Original Article / Özgün Araştırma

Radiographic and Histopathologic Evaluation of Radiolucent Lesions Involving Impacted Teeth: A Multicenter Study

Gömülü Diş İçeren Radyolüsent Lezyonların Radyografik ve Histopatolojik Değerlendirilmesi: Çok Merkezli Bir Çalışma

Zeynep Fatma Zor[1], Zühre Akarslan[2], Nur Hacıosmanoğlu[3], Yavuz Tolga Korkmaz[4], Cenk Durmuşlar[5], Emre Barış[6], Saadettin Kayıpmaz[7], İsmail Saygın[8], Murat İçen[9], Doğan Gün[10], Nuray Bağcı[2], İlkay Peker[2]

[1]Gazi University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Ankara, Turkey
[2]Gazi University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Ankara, Turkey
[3]Ankara University Faculty of Dentistry, Department of Oral and Radiology, Ankara, Turkey
[4]Karadeniz Technical University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Trabzon, Turkey
[5]Bülent Ecevit University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Zonguldak, Turkey
[6]Gazi University Faculty of Dentistry, Department of Oral Pathology, Ankara, Turkey
[7]Karadeniz Technical University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Trabzon, Turkey
[8]Karadeniz Technical University Faculty of Medicine, Department of Pathology, Trabzon, Turkey
[9]Bülent Ecevit University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Zonguldak, Turkey
[10]Bülent Ecevit University Faculty of Medicine, Department of Pathology, Zonguldak, Turkey

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Anahtar Kelimeler
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Address for Correspondence/Yazışma Adresi:
Nuray Bağcı Asst,
Gazi University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Ankara, Turkey
Phone : 0544 715 83 76
E-mail : dtnuraybagci@gmail.com
ORCID ID: orcid.org/0000-0001-9362-723X

Abstract

Objective: The purpose of this retrospective study was to evaluate the radiographic and histopathologic features of the pathologic lesions associated with an impacted tooth in the maxilla and mandible of patients who were admitted to three different university hospitals located in different cities.

Materials and Methods: One hundred one patients (36 females and 65 males) aged between 8 and 67 and who have radiolucent lesions associated with the impacted teeth were included in this study. Data related to the age and gender of the patients, and the findings of cone-beam computed tomography, and histopathologic diagnosis of the lesions were recorded and analyzed.

Results: Majority of the lesions were in the posterior region of the mandible (62.4%), related to the mandibular third molars (59.4%), and were diagnosed as a dentigerous cyst. The most common features of the lesions were unilocular radiolucency (91.1%), well-circumscribed (90.1%), and expansive (85.1%). A statistically significant relationship was found between the migration of the impacted tooth/teeth related to the lesion ($p<0.05$) and the expansion of the lesion ($p<0.01$) according to gender. A statistically significant relationship was found between the migration of the impacted tooth/teeth related to the lesion ($p<0.05$) and the histopathological diagnosis of the lesion ($p<0.01$) according to age groups.

Conclusion: Knowing all of the clinical, radiological and histopathological features of the lesions provide the surgeon to reach the correct diagnosis. Thus, the doctors achieve high success in treatment with the right treatment plan.

Öz

Amaç: Bu retrospektif çalışmanın amacı, farklı şehirlerde bulunan üç farklı üniversite hastanesine başvuran hastaların üst ve alt çenesindeki gömülü diş ile ilişkili patolojik lezyonların radyografik ve histopatolojik özelliklerini değerlendirmektir.

