CLINICOPATHOLOGICAL STUDY OF RADIOLUCENT LESIONS OF THE JAWS

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ABSTRACT

Objective: *The objective of this study was to investigate the clinical and histopathological features of the radiolucent jaw lesions in patients reported to Khyber College of Dentistry Peshawar.*

Materials and Methods: *This descriptive study was conducted in Khyber College of Dentistry, Peshawar on 52 patients. Patients of all ages, both male and female presenting for Primary diagnosis of radiolucent jaw lesions were included. Clinical features like Site of the lesions and radiographic features like locularity and cortical integrity were also recorded. Detailed microscopical features of the lesions including, areas of haemorrhage, areas of vascular invasions and final diagnosis were recorded in proforma. In case of a tumour, complete tumour characteristics like benign or malignant lesions were also recorded. The data were analysed using SPSS 20.0. Mean, and the standard deviation was calculated for quantitative variables like age. Frequencies and percentages were calculated for qualitative variables like sex and features of radiolucent lesions.*

Results: *Males were 27 (51.9%), and females were 25 (48.1%). The mean age was 29.71±15.35 years. 71.2% of the lesions were unilocular and 88.5% of the lesions were benign. Most of the dentigerous cysts and Odontogenic keratocyst were present in the posterior region of both arches. All cases of unicystic ameloblastoma were in the posterior mandible. Radicular cysts were present almost all periapical areas in the anterior region of the jaws.*

Conclusion: *The common radiolucent lesions of the jaws include radicular cyst, odontogenic keratocyst, and dentigerous cyst. Most of the lesions were unilocular. The common locations for these lesions were posterior region. Most of these were benign and occurred at early ages.*

Keywords: *Radiolucent lesions, jaws, keratocyst, radicular cyst*

INTRODUCTION

Jaw lesions which produce a dark image on the x-ray film and are frequently seen during the routine panoramic radiographic examination are called radiolucent lesions of the jaw.[1] Radiolucent lesions on a panoramic radiographs are difficult to diagnose, especially in those cases with well-defined unilocular radiolucency such as odontogenic tumors, which includes ameloblastoma and odontogenic cysts like, dentigerous cyst, keratocyst and idiopathic bone cavity (simple bone cyst) because all these have similar radiographic and clinical characteristics.[2]

It is difficult to distinguish jaw lesions from each other on the dental radiograph. Therefore, it is essential to have a complete history and an analytical approach for an appropriate diagnosis.The jaw lesion should be evaluated taking into consideration of the margin, density, anatomical location, locularity, cortical integrity, periosteal reaction and relation to the dentition and also its effect on soft tissue and surrounding structures.[3] Taking into consideration the histopatho-

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logical examination and biopsy is very important for appropriate treatment and diagnosis.[4]

About 80% of the jaw lesions are radiolucent, and the majority of them shows unilocular radiolucency with well-defined borders which indicate a slow proliferating benign process, whereas the aggressive behaviour is indicated in most of the multilocular lesions with well-defined borders.[5] In general, those with ill-defined borders represent an aggressive behaviour with the neoplastic and inflammatory process.[6] The behaviour of the lesion can be assessed by its effect on structures that it surrounds which includes space occupying and slow-growing lesions of the jaws which are involved in the displacement of teeth. Those cystic lesions of the jaws which surround the crown of the teeth like a dentigerous cyst, odontogenic keratocyst and occasionally odontomas push the tooth apically. The Lesions which are present in the ramus, such as cherubism, may push teeth in the anterior direction. Resorption of teeth is more common in slow-growing and chronic processes as compared to malignant lesions of the jaws.[7] Destruction and irregular widening of the lamina dura indicates a malignant process because they destroy the ligament space. Benign lesions with neural and vascular origin will cause widening of the inferior alveolar canal with the maintenance of a cortical boundary.[8, 9]

The Unilocular radiolucent lesion has a single loculus.[10] The clinical and radiographic characteristics of ameloblastoma, odontogenic tumour, keratocyst, and idiopathic bone cavity cyst usually similar but their histopathological aspects, biological behaviour, and treatment are different. These lesions show a well-defined radiolucent image with well-corticated borders with or without an unerupted tooth.[11] This makes the radiographic differentiation a difficult task.[12]

