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CHARACTERISTICS OF RADIOLUCENT LESIONS ASSOCIATED WITH IMPACTED TEETH AT RSGM UNPAD

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ABSTRACT
Background: *Impacted teeth occur when teeth fail to erupt or cannot fully erupt along the dental arch in the normal pattern of dental growth. Untreated impacted teeth can cause pain, tooth decay, inflammatory lesions, odontogenic cysts, and tumors. Pathological lesions in impacted teeth that are not clinically visible are usually found on routine radiographic examinations. Panoramic radiography is used as an initial imaging technique to evaluate impacted teeth and associated lesions.* ***Purpose:*** *This study aims to see the characteristics of radiolucent lesions associated with impacted teeth based on panoramic radiographic archives of patients at RSGM Unpad.* ***Methods:*** *This is an observational descriptive study with purposive sampling technique using secondary data of panoramic radiographs from the Dental Radiology Installation RSGM Unpad. The radiographs were inverted to enhance the visualization of characteristics such as location, shape, borders and associations. The data is presented in the table of frequency and distribution.* ***Results:*** 346 samples of radiolucent lesions associated with impacted teeth were obtained from 8034 impacted teeth. There were 323 (93,4%) pericoronal lesions, 344 (99,4%) monolocular lesions, 218 (63%) had well-defined borders, and 345 (99,7%) lesions caused bone destruction. The prevalence of radiolucent lesions associated with impacted teeth is 4.3%. ***Conclusion:*** *The characteristics of radiolucent lesions associated with impacted teeth at the Dental Radiology Installation RSGM Unpad most common are pericoronal lesions, monolocular shape, well-defined borders, and the effect on the surrounding structure is bone destruction.*

Keywords: *Impacted, Panoramic Radiograph, Radiolucent Lesion*
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INTRODUCTION

Impacted teeth occur when the tooth has not or cannot erupt into the dental arch in its normal growth pattern.[1] This can occur due to lack of space in the dental arch, root dilaceration, trauma, ankylosis of primary teeth, mesial displacement of teeth due to premature loss of primary teeth, ectopic position of tooth buds, presence of inflammatory or pathological lesions, or genetic abnormalities preventing eruption.[1,2] The most commonly impacted teeth were the mandibular third molars and maxillary third molars, followed by the maxillary canines and mandibular premolars.[3] In general, patients do not know that they have impacted teeth and only find out when they go to the dentist because patients tend to go to the dentist when they feel pain, trismus, swelling and dizziness.[4]

Untreated impacted teeth can cause trismus, pain, pericoronitis, tooth decay, root resorption, odontogenic cysts and tumors.[4,5] The most frequently found lesions associated with impacted teeth are radiolucent lesions such as dentigerous cysts, keratocystic odontogenic tumors, ameloblastomas, and adenomatoid odontogenic tumors.[5,6] In addition, inflammatory radiolucent lesions such as pericoronitis and periapical abscess are also commonly found.[7,8] Common clinical findings in patients with pathological lesions include facial asymmetry due to enlarged lesions and pain indicating secondary infection.[3]

Pathological lesions on impacted teeth that are not seen clinically are usually found on routine radiographic examinations.[9] The characteristic and location of the impacted tooth and the associated radiolucent lesion are very important in establishing the diagnosis and in determining the treatment plan.[10] Based on the indications, panoramic radiographs can indicate lesions such as tumors, cysts, and other bone diseases, so panoramic radiographs are often used as an initial diagnostic feature in establishing the diagnosis of changes that occur in the maxillofacial structures.[11,12] One type of diagnostic processing radiographs is the analytic or systematic strategy which this approach relies on a step-by-step analysis

of all the imaging features of the abnormal finding so that a diagnosis can be made based on the findings: location, size and shape, borders, internal structure, and the effect of the lesion on surrounding structures.[13]

Based on the literature review, there are various types of radiolucent lesions associated with impacted teeth. However, in Bandung there has been no study about the characteristics of radiolucent lesions associated with impacted teeth. Because of the high incidence of impacted teeth, both accompanied or without symptoms which can eventually lead to various complications, the authors are interested in conducting research on the characteristics of radiolucent lesions associated with impacted teeth at RSGM Unpad.