Gereç ve Yöntemler: Bu çalışmaya gömülü diş ile ilişkili radyolüsent lezyonu olan 8-67 yaş aralığındaki 101 hasta (36 kadın ve 65 erkek) dahil edildi. Hastaların

yaşı ve cinsiyeti, lezyonların konik-ışınlı bilgisayarlı tomografi bulguları ve histopatolojik tanısı ile ilgili veriler kaydedildi ve analiz edildi.
Bulgular: Lezyonların çoğu mandibula posterior bölgede (%62,4), mandibular üçüncü molar dişlerle (%59,4) ilişkiliydi ve dentigeröz kist tanısı aldı. Lezyonlarda en fazla görülen özellikler uniloküler radyolüsensi (%91,1), iyi sınırlı (%90,1) ve ekspansif (%85,1) olması idi. Cinsiyete göre lezyon ile ilişkili gömülü diş/dişlerin migrasyonu ($p<0,05$) ve lezyonun ekspansiyonu ($p<0,01$) arasında istatiksel olarak anlamlı bir ilişki bulundu. Yaş gruplarına göre lezyon ile ilişkili diş/dişlerin migrasyonu ($p<0,05$) ve lezyonun histopatolojik tanısı ($p<0,01$) arasında istatiksel olarak anlamlı bir ilişki bulundu.
Sonuç: Lezyonların tüm klinik, radyolojik ve histopatolojik özelliklerinin bilinmesi cerrahın doğru tanıya ulaşmasını sağlar. Böylece hekimler doğru tedavi planı ile tedavide yüksek başarı elde ederler.

Introduction

Impacted teeth are one of the most common situations in dentistry. Insufficient space in the dental arch, malposition, and absence of eruption force are some etiologic factors for the impaction (1). Impacted teeth can be extracted because of inflammation and infection, cyst and tumors, destruction of adjacent teeth, periodontitis, caries, and etcetera (2). The most common impacted teeth are mandibular third molars followed by maxillary third molars, maxillary canines, and mandibular premolars, respectively. Approximately, one in every five mandibular third molars and maxillary third molars are impacted. Also, radiolucency around the crowns in radiographic examination are present in 37% of impacted mandibular third molars and 15% of maxillary third molars (1,2).

The crowns of impacted teeth are surrounded by a soft tissue called dental follicle. Radiographically, the dental follicle is a radiolucent space with a thin radiopaque border (1). Immune-histochemical studies showed that the dental follicle cells have a great potential for growth and proliferation (3). Thus, pathologic changes can occur from the dental follicle and it can be detected as an enlargement of the pericoronal space. Dentigerous cyst (DC) is the most common pathology associated with the dental follicle. Odontogenic keratocyst (OKC) and ameloblastoma are the other pathologies associated with impacted molars. Bifurcation cyst, glandular odontogenic cyst, calcifying epithelial odontogenic tumor, adenomatoid odontogenic tumor, ameloblastic fibroma, and ameloblastic fibro-odontoma are rarely seen in radiolucent lesions associated with impacted teeth (4).

Radiographic examination is routinely used to detect the presence or absence of any pathology associated with impacted teeth (5). Different types of cystic and cystic-appearing lesions can be easily detected by periapical, occlusal, and panoramic radiography. Adjunct to these radiographic techniques, cone-beam computed tomography (CBCT), computed tomography (CT), magnetic resonance imaging and scintigraphy are used for detailed three-dimensional imaging of the lesions (6). Especially CBCT provides three-dimensional images with axial, sagittal and coronal sections with a lower radiation dose compared to CT. CBCT is originally designed for the visualization of solid structures in the head and neck region because it produces a lower radiation dose with high spatial resolution. The clinical use of CBCT provides accurate information about the contents and borders of the lesions, their special relations with surrounding structures, and cortical expansion for which the conventional radiographic techniques are usually inadequate (7).

In the literature, there are a lot of studies about impacted teeth and the lesions (8-10). To the best of our knowledge, this paper is one of the very few multicenter studies that evaluate the pathologic lesions related with impacted teeth (11,12). In other multicenter studies, specific lesions have been evaluated. In contrast, in this study, the lesions associated with impacted teeth have been handled more comprehensively. The purpose of this retrospective study was to evaluate the radiographic and histopathologic features of the pathologic lesions associated with impacted tooth in maxilla and mandible of patients who were admitted to three different university hospitals located in different cities.

