

Frequency of jaw pathologic lesions related to impacted teeth in Isfahan Dental School, Iran

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Original Article

Abstract

BACKGROUND AND AIM: The impacted teeth are an important matter in dental science and one of the most common reasons of surgery in dental offices. Impacted teeth may lead to decay, pulp and periodontal disease, root resorption of adjacent teeth, and odontogenic cysts and tumors. The purpose of this study was to evaluate the frequency of pathological lesions associated with impacted teeth.

METHODS: In this descriptive-analytical study, all registered samples with the lesions related to impacted teeth in the patients who referred to the Department of Oral and Maxillofacial Pathology, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran, were reviewed from 1991 to 2020. All necessary information including age, gender, location of the lesion in the jaw, clinical and radiographic features (if described), differential diagnosis, and type of the lesion was recorded from the files. Then, the obtained information was entered in SPSS statistical software and statistically analyzed using chi-square test and Fisher's exact test. Statistical significance level was considered at $P < 0.05$.

RESULTS: Out of 11964 cases in the 30-year period, 576 cases (4.81%) were related to impacted teeth lesions. The highest frequency of pathologic lesions accompanied with impacted teeth was dentigerous cyst (76.6%) and the lowest frequency was related to ameloblastic fibroodontoma (0.2%). The most common odontogenic tumors were odontoma (6.6%) and ameloblastoma (1.6%), respectively. The frequency of lesions was higher in mandible (64.6%) than maxilla. Most lesions were observed in patients less than 20 years of age.

CONCLUSION: Although the frequency of odontogenic lesions with impacted teeth was low, many patients did not have any sign or symptom. Therefore, clinical assessment and follow-up are not sufficient and radiographic and clinicopathological analysis is necessary for correct diagnosis and treatment.

KEYWORDS: Pathology; Tooth; Jaw

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Impacted teeth are considered as a pathological problem; this means that the tooth will not be in its functional position at the appointed time. The most common impacted teeth are maxillary third molars, maxillary canines, and mandibular premolars.^{1,2} Multiple local factors such as dense overlying bone, supernumerary teeth, aberrant tooth buds, long-term retention of deciduous teeth, and small dental arch affect the impaction of teeth.

Systemic factors including Down syndrome, cleidocranial dysplasia (CCD), and hormonal changes are effective in causing impacted teeth.³ Impacted teeth may be asymptomatic in the clinical feature. But the most common symptoms are trismus, pain, pericoronitis, tooth decay, root resorption, and odontogenic cysts and tumors. Some studies have reported different frequency of gender, age, and location of odontogenic lesions and their frequency in association with impacted teeth.

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In some studies, the most common lesion associated with impacted teeth has been dentigerous cysts, but more invasive lesions such as odontogenic keratocyst and ameloblastoma have been reported to be associated with impacted teeth.⁴⁻⁶ In a study by Sardar et al.,² pericoronitis and in the study by Patil et al.,⁷ dentigerous and ameloblastoma were reported as the most common lesions associated with impacted teeth. In addition, a study by Shoaee et al. showed that the highest prevalence of lesions associated with impacted teeth was related to dentigerous cyst (46.6%), odontogenic keratocyst (29.8%), and ameloblastoma (9.2%), respectively.⁸

Given that some odontogenic cysts and tumors can become malignant and aggressive lesions in some cases, the aim of this study was to evaluate the frequency of pathological lesions associated with impacted teeth in the samples registered in School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran, in a 30-year period (between 1991 and 2020).