METHODS

This study was conducted at Dental Radiology Installation at RSGM Unpad by taking secondary panoramic radiograph data in April 2023. This study has received ethical clearance No. 393/UN6.KEP/EC/2023 from the Research Ethics Commission of Padjadjaran University and a research permit from RSGM Unpad No. 595/UN6.RSGM/TU.00/2023. The population in this study were all panoramic radiograph records at the Dental Radiology Installation at RSGM Unpad in May 2019 – April 2023. The variables to be examined in this study were radiolucent lesions associated with impacted teeth based on panoramic radiograph archives in patients who came to RSGM Unpad. The criteria of sample inclusion were: panoramic radiographs of patients with impacted incisor, canine, premolar and molar, maxillary and also mandibular with radiolucent lesions; panoramic radiographs of pediatric and adult patients without limitation of age; diagnostically acceptable panoramic radiograph. The presence of a lesion that does not associated or not around the impacted tooth was excluded from this study. The obtained samples in this study amounted to 346 radiolucent lesions associated with impacted teeth from 304 panoramic radiographs.

The type of research used in this study is descriptive study with observational and documentation methods. The sampling technique is purposive sampling technique, where the selection of samples with specific characteristics is determined by the researcher based on the research objectives.[14,15] Sample size determination from an unknown population can be determined by the Lemeshow formula.[16,17] In this study, the confidence level was set at 90% with margin of error 10%. Calculating from this, the sample size was determined to be 67.24, rounded up to 68 samples.

The instruments in this study were panoramic radiograph archives at the Dental Radiology Installation at RSGM Unpad, CliniView Imaging Software 11.7, ImageJ software 1.53t, IBM SPSS software 25, Microsoft excel, laptops, stationery and dummy tables. Guidelines established by the researchers for determining the characteristics of radiolucent lesions associated with impacted teeth and radiodiagnosis are provided in Tables 1 and 2. The recorded data encompassed details such as name, age, gender, tooth nomenclature, impaction classification, type of radiolucent lesion, location, shape, border, association, and radiodiagnosis. The data were presented in tabular form showing frequencies and percentages.

All collected radiograph samples were analyzed using ImageJ software with the invert method which transformed the originally white images into black, and vice versa, thus enhancing the visibility of lesion borders. Images that were underexposed or too bright were also adjusted for contrast and brightness to enhance clarity. The results of the study underwent intraobserver and interobserver reliability tests using the Intraclass Correlation Coefficient (ICC) in SPSS.

RESULTS

The study was conducted by grouping the samples based on age, gender, classification of impaction, type of lesion, and characteristics of radiolucent lesions. The radiolucent lesions characteristics assessed included location, shape, border and association (effect on surrounding structures), followed by radiodiagnosis determination.

The results in Table 3 show that the total samples in this study was 346 radiolucent lesions associated with impacted teeth. In this study, 8034 impacted teeth were obtained from all panoramic radiographs.

The results of the study in Table 4 show the distribution of samples categorized based on age, gender and dental nomenclature, with percentage obtained by dividing the number with the total sample, which is 346 samples. Based on Table 4, the most common radiolucent lesions associated with impacted teeth were found in the early adult age group (26-35 years) there were 158 (45,7%) cases. Based on gender in Table 4, radiolucent lesions associated with impacted teeth were found 179 (51,7%) cases in males and 167 (48,3%) cases in females. Table 4 also shows that the most impacted teeth associated by radiolucent lesions are the mandibular third molars, specifically 38 had 177 (51,1%) cases and 48 had 164 (47,4%) cases.