Materials and Methods

Data Collection

This multicenter study was conducted in three different university hospitals. Before starting the study, ethical approval was received (approval no:

36290600/63, date: 30.11.2015). This study was carried out in accordance with the principles of the Helsinki Declaration. CBCT images belonging to 101 patients (36 females and 65 males) having radiolucent lesions in conjunction with any impacted tooth/teeth were assessed. The CBCT images of patients who had a history of maxillofacial trauma, surgery, and artifacts were excluded from the study.

CBCT images in different centers were obtained by ProMax 3D Mid (Planmeca Oy, Helsinki, Finland), Morita Veraviewepocs 3D R100-CP (J Morita MFG Corp, Kyoto, Japan) and Kodak 9500 3D (Kodak Corp, Carestream Health, Rochester, New York) using parameters of 90 kilovoltage peak, 12-mile ampere, scanning time of 10.8-13.8 seconds and 0.4 mile meter voxel size according to imaging area. Sagittal, coronal, and axial CBCT sections of the radiolucent lesions in conjunction with any impacted tooth/teeth were evaluated in a quiet room with subdued ambient lighting, approximately 50 centimeters away from the screen by dentomaxillofacial radiologists with at least five years of experience. The dentomaxillofacial radiologists held a meeting to detect the evaluation criteria of the lesions before starting the evaluation process (Table 1). Surgical procedures of the lesions were performed by maxillofacial surgeons with at least seven years of experience. Histopathologic validations were carried out by pathologists with at least ten years of experience. Demographic data, CBCT findings and histopathologic validations of the patients were recorded.

Statistical Analysis

Obtained data were statistically analyzed by using SPSS program version 21.0 (SPSS Inc., Chicago, USA). The findings were categorized and statistically analyzed with descriptive statistics, crosstabs, chi-square tests and Fisher's Exact tests where appropriate. Statistical analyses were performed both in 95% and 99% confidence intervals. The patients were categorized into three age groups: 8-30 years old (<30 years old), 31-50 years old and 51 years old and over (51> years old) for the analysis.

Results

CBCT and histopathologic data belonging to 101 patients (36 females; 35.6% and 65 males; 64.4%) aged between 8 and 67 years (mean age ± standard deviation: 38.8±15.7) were evaluated in the study

Table 1. The evaluation criteria of the study

Demographics
1. Age
2. Gender
Features of the lesions
3. Location
a) Anterior region of the jaws
b) Posterior region of the jaws
4. Internal structure
a) Unilocular radiolucent
b) Multilocular radiolucent
5. Periphery
a) Well-defined
b) Scalloped shape
6. Impacted tooth/teeth in conjunction with the lesion
7. The relationship between impacted tooth/teeth and lesion
a) The lesion related with crown of the impacted tooth/teeth
b) The lesion related with root of the impacted tooth/teeth
c) The lesion related with both crown and root of the impacted tooth/teeth
8. Migration of impacted tooth/teeth in conjunction with the lesion
a) No migration
b) Migration towards buccal direction
c) Migration towards lingual/palatal direction
9. Expansion and direction of the lesion
a) Buccal expansion
b) Buccal-lingual or buccal-palatal expansion
c) Lingual or palatal expansion
10. Size of the lesion (mm)
11. Effects on surrounding anatomical structures
a) No effect
b) The lesion is adjacent to cortical boundary of anatomical structures
c) The lesion is related with surrounding anatomical structures
12. Expansion of the lesion
a) Present
b) Absent
13. Cortical bone thinning related with the lesion
a) Present
b) Absent
14. Cortical bone perforation related with the lesion
a) Present
b) Absent
15. Root resorption in adjacent tooth/teeth
a) Present
b) Absent
16. Migration in adjacent tooth/teeth
a) Present
b) Absent
17. Histopathological diagnosis of the lesion

(Table 2). 65 lesions were diagnosed in males, while 36 lesions were diagnosed in females. The lesions consisted of DC (n=72; 71.29%) (Figure 1), OKC (n=15; 14.85%) (Figure 2,3), inflammation (n=7; 6.93%), ameloblastoma (n=5; 4.95%), and glandular odontogenic cyst (n=2; 1.98%) respectively (Table 3).