Those lesions having many compartments or loculi are called multilocular lesions. Multilocular lesions of the jaws have variation in clinical nature and, hence, variation in management. These multilocular lesions include ameloblastoma, odontogenic keratocyst, central giant cell lesions, cherubism, odontogenic myxoma, aneurysmal bone cyst and central hemangioma and other vascular lesions.[13] The clinician needs to consider the possibility of a vascular lesion can be considered whenever there is a possibility of evaluating a multilocular radiolucency clinically.[14]

Inflammation is the most common cause of radiolucent lesions of the jaws. Periapical granuloma and radicular cyst are the most common example, and both are associated with root apices of the non-vital teeth. These both lesions have same microorganisms present in the root canal of affected teeth and necrotic pulp.[15]

Becconsall-Ryan et al. determine the demographic features and the range of radiolucent jaw lesions in a New Zealand population.[16] The five most common radiolucent lesions which were reported were the periapical granuloma, radicular cyst, dentigerous cyst, hyperplastic dental follicle and odontogenic keratocyst, which accounted for 79.6% of all radiolucent jaw lesions. Koivisto et al. did a retrospective study on frequency and distribution of radiolucent lesions of the jaw and classified the jaw lesions into thirteen different types. 17 Non healing apical granulomas (40.4%) and cysts (33.1%) had similar rates, and together it accounts for 73% of all biopsy lesions. Most of the reported granulomas and cysts occurred in the anterior maxilla (>36% in each category). The frequency of KOTs (8.8%), CGCLs (1.3%), ameloblastomas (1.2%), and metastatic lesions (<1%) were found in the posterior mandible. The occurrence of apical cysts, ameloblastomas, KOTs and metastatic lesions were seen slightly more in men than women at 56%, 54%, 55% and 68% respectively. The occurrences of CGCLs were more common in women than male at 56%, whereas apical granulomas were found equally in men and women.

In Pakistan very less work has been undertaken so far. In thiswe intend to make a clinical diagnosis, relative frequency, and morphological examination of all radiolucent jaw lesions. It will help the dental surgeons and health professional in giving them a better understanding of radiolucent shadows and underlying lesions of the jaws. They may be able to clinically, morphologically and radiologically diagnose the lesions for a more effective treatment. So the objective of this study was to investigate the clinical and histopathological features of the radiolucent jaw lesions in a sample of the Pakistani population.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at the Department of Morbid Anatomy and Histopathology at the University of Health Sciences. After procuring the history, the examination and the samples from Oral & Maxillofacial Department, Khyber College of Dentistry, Peshawar. Ethical approval was taken

from the institutional review board of University of Health Sciences. A total of 52 patients were included by convenient sampling technique and concent taken from the patients.

Patients of all ages, both male and female presenting for Primary diagnosis of radiolucent jaw lesions were included. Patients are having a follow-up, recurrence or having treatment for these lesions and having disorders of immune systems were excluded.

The detailed clinical profile of the patient includes age, sex, site of the lesions, cortical integrity and pattern of popularity was recorded in proforma. Detailed microscopical features of the lesions like the area of haemorrhage, vascular invasions and final diagnosis were recorded in proforma. In case of a tumour, complete tumour characteristics were also recorded. Laboratory processing was done as follows; if the bony component is present in the specimen, decalcification was carried out in 5% HNO3 for 1-2 days. After the gross examination tissue was taken and labelled in plastic cassettes. Paraffin-embedded tissue blocks were prepared, and from each tissue, one section with a thickness of 4 microns, using a Rotary Microtome was taken. These sections were then stained with conventional haematoxylin and eosin stains. Dried at room temperature and microscopy was done.

The data were extracted and analysed using SPSS 20.0. Mean, and the standard deviation was calculated for quantitative variables like age, etc. Frequencies and percentages were calculated for qualitative variables like sex, the diagnosis of each lesion and features of radiolucent lesions.