Table 5 shows the distribution of radiolucent lesions associated with impacted teeth based on the classification of impacted teeth, where the most common lesion was found in the mandibular third

molars with Pell & Gregory Class II A classification, there were 203 (58,6%) cases.

Table 6 shows that the majority of radiolucent lesions found in this study are inflammatory lesions were 324 (93,6%) cases. Based on Table 6, cystic lesions were found in 22 (6,4%) cases and no tumor lesions were found.

Table 7 shows the variations in the characteristics of the location, shape, border and association of radiolucent lesions associated with impacted teeth. Based on location, 323 (93,4%) lesions were found in pericoronal. Based on the shape, 344 (99,4%) lesions were found to be monolocular. Based on the border of the lesions, 218 (63%) lesions with well-defined borders were found. Based on the association, 345 (99,7%) lesions resulted in bone destruction. This percentage was obtained by dividing the number of each lesion characteristic with the total sample, which is 346 samples.

Table 8 shows the distribution of radiodiagnosis of radiolucent lesions associated with impacted teeth. Out of 346 samples obtained, pericoronitis was the most radiolucent lesion associated with impacted teeth were 244 (70,5%) cases, followed by periodontal abscess 67 (1,.4%) cases, dentigerous cyst 23 (6,6%) cases, periapical abscess 11 (3,2%) cases and odontogenic keratocyst in 1 (0,3%) case.

Table 9 shows the results of the reliability test using the Intraclass correlation coefficient (ICC). The results of the intraobserver study where the researcher assessed twice, obtained excellent ICC value for the impaction classification variables, location of the lesion, shape of the lesion, border of the lesion, effects to surrounding structures, radiodiagnosis, while the ICC value for type of the lesion variable were classified as good. The results of the interobserver reliability test showed very good results for the variable impaction classification, type of lesion, location of the lesion, shape of the lesion, border of the lesion, effects to surrounding structures, while the radiodiagnosis variable showed good results.

Table 10 shows the radiodiagnosis distribution of radiolucent lesions associated with impacted teeth based on their classification. Pericoronitis in mandibular third molars with Pell & Gregory Class II A classification were the most common cases; there were 137 (39.6%) cases from 346 samples of radiolucent lesions found.

DISCUSSION

This study was conducted to determine the characteristics of radiolucent lesions associated with impacted teeth based on evaluation of the location, shape, border and the association or effect of the lesion on the surrounding structures. These characteristic findings are then used in determining the radiodiagnosis. This study also calculated the prevalence of radiolucent lesions associated with impacted teeth in Unpad RSGM patients.

Based on the results of the study in Table 3, there were 346 radiolucent lesions associated with impacted teeth. The total of impacted teeth obtained from the observation of all panoramic radiographs is 8034 impacted teeth. The prevalence of radiolucent lesions associated with impacted teeth was obtained by dividing the sample of radiolucent lesions associated with impacted teeth by the total impacted teeth, so the prevalence of radiolucent lesions associated with impacted teeth was obtained, that is 4.3%. This prevalence rate indicates the magnitude of the incidence of radiolucent lesions associated with impacted teeth from all incidents of impacted teeth.

Based on Table 3 it can be seen that the incidence of impaction and the incidence of radiolucent lesions associated with impacted teeth show an increase every year. However, there was a decrease in 2020 and 2023. This could be due to the uneven distribution of panoramic radiograph samples in 2020 due to Covid-19 pandemic where there was a drastic decrease in patients taking panoramic radiographs at Dental Radiology Installation at RSGM Unpad. Whereas in 2023 sampling will not be carried out for one full year because the research only lasts until April 2023.