Majority of the lesions were in the posterior region of the mandible (n=63; 62.4%) and related with the mandibular third molars (n=60; 59.4%). The most common features of the lesions were unilocular radiolucency (n=92, 91.1%), well-circumscribed (n= 91, 90.1%), and expansive (n=86, 85.1%). More than half of the lesions did not cause any migration of the related impacted tooth (n=53, 52.5%), resorption of adjacent tooth/teeth (n=52, 51.2%) and migration of adjacent tooth/teeth (n=62, 61.4%). The cortical bone thinning (n=89, 88.1%) and perforation (n=90, 89.1%) were a common finding. The distribution and statistical analysis of the variables were shown in Table 4 in detail according to gender.

A statistically significant relationship was found between the migration of the impacted tooth/teeth related to the lesion ($p<0.05$) and the expansion of the lesion ($p<0.01$) according to gender. The migration both the buccal and lingual/palatal direction of impacted tooth/teeth was more common in males than in females. Expansion of the lesion was more common in males than in females. No statistically significant difference was found between gender and the other variables (Table 4).

A statistically significant relationship was found between the migration of the impacted tooth/teeth related to the lesion ($p<0.05$) and the histopathological diagnosis of the lesion ($p<0.01$) according to age groups. The migration towards buccal direction of impacted tooth/teeth was more common in the patients ≤30 years old, while the migration towards lingual/palatal was more common in the patients 51≥ years old. Most of the patients with DC were 31-50 years old and 51≥ years old, while other lesions were

Table 2. Demographic characteristics of the patients

Characteristics	Mean ± SD	n	%
Age	38.8±15.7		
Gender			
Female		36	35.6
Male		65	64.4
Total		101	100
SD: Standard deviation			

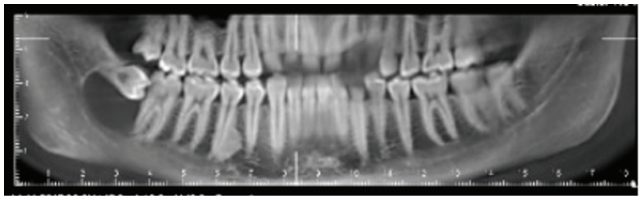

Figure 1. The image of cone-beam computed tomography for dentigerous cyst

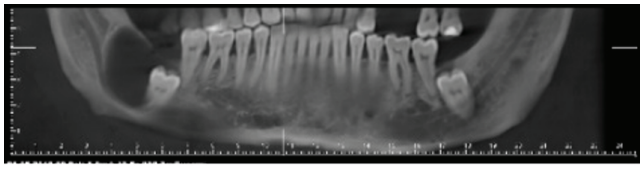

Figure 2. The image of cone-beam computed tomography for odontogenic keratocyst

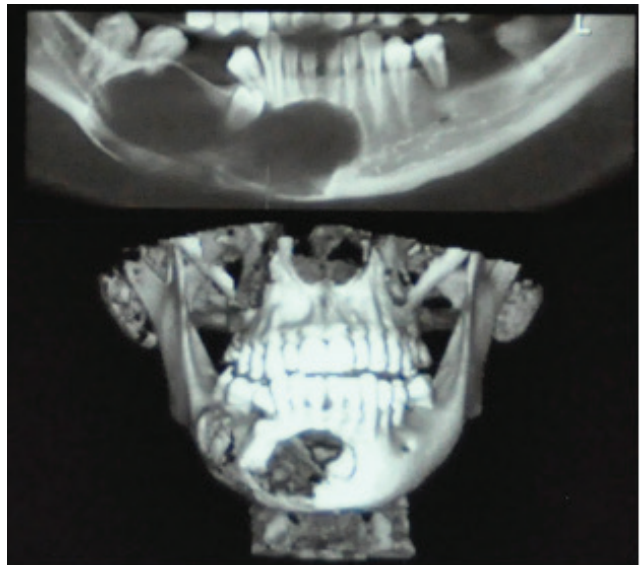

Figure 3. The image of cone-beam computed tomography for odontogenic keratocyst

Table 3. Histopathologic distribution of lesions in total and according to gender