RESULTS

A total 52 cases that had radiolucent lesions of the jaws was included. Males were 27 (51.9%), and females were 25 (48.1%). The mean age was 29.71±15.35 years. The age range was from 6 to 70 years.

Radiographic examinations of these radiolucent lesions showed that most of them were Unilocular (71.2%) and the most common effect of these lesions on cortices of the jaws was an expansion (55.8%) and destruction (11.5%). The details are given in the (Table 1).

On microscopical examination more than half had haemorrhaged. Most of them were benign (88.5%). Few showed vascular invasion (7.7%). The details are given in the (Table 2).

Final diagnosis of these radiolucent lesions showed that the most common radiolucent lesions of the jaws were radicular cyst (25%), odontogenic keratocyst (15.4%), dentigerous cyst(9.60%), adenoid cystic carcinoma (5.80%), follicular ameloblastoma (5.80%), plexiform ameloblastoma(3.80%), giant cell granuloma (3.8%), osteomylitis (3.8%), unicystic ameloblastoma (3.8%), acute and chronic infection (1.9%), ameloblastic fibroma(1.9%), Aneurysmal bone cyst(1.9%), Burkit lymphoma (1.9%), Glandular odontogenic cyst (1.9%), gingival odontogenic cyst(1.9%), hemangioma (1.9%), osteosarcoma (1.9%), Periapical cyst (1.9%), pyogenic infection(1.9%), residual cyst (1.9%), and SC-NHL(1.9%). (Fig 1)

The Multilocular lesions were odontogenic Keratocyst (37.5%), hemangioma (100%), Adenoid Cystic carcinoma (33.3%), follicular and plexiform ameloblastoma, Glandular odontogenic cyst (100%) and Burkitt Lymphoma (100%). The details are shown in the (Table 3).

Haemorrhage was found in periapical cyst, residual cyst, giant cell granuloma, aneurysmal bone cyst, and Burkitt lymphoma. Haemorrhage was found in a dentigerous cyst (80%), follicular ameloblastoma (66.75), odontogenic keratocyst (62.5%), unicystic ameloblastoma (50%), radicular cyst (46.2%) and adenoid cystic carcinoma (33.3%). (Table 4).

Osteosarcoma (100%), unicystic ameloblastoma (50%), plexiform ameloblastoma (50%) and adenoid cystic carcinoma (33.30%) had vascular invasion. (Table 5).

Most of the dentigerous cysts were present in the posterior maxilla and mandible. Similar Odontogenic keratocyst was present in the posterior region of both arches. All cases of unicystic ameloblastoma were in the posterior mandible. Radicular cysts were present almost all of the periapical areas. The most common site for radicular cysts was maxillary (53.8%) and mandibular anterior (15.4%). The rest of the details are given in the (Table 6).

Table-1: Descriptive statistics for the radiographic features of the radiolucent lesions of the jaws

Locularity of the lesions	Unilocular	37(71.2)
	Multilocular	15(28.8)
	Total	52(100.0)
Cortical integrity	Expansion	29(55.8)
	Destruction	6(11.5)
	No expansion	17(32.7)
	Total	52(100.0)

Table-2: Descriptive statistics for the microscopical features of the radiolucent lesions of the jaws

Area of haemorrhage	Present	28(53.8)
	Absent	24(46.2)
	Total	52(100.0)
Types of a tumour	Benign	46(88.5)
	Malignant	6(11.5)
	Total	52(100.0)
Vascular invasion	Present	4(7.7)
	Absent	48(92.3)
	Total	52(100.0)