The age group is divided into 9 groups based on age category according to the Ministry of Health of the Republic Indonesia.[22] The results of the study in Table 4 show that the most cases of radiolucent lesions associated with impacted teeth occurred in the early adult age group (26-35 years) with 158 (45.7%) cases and followed by the late adolescent age group (17-25 years) with 126 (36.4%) cases. This is in line with a study conducted by Al-Ramil et al which stated that the most impacted teeth occurred in the age range of 23-29 years.[23] The results of the study stated that the growth of the maxilla and mandible was completed at the age of 18-21 years in boys and 15-16 years in girls.[24] At the age of 26-35 years the jaw growth process and the eruption time of the teeth have been completed (17-25 years) so this can cause impacted teeth to be found most often. The age of 26-35 years is the age that is close to the normal eruption time, where the condition of impacted teeth that are not treated can cause complaints that indicate pathological lesions related to impacted teeth so that on panoramic radiographic examination many radiolucent lesions are found associated with impacted teeth.

Based on the results of the study in Table 4, it can be seen that the cases of radiolucent lesions associated with impacted teeth in male patients were higher than female patients at RSGM Unpad. This is in line with the results of a study conducted by

Karabas et al, there are 63.3% of radiolucent lesions associated with impacted teeth were found in males.[25] However, the results of this study are different from the results of studies in general which state that impacted teeth are most common in female patients.[26,27,28] Boys have longer growth periods and peaks than girls. Jaw growth in males continues during the eruption of the third molars thus providing a larger space for the third molars to erupt than jaw growth in females which usually stops when the third molars are just starting to erupt. In addition, men also have a larger jaw shape.[24,28,29] The longer jaw growth period and the larger jaw size in males compared to females can cause the incidence of impaction in males to be higher than impaction in females. The difference in the results of this study with previous studies could be caused by several other factors such as genetic factors, nutrition or premature tooth loss that affect jaw growth.[30,31]

The results of the study in Table 4 show that the highest incidence of radiolucent lesions associated with impacted teeth was found in 38 (51.1%), followed by 48 (47.4%). The results of Mohammed et al study showed slightly different results where pathological lesions were found mostly on tooth 48.[32] This study shows that impacted teeth most often occur in mandibular third molars. The growth pattern of the maxilla is influenced by the growth of the cranium where during growth the maxilla will be pushed forward and downward. The maxilla will grow to all dimensions and posterior growth occurs at the tuberosity thus increasing the space for the eruption of the permanent molars.[31] The existence of space due to the maxillary growth pattern causes the maxillary third molars to be impacted less frequently.

A study conducted by Haque et al stated that impacted teeth in position A (62.23%) and class II (55.99%) were found more frequently.[33] These findings are in accordance with the data in Table 5 where the Pell & Gregory class II A classification is the most common classification of impacted teeth in the findings of radiolucent lesions associated with impacted teeth. An impacted tooth in the A position means that the tooth has successfully erupted through the oral mucosa until it is parallel to the occlusal plane. Class II impaction conditions can occur due to a lack of jaw arch due to impaired jaw growth or obstructed third molar development so that the third molar teeth lack space during eruption.

Table 6 shows that the inflammatory lesions were the most radiolucent lesions associated with impacted teeth, there are 324 (93.6%) cases. This study has similarities with the results of the Alkhateeb and Bataineh studies, that the majority of periapical radiolucent lesions found were inflammatory lesions.[34] The gap under the operculum that is difficult to clean from debris can be a place that supports bacterial growth which then causes inflammation. Research by Al-Ramil et al stated that caries in impacted teeth is the second most common finding after pericoronitis as a pathological condition associated with impacted teeth.[23] The condition of impacted teeth accompanied by caries is also one of the causes of inflammatory lesions in the form of periapical abscesses.