Methods

In this cross-sectional study, all files recorded with impacted teeth related to patients who referred to the Department of Oral and Maxillofacial Pathology of Isfahan School of Dentistry in the last 30 years from 1991 to 2020 were reviewed. At the beginning of the study, the most common odontogenic cysts and tumors based on the textbooks of oral pathology were considered to be calcifying odontogenic cyst, adenomatoid odontogenic tumor (AOT), lateral periodontal cyst, calcifying epithelial odontogenic tumor, dentigerous cyst, odontogenic keratocyst, ameloblastoma and variants, odontogenic fibroma, myxoma, and odontoma. The presence or absence of odontogenic lesions was considered as a dependent variable and the presence of the impacted tooth as exposure. The patients with a definitive diagnosis of odontogenic cyst or tumor associated with impacted teeth were included in this study. The cases with uncertain

diagnoses and missing data were excluded from the study. All patients' records were reviewed by the research director and two oral pathologists. All necessary information including age, gender, location of the lesion, clinical and radiographic features (if described), differential diagnosis, and type of the lesion was recorded from the files. Then, the obtained data were entered in SPSS software (version 22, IBM Corporation, Armonk, NY, USA) and statistically analyzed using chi-square test and Fisher's exact test. Statistical significance level was considered at $P < 0.05$.

Results

Out of 11964 patients in the Department of Oral and Maxillofacial Pathology in a 30-year period (from 1991 to 2020), 576 cases (4.81%) were related to the lesions associated with impacted teeth. The highest frequency of pathologic lesions associated with impacted teeth was related to dentigerous cysts (76.6%) and the lowest one was related to ameloblastic fibroadontoma (0.2%). The most common odontogenic tumors were odontoma (6.6%) and ameloblastoma (1.6%). The most common lesion associated with impacted teeth recorded by clinicians based on clinical and radiographical features was dentigerous cyst (65.3%), while Pindborg tumor (0.3%) had the lowest frequency in differential diagnoses of impacted teeth lesions (Table 1). The frequency of these lesions was higher in the mandible (366, 63.5%) than maxilla (210, 36.5%). The lesions were more present on the right side of the mandible compared to the left side. The lesions with impacted teeth was higher in male individuals (330, 57.7%) than female ones (246, 42.7%).

According to this study, most of the reports received along with the tissue sample from the clinicians recorded in the Department of Oral Pathology lacked clinical features of the lesion (333, 57.8%), which indicates that clinicians did not pay attention to this issue. However, most lesions with impacted teeth (142, 24.7%) had swelling in the clinical feature.

Table 1. Frequency of lesions with impacted teeth based on gender and mean age of patients

Histological diagnosis	Men	Women	Age (year)	Age	Age	Total
	n (%)	n (%)	Mean \pm SD	(min)	(max)	n (%)
Dentigerous cyst	256 (77.6)	185 (75.2)	23.19 \pm 15.68	4	92	441 (76.6)
Odontogenic keratocyst	33 (10.0)	23 (9.3)	25.29 \pm 12.46	8	62	56 (9.7)
Odontoma	18 (5.5)	20 (8.1)	21.24 \pm 11.35	5	57	38 (6.6)
Ameloblastoma	4 (1.2)	5 (2.0)	30.22 \pm 21.18	9	80	9 (1.6)
Unicystic ameloblastoma	4 (1.2)	1 (0.4)	29.80 \pm 11.34	20	49	5 (0.9)
Ameloblastic fibroma	4 (1.2)	1 (0.4)	37.80 \pm 13.31	16	47	5 (0.9)
Orthokeratinized odontogenic cyst	3 (0.9)	2 (0.8)	24.00 \pm 3.39	20	29	5 (0.9)
Odontogenic myxoma	3 (0.9)	1 (0.4)	15.50 \pm 5.26	8	20	4 (0.7)
Follicular hyperplasia	0 (0)	3 (1.2)	18.00 \pm 5.29	12	22	3 (0.5)
Odontogenic fibroma	1 (0.3)	2 (0.8)	20.00 \pm 8.88	10	27	3 (0.5)
Calcifying odontogenic cyst	1 (0.3)	1 (0.4)	8.50 \pm 4.95	5	12	2 (0.3)
Pindborg tumor	1 (0.3)	1 (0.4)	13.50 \pm 2.12	12	15	2 (0.3)
Odontogenic cyst	1 (0.3)	1 (0.4)	13.50 \pm 2.12	12	15	2 (0.3)
Ameloblastic fibroodontoma	1 (0.3)	0 (0)	13.00 \pm 0.00	13	-	1 (0.2)
Total (based on gender)	330 (100)	246 (100)	23.34 \pm 15.03	4	92	576 (100)

SD: Standard deviation

According to Fisher's exact test, the frequency of the lesions with impacted teeth based on the clinical features was statistically significant ($P < 0.001$) (Table 2).

