S, et al. Cone-beam computed tomography assessment of the prevalence and association of pulp calcification with dental and periodontal pathology: a descriptive study. J Clin Med. 2025;14(4):1373. doi:10.3390/jcm14041373
7. Movahhedian N, Haghnegahdar A, Owji F. How the prevalence of pulp stone in a population predicts the risk for kidney stone. Iran Endod J. 2018;13(2):246-50. doi:10.22037/iej.v13i2.18181
8. Gonçalves P, Candemil A, Petean I, et al. Identification and classification of pulp calcifications in posterior teeth according to dental condition using digital panoramic radiography and CBCT. Dentomaxillofac Radiol. 2024;53(5):308-15. doi:10.1093/dmfr/twae015
9. Chan F, Brown LF, Parashos P. CBCT in contemporary endodontics. Aust Dent J. 2023;68(S1):S39-55. doi:10.1111/adj.12995
10. Sanz JL, Callado L, Mantale S, et al. Cone-Beam Computed Tomography assessment of the prevalence and association of pulp calcification with dental and periodontal pathology: a descriptive study. J Clin Med. 2025;14(4):1373. doi:10.3390/jcm14041373
11. Kaabi HH, Riyahi AM, Al-Maflehi NS, et al. Three-dimensional analysis for detection of pulp stones in a Saudi population using cone beam computed tomography. J Oral Sci. 2023;65(4):257-60. doi:10.2334/josnusd.23-0091
12. Ravanshad S, Khayat S, Freidonpour N. The prevalence of pulp stones in adult patients of Shiraz Dental School, a radiographic assessment. J Dent. 2015;16(4):356-61. PMID:26636125
13. Kalaji MN, Habib AA, Alwessabi M. Radiographic assessment of the prevalence of pulp stones in a Yemeni population sample. Eur Endod J. 2017;2(1):25. doi:10.5152/eej.2017.17024
14. Mirah MA, Bafail A, Shaheen S, et al. Assessment of pulp stones among Western Saudi populations: a cross-sectional study. Cureus. 2023;15(9):e46056. doi:10.7759/cureus.46056
15. Sezgin GP, Sönmez S, Kaplan T. Evaluation of the relation between the pulp stones and direct resto-

rations using cone beam computed tomography in a Turkish subpopulation. Restor Dent Endod. 2021;46(3):e34. doi:10.5395/rde.2021.46.e34

16. Srivastava KC, Shrivastava D, Nagarajappa AK, et al. Assessing the prevalence and association of pulp stones with cardiovascular diseases and diabetes mellitus in the Saudi Arabian population—A CBCT based study. Int J Environ Res Public Health. 2020;17(24):9293. doi:10.3390/ijerph17249293
17. Bains SK, Bhatia A, Singh HP, et al. Prevalence of coronal pulp stones and its relation with systemic disorders in northern Indian central Punjabi Population. ISRN Dent. 2014;2014(1):617590. doi:10.1155/2014/617590
18. Tassoker M, Magat G, Sener S. A comparative study of cone-beam computed tomography and digital panoramic radiography for detecting pulp stones. Imaging Sci Dent. 2018;48(3):201-12. doi:10.5624/isd.2018.48.3.201