The results of the study showed that the characteristics of radiolucent lesions associated with impacted teeth were predominantly pericoronal in 323 (93.4%) cases, monolocular in 344 (99.4%) cases, well-defined borders in 218 (63%) cases and association with bone destruction in 345 (99.4%) cases. 7%) cases. The characteristics of the location are consistent with previous research findings, where the most common pathological condition found was pericoronal radiolucency at 31.7%.[34] Radiolucency around the pericoronal area is most commonly associated with impacted teeth during radiographic examination and can represent either a normal or pathological condition.[35] A fully formed tooth in the jaw has a pericoronal sac or follicle adjacent to the crown of the impacted tooth which is composed of fibrous connective tissue and often contains residual odontogenic epithelium.[36] The presence of tooth follicles that experience cystic degeneration in impacted teeth can be a trigger for a pathological condition such as a cyst. The presence of trauma or an inflammatory response from the mucosa that covers part of the impacted tooth is also the cause of the appearance of pericoronal radiolucent lesions such as pericoronitis.

Characteristics of monolocular lesions are more dominant, namely 99.4% compared to 0.6% multilocular. This study is in line with the previous study by Araujo et al, namely 89.6% of the lesions found in the jaws were monolocular lesions.[37] The characteristic borders of the lesion found in this study was 63% well-defined. The results of this study are in line with previous studies where there were 90.1% radiolucent lesions with well-defined borders associated with impacted teeth.[38] The appearance of monolocular lesions usually represents a benign process that is non-aggressive and slow growing.[39] The results of the study said that almost all lesions with well-defined borders were benign lesions, while lesions with diffuse borders tended to be aggressive, acute inflammation or malignancy.[40] Based on the characteristics of the shape and borders of the lesions, it can be concluded that the findings in this study were mostly benign lesions. However, radiographic assessment alone cannot diagnose the lesion with certainty, so it needs to be seen from other aspects.

In this study, the majority of the effects of radiolucent lesions associated with impacted teeth on the surrounding structures were bone destruction, namely 99.7% of cases. Radiolucent appearance in

hard tissue occurs due to decreased mineralization, decreased thickness, or a combination of both that occurs due to trauma, inflammation, cystic lesions, neoplastic, or due to systemic conditions.[38] The results of this study are in line with previous studies which found cortical bone thinning of 88.1% and cortical bone perforation associated with lesions of 89.1% which are common radiographic findings in benign lesions.[38] This shows that the lesion in this study caused bone destruction allowing the passage of X-rays unhindered which then produced a radiolucent image on the radiographic results.

Based on observations of the characteristics of the lesions assessed from panoramic radiographs, this study found pericoronitis as the most common lesion, namely 244 (70.5%) cases. This study is in line with previous studies which stated that pericoronitis was the most common pathological finding associated with impacted third molars, amounting to 38.9% of cases.[41] The results of the study by Al-Ramil et al also stated that the largest case found related to impacted teeth was pericoronitis, which was 60.6% of cases.[23] As the tooth begins to erupt, the oral mucosa is perforated by the tooth crown, resulting in a narrow gap between the tooth crown and the mucosa which is also called the pericoronary space, which is an ideal shelter for the accumulation of bacteria and food debris.[42,43] Food debris and bacteria trapped in the operculum (soft tissue covering a partially erupted tooth) as well as secondary trauma from opposing occlusion can cause inflammation, which is known as pericoronitis.

Based on this study, the most common radiolucent lesions associated with impacted teeth were pericoronitis in mandibular third molars with the Pell & Gregory class II A impaction classification. This is in line with the study conducted by Katsaraou et al, which states that based on its position, pericoronitis occurs most often in Pell & Gregory class II (65.5%) level A (93.75%).[44] Based on the relationship between the ramus and available space, teeth with class II impaction have a space between the distal second molar and ramus that is smaller than the mesiodistal width of the third molar.[19] Lack of space in class II impaction results in part of the teeth being inside the bone making it difficult to cleaned. This then causes the accumulation of food scraps and bacteria which can then cause pericoronitis. Based on the depth, level A impaction means that the occlusal plane of the third molar is the same as the occlusal plane of the second molar[18], where this situation results in teeth in position A being more vulnerable to trauma from opposing teeth which can then cause inflammation of the soft tissue covering the teeth or is called pericoronitis.