Histopathologic diagnosis	Female	Male	Total n (%)
Dentigerous cyst	23	49	72 (71.3)
Odontogenic keratocyst	7	8	15 (14.85)
Glandular odontogenic cyst	0	2	2 (1.98)
Ameloblastoma	2	3	5 (4.95)
Inflammation	4	3	7 (6.93)
Total	36	65	101 (100)

Table 4. The distribution and statistical analysis of the variables according to gender

Variables	Items	Female n (%)	Male n (%)	Total n (%)	p-value
Location of the lesion	Anterior region of the jaws	13 (36.1)	25 (38.5)	38 (37.6)	0.815
	Posterior region of the jaws	23 (63.9)	40 (61.5)	63 (62.4)	
Internal structure of the lesion	Unilocular	32 (88.9)	60 (92.3)	92 (91.1)	0.405[a]
	Multilocular	4 (11.1)	5 (7.7)	9 (8.9)	
Periphery of the lesion	Well-defined	31 (86.1)	60 (92.3)	91 (90.1)	0.253[a]
	Scalloped shape	5 (13.9)	5 (7.7)	10 (9.9)	
Impacted tooth/teeth in conjunction with the lesion	38	13 (36.1)	15 (23.1)	28 (27.7)	0.363
	48	9 (25.0)	23 (35.4)	32 (31.7)	
	13, 23 or 43	9 (25.0)	13 (20.0)	22 (21.8)	
	Other teeth	5 (13.9)	14 (21.5)	19 (18.8)	
The relationship between impacted tooth/teeth and lesion	The lesion related with crown of the impacted tooth/teeth	19 (52.8)	22 (33.8)	41 (40.6)	0.177
	The lesion related with root of the impacted tooth/teeth	4 (11.1)	11 (16.9)	15 (14.9)	
	The lesion related with both crown and root of the impacted tooth/teeth	13 (36.1)	32 (49.2)	45 (44.6)	
Migration presence of impacted tooth/teeth in conjunction with the lesion	No migration	20 (55.6)	33 (50.8)	53 (52.5)	0.047*
	Migration towards buccal direction	13 (36.1)	14 (21.5)	27 (26.7)	
	Migration towards lingual/palatal direction	3 (8.3)	18 (27.7)	21 (20.8)	
Expansion presence and direction of the lesion	Buccal expansion	11 (30.6)	17 (26.2)	28 (27.7)	0.478
	Buccal-lingual or buccal-palatal expansion	20 (55.6)	43 (66.2)	63 (62.4)	
	Lingual or palatal expansion	5 (13.9)	5 (7.7)	10 (9.9)	
Effects of surrounding anatomical structures	No effect	7 (19.4)	14 (21.5)	21 (20.8)	0.805
	The lesion is adjacent to cortical boundary of anatomical structures	8 (22.2)	11 (16.9)	19 (18.8)	
	The lesion is related with surrounding anatomical structures	21 (58.3)	40 (61.5)	61 (60.4)	
Expansion of the lesion	Present	26 (72.2)	60 (92.3)	86 (85.1)	0.007**
	Absent	10 (27.8)	5 (7.7)	15 (14.9)	
Cortical bone thinning related with the lesion	Present	32 (88.9)	57 (87.7)	89 (88.1)	0.566[a]
	Absent	4 (11.1)	8 (12.3)	12 (11.9)	
Cortical bone perforation related with the lesion	Present	31 (86.1)	59 (90.8)	90 (89.1)	0.342[a]
	Absent	5 (13.9)	6 (9.2)	11 (10.9)	
Root resorption in adjacent tooth/teeth	Present	14 (38.9)	35 (53.8)	49 (48.5)	0.150
	Absent	22 (61.1)	30 (46.2)	52 (51.5)	
Migration in adjacent tooth/teeth	Present	12 (33.3)	27 (41.5)	39 (38.6)	0.417
	Absent	24 (66.7)	38 (58.5)	62 (61.4)	
Histopathological diagnosis of the lesion	Dentigerous cyst	23 (63.9)	49 (75.4)	72 (71.3)	0.221
	Other lesions	13 (36.1)	16 (24.6)	29 (28.7)	
Total		36 (35.6)	65 (64.4)	101(100)	