The most common lesions with impacted teeth (397, 69%) had a radiolucent appearance. Furthermore, 28 cases (4.8%) with radiopaque feature, and 49 cases (8.5%) with mixed feature (17.7%) were recorded. It should be noted that 102 samples (17.7%) without information about the radiographic view of the lesion were recorded in the file. Chi-square test showed that there was a

significant difference between the lesions with impacted teeth based on radiographic feature ($P < 0.001$).

The most common lesions (314, 54.5%) were in the patients aged less than 20 years and only 15.3% of the lesions were observed in the patients aged over 40 years. There was no significant difference between the mean age of male (23.81 \pm 14.85) and female (22.70 \pm 15.28) patients ($P = 0.386$). According to t-test, there was no significant difference between the frequency of lesions with impacted teeth based on total mean age ($P = 0.087$).

Table 2. Frequency of lesions with impacted teeth based on clinical features

Histological diagnosis	Without symptom	Swelling	Pain	Swelling and pain	Unknown
	n (%)	n (%)	n (%)	n (%)	n (%)
Dentigerous cyst	49 (79.0)	112 (78.9)	9 (47.4)	14 (70.0)	257 (77.2)
Odontogenic keratocyst	2 (3.2)	9 (6.3)	6 (31.6)	3 (15.0)	36 (10.8)
Odontoma	4 (6.5)	9 (6.3)	1 (5.3)	0 (0)	24 (7.2)
Ameloblastoma	0 (0)	1 (0.7)	0 (0)	1 (5.0)	5 (1.5)
Unicystic ameloblastoma	1 (1.6)	2 (1.4)	0 (0)	2 (10.0)	0 (0)
Ameloblastic fibroma	2 (3.2)	2 (1.4)	0 (0)	0 (0)	1 (0.3)
Orthokeratinized odontogenic cyst	0 (0)	1 (0.7)	2 (10.5)	0 (0)	2 (0.6)
Odontogenic myxoma	1 (1.6)	1 (0.7)	0 (0)	0 (0)	2 (0.6)
Follicular hyperplasia	1 (1.6)	0 (0)	1 (5.3)	0 (0)	1 (0.3)
Odontogenic fibroma	0 (0)	1 (0.7)	0 (0)	0 (0)	2 (0.6)
Calcifying odontogenic cyst	0 (0)	2 (1.4)	0 (0)	0 (0)	0 (0)
Pindborg tumor	0 (0)	1 (0.7)	0 (0)	0 (0)	1 (0.3)
Odontogenic cyst	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.6)
Ameloblastic fibroodontoma	1 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)
Total (based on clinical feature)	62 (100)	142 (100)	19 (100)	20 (100)	333 (100)
Total (based on total lesions)	10.8	24.7	3.3	3.5	57.8

Discussion

In recent years, extraction of impacted teeth especially asymptomatic third molars has been considered by many surgeons to prevent complications and pathological lesions.⁹ However, the need for asymptomatic impacted tooth surgery remains still questionable.^{10,11} In this study, 576 odontogenic lesions related to impacted teeth including 509 (88.3%) cysts and 67 (11.7%) tumors were reported, which is consistent with the results of some studies.¹²⁻¹⁴ The most common lesion observed with impacted teeth was dentigerous cyst (76.6%), which is similar to the results of most studies in Iran, Korea, and India.^{8,10,12-17} Furthermore, the most common lesions after dentigerous cysts were odontogenic keratocysts (9.7%), odontomas (6.6%), and ameloblastoma (1.6%), respectively, which is consistent with the results of some studies.^{8,14,16,18,19} While in the studies of Patil et al.⁷ in India, Seyedmajidi and Nafarzadeh¹⁵ in Iran, and Yildirim et al.²⁰ in Turkey, calcified odontogenic cyst and ameloblastoma were the most common lesions associated with impacted teeth after dentigerous cyst. The study of Mohammed et al. in South Africa also identified ameloblastoma and odontogenic keratocysts after dentigerous cysts as the most common lesions.²¹ Sagh Ravanian et al. reported dentigerous cyst, odontogenic keratocyst, calcified odontogenic cyst, odontoma, and ameloblastoma as the most common lesions with impacted teeth, respectively.¹² Similarly, ameloblastic fibroodontoma had the lowest frequency in this study. In the studies of Anand et al.,¹⁶ Mortazavi and Baharvand,¹⁹ and Mohammed et al.,²¹ Pindborg tumors had the lowest frequency. In some studies, odontogenic fibroma, AOT, and unicystic ameloblastoma had the lowest frequency.^{7,14,15} The presence of an impacted tooth is a common finding in radiographic feature of all types of ameloblastoma.²² However, in the present study and Mohammed et al. study, the prevalence of multicystic ameloblastoma associated with impacted teeth is higher than