The ICC test was conducted to determine the reliability or consistency of the results of intra and inter observer data analysis. ICC test with a value of <0.5 means poor reliability, 0.50-0.75 means moderate reliability, 0.76-0.9 means good reliability, and >0.90 means excellent reliability.[45] The results of the intraobserver study on impaction classification variables, location of the lesion, shape of the lesion, borders of the lesion, effects on surrounding structures and radio diagnosis obtained very good ICC values in the range of 0.901-1, while the ICC values for the type of lesion variables were classified as good, namely 0.873. This means that researchers are consistent in conducting research. The results of the interobserver reliability test showed very good results for the variable impaction classification, type of lesion, location of the lesion, shape of the lesion, borders of the lesion, effects on surrounding structures, which was in the range of 0.909-1, which means that one observer with another has the same understanding of operational definitions. The radiodiagnosis variable from the interobserver test results showed a relatively good result, namely 0.849.

The limitation of this study is that the study only used secondary data on two-dimensional panoramic radiographs in assessing lesion characteristics and determining radiodiagnosis. Two-dimensional assessment is less accurate because it cannot see the full extent of the lesion. Assessment of secondary data from panoramic radiographs cannot see clinical conditions directly. Future research is expected to be able to look at primary data on clinical conditions and anamnesis in order to produce a more accurate radiodiagnosis.

Pericoronitis is the most common occurrence in this study. Efforts that can be made by dentists in reducing the incidence of pericoronitis are educating patients about the importance of maintaining oral hygiene, including encouraging patients to carry out the habit of brushing their teeth twice a day. Operculectomy and removal of impacted third molars can also be performed to reduce the incidence of pericoronitis. Then a control visit is needed to evaluate the actions that have been taken.

In this study, the characteristics of radiolucent lesions associated with impacted teeth at the Dental Radiology Installation at Dental Radiology Installation at RSGM Unpad can be concluded that the most common are pericoronal lesions, monolocular in shape, well-defined borders and the effects of the lesion on the surrounding structures is bone destruction, with a prevalence of radiolucent lesions associated with impacted teeth is 4.3%.

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Table 1. Researcher's guidelines for determining radiodiagnosis[18,19]

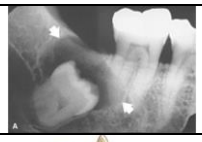
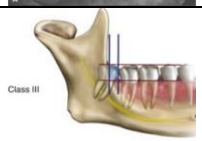
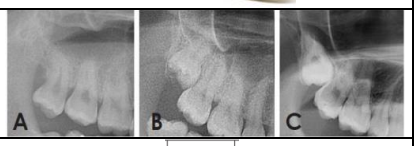
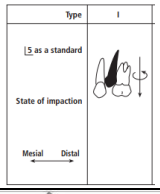
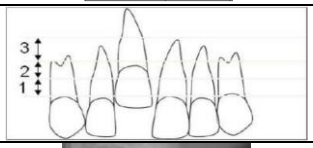
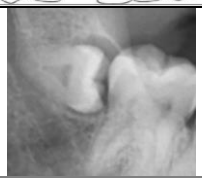
Variable	Definition	Picture
Radiolucent lesion	The lesions which in imaging results on the film appear as dark shadows in the jaw area and around impacted teeth because the tissue structure absorbs less x-rays.	
Impacted teeth	The condition of the teeth that were submerged or not erupted either partially or completely after the normal tooth eruption period.	
Pell and Gregory classification	Classification of third molars based on the relative depth of the teeth and the relation of the ramus to the available space in the jaw.	
Classification of impacted maxillary third molars	Classification of maxillary third molars based on their level of eruption.	
Yamamoto's classification	Classification of the canines based on the orientation of the long axis of the maxillary canines in relation to the occlusal plane.	
Yavuz Büyükurt classification	The classification of the canines is based on their depth within the alveolar bone.	
Classification of impacted second premolar	Classification of the second premolar based on the tooth axis and occlusal plane.	
Smailiene classification	Classification of incisors based on the vertical depth of the teeth.	
Classification of impacted supernumerary teeth	Classification of impaction based on the position of the supernumerary teeth.	