[a]Statistical analysis result according to Fisher Exact test. *p<0.05; **p<0.01 Teeth were numbered according to FDI system

more common among patients ≤30 years old. No statistically significant difference was found between the age groups and the other variables (Table 5).

Discussion

The multicenter studies are very important and valuable to determine the real prevalence of lesions. Actually it is very difficult to collect the data in these types of studies but obtained results are so valuable. Essentially, in the literature some studies which were evaluated the prevalence and characteristics of jaw lesions (8,13,14) can be found and there are a lot of studies about impacted teeth and the lesions (8-10). But the number of the multicenter studies about the impacted teeth and the lesions related with them is limited (11,12). Our study is one of the few studies with these properties.

According to our results, majority of the lesions were in the posterior region of the mandible and related with mandibular third molars. This result is compatible with previous studies (10-12). Additionally, in this study, the most frequently impacted teeth were found as the third molar, canine and other teeth, respectively. Because the third molars account for 98% of all impacted teeth. Generally, impaction of mandibular molars is seen more frequently compared with maxillary molars (7,14).

According to CBCT findings, the most common features of the lesions were unilocular radiolucency, well-circumscribed and expansive. More than a half of the lesions did not cause any migration of the related impacted tooth, resorption of adjacent tooth/teeth and migration of adjacent tooth/teeth. The cortical bone thinning and perforation were a common finding in general. These radiographic findings are common in benign lesions. In general, cysts and tumors present in the study had benign characters (15).

There were statistically significant differences between gender with the migration of impacted tooth/teeth in conjunction with the lesion and expansion of the lesion. This could be related with the type of lesion. The benign and aggressive lesions show different growth patterns. The radiographic findings of these lesions depend on morphologic findings and the relationship of adjacent structures. The size, growth stage, and localization of the lesions have effect on the radiographic features of the lesions, even one having the same histopathological diagnosis. On the other hand, lesions with different histopathologic structures could share similar radiographic features (16,17).

Regarding histopathological diagnosis almost two third of the lesions were DC, followed by OKC, inflammation, ameloblastoma and glandular odontogenic cysts. In some studies, the relationship between the impacted tooth and the frequency of odontogenic cyst and tumors has been discussed. Curran et al. (18) showed that the frequency of the lesions associated with impacted teeth was DC, OKC, odontoma, ameloblastoma, calcifying epithelial odontogenic tumor, carcinoma, and myxoma, respectively. Shoaee et al. (19) reported that the three most common lesions associated with impacted teeth were DC, OKC, and ameloblastoma. In a previous study, the most common type of lesion associated with impacted third molar teeth was defined as DC followed by OKC, ameloblastoma, paradental cyst, and glandular odontogenic cyst (20). Our results show similarity with recent research indicating DC is the most common lesion associated with impacted teeth (10,15,21).