unicystic ameloblastoma. These results show the importance of paying attention to the clinical feature, early diagnosis, and treatment of lesions associated with impacted teeth.

In this study, hyperplastic dental follicle accounted for only 0.5% of the lesions, while this lesion was reported in 2.5% in the study of Patil et al.⁷ in India and 4.4% in the study of Mohammed et al.²¹ in South Africa. Lack of attention to radiographic appearance and recording of observations during surgery may be one of the reasons for inaccuracy in differentiating dental follicular hyperplasia from dentigerous cyst. Besides, many surgeons and clinicians do not refer to the soft tissue around the crown of impacted teeth for histopathological examination after extracting impacted tooth, and therefore, many lesions will not be diagnosed. In this study, dentigerous cysts (65.3%) and odontogenic keratocysts (10.8%) had the highest frequency of differential diagnoses based on clinical and radiographic features and 8% of lesions were reported as odontogenic cysts.

In the present study, the frequency of lesions with impacted teeth in the mandible (64.6%) was higher than the maxilla (35.4%), which is similar to the results of other studies.^{8,10,12,14,15,19,23} Furthermore, the frequency of lesions reported in this study based on right or left jaws was similar to the results of the study by Kaomongkolgit and Tantanapornkul²⁴ in Thailand. Alfadil and Almajed reported that the frequency of impacted teeth on the right side of the jaw was more than that on the left side in Saudi Arabia population.¹¹ Racial factors may have made this difference in multiple studies.

In most studies, the impacted third molar has been reported as the most common tooth with odontogenic lesions.^{19,23} In our study, this frequency could not be investigated due to the lack of accurate recording of impacted teeth with lesions. Furthermore, the frequency of lesions with impacted teeth in male patients (57.3%) was higher than female individuals (42.7%), which is not consistent with the results of some studies.^{15,20} But these results

are consistent with most studies.^{2,8,10,12,14,19,21} Moreover, in the studies by Alfadil and Almajed¹¹ and Hassan,²⁵ the frequency of impacted teeth was expressed equally between men and women.

In this study, 31.5% of lesions related to impacted teeth had clinical symptoms which swelling of the affected area was the most common symptom. It should be noted that the clinical appearance of the most studied samples (57.8%) was not recorded in their files by the clinician or surgeon. This results showed the need for more information and paying attention to them. In the study by Patil et al., 72.7% of lesions with impacted teeth had clinical symptoms, especially pain and swelling.⁷ In the study of Alamgir et al., pain, swelling, trismus, and tenderness of the affected area were reported as the common clinical symptoms.¹³ In the study of Kim et al., pain and discomfort in the patients made them to visit a dentist.¹⁰

In the present study, about 79% of dentigerous cysts had no clinical symptoms, which indicates the importance of clinical and radiographic examination for timely treatment. However, there are still conflicting reports about extracting impacted teeth without clinical symptoms.¹ In the study of Alfadil and Almajed, only 33.2% of the lesions had symptoms.¹¹ Pain, infection, pericoronitis, caries, pathological lesions, the effect on adjacent teeth, and prosthetic or orthodontic treatments were reasons for extracting impacted teeth. However, guidelines for indications for impacted third molar tooth surgery have been provided by the National Institute of Clinical Excellence.²⁶ But there is also evidence of pathological lesions around asymptomatic impacted teeth that many researchers consider it necessary to remove them.²⁷ The other reasons for prophylactic surgery of impacted teeth include preventing dental arch crowding, reducing the decay of adjacent teeth, increasing the difficulty and complications of surgery with age, reducing the risk of mandibular angle fractures, and the lack of significant role of oral third molars.⁷