Table 2. Characteristics of radiolucent lesions associated with impacted teeth[20,21]

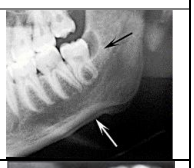
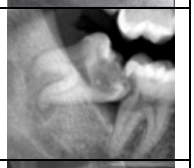
Lesion Type	Internal Structure	Lesion Border	Effects on Surrounding Structures	Picture
Pericoronitis	Radiolucent	Diffusely circumscribed, with a gradual transition from the normal trabecular pattern into sclerotic areas	Typical changes of sclerosis and rarefaction of the surrounding bone; formation of new periosteal bone at the inferior cortex	
Periodontal abscess	Radiolucent	Diffuse	Bone resorption	
Periapical abscess	Radiolucent	Diffuse	Widened periodontal tissue; lamina dura disappear	
Dentigerous cyst	Radiolucent	Smooth; well-defined; often corticated	Displacement of adjacent teeth; absorb teeth; buccal or medial expansion causes facial asymmetry	
Odontogenic keratocyst	Radiolucent	Smooth; scalloped; well-defined and corticated	Minimal displacement of teeth, rarely absorbs adjacent teeth; extensive expansion; thinning of the mandibular cortex	
Calcifying odontogenic cyst	Radiolucent/mixed radiolucent-radiopaque	Well-defined; corticated	Displacement adjacent teeth; can absorb the roots of adjacent teeth	
Buccal bifurcation cyst	Radiolucent	Well-defined; corticated	Displacement and resorption of adjacent teeth; buccal cortical plate expansion; formation of new periosteal bone	
Adenomatoid Odontogenic Tumor	Radiolucent/mixed (radiopaque foci)	Well-defined corticated or sclerotic	Displacement of adjacent teeth rarely absorbs the root of the tooth.	
Ameloblastoma	Radiolucent with internal radiopaque septa	Well-defined, corticated	Displacement, mobility, resorption of adjacent teeth; extensive expansion in all dimensions; bone destruction	

Table 3. The data of impacted teeth with and without lesions in 2019-2023

Year	Impaction	Non-lesional impaction	Lesion impaction	Radiopaque impaction	Radiolucent impaction
2019	1432	1345	87	6	81
2020	1074	1034	40	4	36
2021	2236	2132	104	10	94
2022	2482	2382	100	3	97
2023	810	770	40	2	38
Total	**8034**	**7663**	**371**	**25**	**346**

Table 4. Distribution of radiolucent lesions associated with impacted teeth by age, gender and dental nomenclature (n=346)

Variable		Total (n)	Percentage (%)
Age (years)			
	Toddler (0-5)	0	0
	Childhood (5-11)	0	0
	Early youth (12-16)	0	0
	Late youth (17-25)	126	36,4
	Early adulthood (26-35)	158	45,7
	Late adulthood (36-45)	40	11,5
	Early elderly (46-55)	20	5,8
	Late elderly (56-65)	2	0,6
	Seniors (>65)	0	0
Gender			
	Man	179	51,7
	Woman	167	48,3
Dental nomenclature			
	13	1	0,3
	28	2	0,6
	38	177	51,1
	48	164	47,4
	S (Supernumerary)	2	0.6

Table 5. Distribution of radiolucent lesions associated with impacted teeth based on impaction classification

Impaction classification		Total (n)	Percentage (%)
C RA			
	Yamamoto Classification Type II	1	0.3
M3 RA			
	Level A	0	0
	Level B	1	0,3
	Level C	1	0,3
M3 RB			
	Pell & Gregory Class I A	0	0.3
	Pell & Gregory Class I B	2	0,6
	Pell & Gregory Class I C	1	0,3
	Pell & Gregory Class II A	203	58,6
	Pell & Gregory Class II B	110	31,8
	Pell & Gregory Class II C	9	2,6
	Pell & Gregory Class III A	9	2,6
	Pell & Gregory Class III B	6	1,7
	Pell & Gregory Class III C	1	0,3
S (Supernumerary)			
	Distomolar	2	0.6
	Total	**346**	**100**