According to our results, majority of the patients with DC were between 31-50 years old, while other lesions were more common among patients <30 years old. The migration and root resorption in the adjacent tooth and expansion were seen in the evaluated cases in our study. DC was more common among males compared to females. The studies have reported that the DC is usually seen more common in adolescents and young adults between 20-40 years. In addition, it has been shown that DC is typically enveloping the crown of the impacted, leads to migration and is resorbed of adjacent tooth/teeth, and makes expansion buccally or medially, especially in large lesions radiographically (22,23). Also, DC is reported to be seen more common among males in the literature (24). Our findings show similarity with previous studies.

We found that other lesions associated with impacted teeth were OKC, inflammation, ameloblastoma and glandular odontogenic cyst. Many studies have shown that these lesions are associated with impacted teeth (18-20). It has reported that OKC usually appears between second and fourth decades. This lesion is frequently located at posterior body of the mandible and ramus and represented as unilocular

Table 5. The distribution and statistical analysis of the variables according to age

Variables	Items	<30 n (%)	31-50 n (%)	51> n (%)	Total n (%)	p value
Location of the lesion	Anterior region of the jaws	13 (40.6)	17 (41.5)	8 (28.6)	38 (37.6)	0.507
	Posterior region of the jaws	19 (59.4)	24 (58.5)	20 (71.4)	63 (62.4)	
Internal structure of the lesion	Unilocular	31 (96.9)	36 (87.8)	25 (89.3)	92 (91.1)	[a]
	Multilocular	1 (3.1)	5 (12.2)	3 (10.7)	9 (8.9)	
Periphery of the lesion	Well-defined	30 (93.8)	35 (85.4)	26 (92.9)	91 (90.1)	[a]
	Scalloped shape	2 (6.2)	6 (14.6)	2 (7.1)	10 (9.9)	
Impacted tooth/teeth in conjunction with the lesion	38	7 (21.9)	12 (29.3)	9 (32.1)	28 (27.7)	0.652
	48	9 (28.1)	12 (29.3)	11 (39.3)	32 (31.7)	
	13, 23 or 43	7 (21.9)	10 (24.4)	5 (17.9)	22 (21.8)	
	Other teeth	9 (28.1)	7 (17.0)	3 (10.7)	19 (18.8)	
The relationship between impacted tooth/teeth and lesion	The lesion related with crown of the impacted tooth/teeth	12 (37.5)	20 (48.8)	9 (32.1)	41 (40.6)	[a]
	The lesion related with root of the impacted tooth/teeth	4 (12.5)	4 (9.8)	7 (25.0)	15 (14.9)	
	The lesion related with both crown and root of the impacted tooth/teeth	16 (50.0)	17 (41.5)	12 (42.9)	45 (44.6)	
Migration of impacted tooth/teeth in conjunction with the lesion	No migration	12 (37.5)	26 (63.4)	15 (53.6)	53 (52.5)	0.011*
	Migration towards buccal direction	14 (43.8)	10 (24.4)	3 (10.7)	27 (26.7)	
	Migration towards lingual/palatal direction	6 (18.8)	5 (12.2)	10 (35.7)	21 (20.8)	
Direction of expansion	Buccal expansion	7 (21.9)	14 (34.1)	7 (25.0)	28 (27.7)	[a]
	Bucco-lingual or buccal-palatal expansion	22 (68.8)	23 (56.1)	18 (64.3)	63 (62.4)	
	Lingual or palatal expansion	3 (9.4)	4 (9.8)	3 (10.7)	10 (9.9)	
Effects on surrounding anatomical structures	No effect	6 (18.8)	9 (22.0)	6 (21.4)	21 (20.8)	0.934
	The lesion is adjacent to cortical boundary of anatomical structures	6 (18.8)	9 (22.0)	4 (14.3)	19 (18.8)	
	The lesion is related with surrounding anatomical structures	20 (62.5)	23 (56.1)	18 (64.3)	61 (60.4)	
Expansion of the lesion	Present	30 (93.8)	33 (80.5)	23 (82.1)	86 (85.1)	[a]
	Absent	2 (6.2)	8 (19.5)	5 (17.9)	15 (14.9)	
Cortical bone thinning related with the lesion	Present	30 (93.8)	36 (87.8)	23 (82.1)	89 (88.1)	[a]
	Absent	2 (6.2)	5 (12.2)	5 (17.9)	12 (11.9)	
Cortical bone perforation related with the lesion	Present	31 (96.9)	37 (90.2)	22 (78.6)	90 (89.1)	[a]
	Absent	1 (3.1)	4 (9.8)	6 (21.4)	11 (10.9)	
Root resorption in adjacent tooth/teeth	Present	13 (40.6)	21 (51.2)	15 (53.6)	49 (48.5)	0.548
	Absent	19 (59.4)	20 (48.8)	13 (46.4)	52 (51.5)	
Migration in adjacent tooth/teeth	Present	14 (43.8)	16 (39.0)	9 (32.1)	39 (38.6)	0.653
	Absent	18 (56.2)	25 (61.0)	19 (67.9)	62 (61.4)	
Histopathological diagnosis of the lesion	Dentigerous cyst	15 (46.9)	34 (82.9)	23 (82.1)	72 (71.3)	0.001**
	Other lesions	17 (53.1)	7 (17.1)	5 (17.9)	29 (28.7)	
Total		32 (31.7)	41 (40.6)	28 (27.7)	101 (100)	