One of the most important tools for diagnosing impacted teeth and related lesions is radiography.¹² In this study, 69% of the lesions had a radiolucent appearance, among which the lesions with impacted teeth had a significant difference based on radiographic appearance. One of the reasons for this result was the presence of odontoma, with radiopacity (96.6%) and mixed (18.4%) feature in radiographic view, which is consistent with the results of some studies.^{12,15,16,27} In general, increasing the radiolucency size around the crown of impacted teeth is very important to indicate the removal of asymptomatic impacted teeth.⁷ However, in line with our study, lesions such as calcified odontogenic cysts, Pindborg tumor, ameloblastic fibroodontoma, and odontoma can show foci of opacity regions with radiolucency that help in differential diagnosis.¹⁹

In the present study, the highest frequency of lesions related to impacted teeth was observed in the age group of less than 20 years and the frequency of these lesions decreased with age, which is consistent with the results of the study by Mohammed et al.²¹ In addition, the highest frequency of these lesions has been reported in the second decade,^{14,19} while most studies have reported the highest frequency of these lesions in the age group of 20-30 years.^{7,14,19-21,26} Kim et al. reported that the highest frequency of impacted teeth was in the age group of 21-25 years and the lowest one was in the age group over 41 years in Korean population.¹⁰ In our study, the mean age of the patients was 23.34 ± 15.03 years and in the study of Alfadil and Almajed, the mean age of patients with impacted teeth was 30.67 ± 8.98 years in the Saudi Arabia population.¹¹ The factors that make the difference in the frequency of lesions can be related to environmental factors, genetic factors, and socio-economic status. The frequency of regular visits to the dentist, especially in childhood, can affect the frequency of lesions with impacted teeth. Early extraction of high-risk impacted teeth can prevent pathological lesions. According to studies, in

the most cases of extraction of impacted teeth only after pathological lesion or for prosthetic treatments of patients who are older, the risk of serious complications will increase significantly compared to younger ages. Therefore, prophylactic surgery has been an appropriate treatment for many researchers. Besides, odontogenic lesions with latent behavior can become invasive lesions in patients aged over 50 years.¹⁰ However, according to the results of this study, the lesions with impacted teeth decreased with age, which can be considered as one of the reasons for the discovery of most lesions in the first and second decades.

In our study, there was no significant difference between the mean age of patients based on gender ($P < 0.05$), which is similar to the study of Sina et al. in Tabriz, Iran.¹⁴ However, in the study of Shoaee et al. in Tehran, Iran, similar to the present study, female patients with impacted teeth at a younger age were more prone to odontogenic lesions than male individuals.⁸ According to the results of the present study and other studies, the development of odontogenic lesions with impacted teeth one or two decades earlier in patients living in developing countries compared to those living in developed countries has been seen to determine the cause of extensive studies.²¹

Mortality rates increase with age due to increased risk of infection, complications of local anesthesia and surgery including

damage to the mandibular nerve, the need for bone grafts, and increase of immobilization of the mandible. Therefore, the advantages and disadvantages of prophylactic extraction of asymptomatic impacted teeth in patients should be considered. Although there are no definitive guidelines for the treatment of impacted teeth, recent studies have shown that pericronal changes especially in impacted molars are unpredictable.⁷

Lack of accurate recording of some information in patients' files has been one of the limitations of this study.

Conclusion

The most common odontogenic cyst with impacted teeth was dentigerous cyst and the most common tumor was odontoma. Although the frequency of odontogenic cysts and tumors with impacted teeth is relatively low, many patients with pathological lesions had no clinical symptoms. Therefore, radiographic and clinical examination is necessary to follow up patients.

Conflict of Interests

Authors have no conflict of interests.

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