Table 6. Distribution of the types of radiolucent lesions associated with impacted teeth

Type of radiolucent lesion	Total (n)	Percentage (%)
Inflammation	324	93,6
Cyst	22	6,4
Tumor	0	0
Total	**346**	**100**

Table 7. Characteristics of radiolucent lesions associated with impacted teeth

	Lesion characteristics	Total (n)	Percentage (%)
Location	Pericoronal	323	93,4
	Periapical	13	3,7
	Pericoronal & Periapical	10	2,9
Shape	Monolocular	344	99,4
	Multilocular	2	0,6
Border	Well-defined	218	63
	Diffuse	128	37
Association	Bone destruction	345	99,7
	Inferior alveolar canal destruction	1	0,3

Table 8. Radiodiagnosis distribution of radiolucent lesions associated with impacted teeth

Radiodiagnosis	Total (n)	Percentage (%)
Pericoronitis	244	70,5
Periodontal abscess	67	19,4
Periapical abscess	11	3,2
Dentigerous cyst	23	6,6
Odontogenic keratocyst	1	0,3
Total	**346**	**100**

Table 9. Intraobserver and interobserver reliability test results

Variable	Evaluator	ICC	ICC interpretation
Impaction classification	Intraobserver	1,000	Excellent
	Interobserver	0,999	Excellent
Lesion type	Intraobserver	0,873	Good
	Interobserver	0,909	Excellent
Location	Intraobserver	1,000	Excellent
	Interobserver	1,000	Excellent
Shape	Intraobserver	1,000	Excellent
	Interobserver	1,000	Excellent
Border	Intraobserver	0,962	Excellent
	Interobserver	1,000	Excellent
Association	Intraobserver	1,000	Excellent
	Interobserver	1,000	Excellent
Radiodiagnosis	Intraobserver	0,901	Excellent
	Interobserver	0,849	Good

Table 10. Categories of radiolucent lesions associated with impacted teeth based on impaction classification

Radiodiagnosis	Tooth	Impaction classification	Total (n)	Percentage (%)
Pericoronitis	M3 RA	Level B	1	0,3
		Level C	1	0,3
	M3 RB	Pell & Gregory Class I B	2	0,6
		Pell & Gregory Class I C	1	0,3
		Pell & Gregory Class II A	137	39,6
		Pell & Gregory Class II B	88	25,4
		Pell & Gregory Class II C	1	0,3
		Pell & Gregory Class III A	7	2
		Pell & Gregory Class III B	5	1,4
	S	Distomolar	1	0,3
Periodontal abscess	M3 RB	Pell & Gregory Class II A	48	13,9
		Pell & Gregory Class II B	16	4,6
		Pell & Gregory Class III A	2	0,6
		Pell & Gregory Class III C	1	0,3
Periapical abscess	M3 RB	Pell & Gregory Class II A	11	3,2
Dentigerous cyst	C RA	Yamamoto Classification Type II	1	0,3
	M3 RB	Pell & Gregory Class II A	7	2
		Pell & Gregory Class II B	6	1,7
		Pell & Gregory Class II C	7	2
		Pell & Gregory Class III B	1	0,3
	S	Distomolar	1	0,3
Odontogenic keratocyst	M3 RB	Pell & Gregory Class II C	1	0,3
Total			**346**	**100**

Formula 1. Prevalence of radiolucent lesions associated with impacted teeth

$$Prevalence = \frac{Radiolucent\ lesions\ associated\ with\ impacted\ teeth}{Total\ impacted\ teeth} \quad (1) \quad = \frac{346}{8034}\ x\ 100\% = 4{,}3\%$$