[a]Chi-square analysis is not appropriate. *p<0.05; **p<0.01

or multilocular radiolucency having well-defined borders, with minimal mediolateral expansion. Also, it has been informed that OKC may include the crown of the impacted teeth resembling the DC in some cases (22). In contrast, ameloblastoma is a benign lesion, a locally invasive tumor. It has reported that ameloblastoma is usually seen in patients 20-50 years old and develops in the molar-ramus regions of the mandible. It has been presented that this lesion usually shows unilocular or multilocular radiolucency and performs root resorption and tooth migration on the radiograph (24). In a recent study, it was reported that OKC and ameloblastoma lead to mesial-distal displacement of the impacted teeth more frequently compared with DC. OKC and ameloblastoma showed more aggressive growth pattern with higher rate of bony discontinuity and cortical bone expansion compared with DC (22).

Conclusion

We can say that this study is one of the few multicenter studies when viewed from this angle. In this study, statistically significant differences were found between age groups and migration of impacted tooth/teeth in conjunction with the lesion and histopathological diagnosis of the lesion. The migration of impacted tooth/teeth towards buccal direction was more common in the patients ≤30 years old, while lingual/palatal migration was more common in the patients 51≥ years old.

The clinical and radiographic features of lesions located in jaws show some similarity according to their growth patterns. Majority of these lesions are benign but certain lesions are aggressive and show a destructive growth pattern. These affect the treatment choice, surgical techniques, and post-operative recurrence rates. CBCT findings could help the surgeons' initial diagnosis, pre-operative surgery planning and treatment choice. Knowing all clinical, radiological, and histopathological features of the lesions provide the surgeon to reach the correct diagnosis, thus the doctors achieve high success in treatment with the right treatment plan.

Ethics

Ethics Committee Approval: The present cohort study was designed as a survey and was approved by the Clinical Research Ethics Committee of Ankara University Faculty of Dentistry (approval no: 36290600/63, date: 30.11.2015).

Informed Consent: Retrospective study.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Z.F.Z., Z.A., E.B., S.K., D.G., İ.P., Concept: Z.F.Z., Z.A., E.B., S.K., D.G., İ.P., Design: Z.F.Z., Z.A., Y.T.K., C.D., E.B., S.K., D.G., İ.P., Data Collection or Processing: Z.F.Z., Z.A., N.H., Y.T.K., C.D., E.B., İ.S., M.İ., D.G., Analysis or Interpretation: N.H., Y.T.K., C.D., İ.S., N.B., Literature Search: Z.F.Z., Z.A., N.H., Y.T.K., C.D., N.B., Writing: Z.F.Z.

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