Table-3: Pattern of locularity of radiolucent lesion of the jaws

	Unilocular		Multilocular	
	Count	**N**	**Count**	**N**
Dentigerous cyst	5	100.0	0	0.0
Odontogenic Keratocyst	5	62.5	3	37.5
Hemangioma	0	0.0	1	100.0
Gingival Odontogenic Cyst	1	100.0	0	0.0
Periapical cyst	1	50.0	1	50.0
Osteosarcoma	1	100.0	0	0.0
Osteomylitis	1	100.0	0	0.0
Pyogenic infection	1	100.0	0	0.0
Residual cyst	1	100.0	0	0.0
Radicular cyst	13	100.0	0	0.0
Unicystic Ameloblastoma	2	100.0	0	0.0
SC-NHL	1	100.0	0	0.0
Adenoid Cystic carcinoma	2	66.7	1	33.3
Ameloblastoma(folicular)	0	0.0	3	100.0
Ameloblastoma(plexiform)	1	50.0	1	50.0
Glandular odontogenic cyst	0	0.0	1	100.0
Gaint Cell granuloma	1	50.0	1	50.0
Acute and chronic infection	1	100.0	0	0.0
Ameloblastc Fibroma	1	100.0	0	0.0
Anerysmal Bone cyst	1	100.0	0	0.0
Burkit lymphoma	0	0.0	1	100.0

Table-4: Frequency of haemorrhage in a radiolucent lesion of the jaws

Lesion	**n**	**%**
Dentigerous cyst	**4**	**80.00**
Odontogenic Keratocyst	5	62.50
Hemangioma	1	100.00
Gingival Odontogenic Cyst	0	0.00
Periapical cyst	2	100.00
Osteosarcoma	0	0.00

Table-5: Frequency of vascular invasion in radiolucent lesions of the jaws

Dentigerous cyst	**0**	**0.00**
Odontogenic Keratocyst	**0**	**0.00**
Hemangioma	0	0.00
Gingival Odontogenic Cyst	0	0.00
Periapical cyst	0	0.00
Osteosarcoma	1	100.00
Osteomylitis	0	0.00

Osteomylitis	0	0.00
Pyogenic infection	0	0.00
residual cyst	1	100.00
Radicular cyst	6	46.20
Unicystic Ameloblastoma	1	50.00
SC-NHL	0	0.00
Adenoid Cystic Carcinoma	1	33.30
Ameloblastoma (folicular)	2	66.70
Ameloblastoma (plexiform)	0	0.00
Glandular odontogenic cyst	1	100.00
Giant Cell Granuloma	2	100.00
Acute and chronic infection	0	0.00
Ameloblastic fibroma	0	0.00
Aneurysmal Bone Cyst	1	100.00
Burket lymphoma	1	100.00

Pyogenic infection	0	0.00
Residual cyst	0	0.00
Radicular cyst	0	0.00
Unicystic Ameloblastoma	1	50.00
SC-NHL	0	0.00
Adenoid Cystic Carcinoma	1	33.30
Ameloblastoma(folicular)	0	0.00
Ameloblastoma(plexiform)	1	50.00
Glandular odontogenic cyst	0	0.00
Giant Cell Granuloma	0	0.00
Acute and chronic infection	0	0.00
Ameloblastic fibroma	0	0.00
Aneurysmal Bone Cyst	0	0.00
Burket lymphoma	0	0.00

Table-6: Sites of the lesions of radiolucent of the jaws

	Site of lesion									
	Maxilla anterior		**Mandibular anterior**		**Maxilla posterior**		**Mandible anterior**		**Mandible posterior**	
	Count	%	Count	%	Count	%	Count	%	Count	%
Dentigerious cyst	2	40.0	0	0.0	1	20.0	0	0.0	2	40.0
Odontogenic Keratocyst	0	0.0	0	0.0	3	37.5	0	0.0	5	62.5
Hemangioma	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Gingival Odontogenic Cyst	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
Periapical cyst	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
Osteosarcoma	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Osteomylitis	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Pyogenic infection	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Residual cyst	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0
Radicular cyst	7	53.8	1	7.7	2	15.4	0	0.0	3	23.1
Unicystic Ameloblastoma	0	0.0	0	0.0	0	0.0	0	0.0	2	100.0
SC-NHL	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Adenoid Cystic carcinoma	0	0.0	0	0.0	3	100.0	0	0.0	0	0.0
Ameloblastoma(folicular)	0	0.0	0	0.0	1	33.3	0	0.0	2	66.7
Ameloblastoma (plexiform)	0	0.0	0	0.0	0	0.0	0	0.0	2	100.0
Glandular odontogenic cyst	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Giant Cell granuloma	0	0.0	0	0.0	0	0.0	0	0.0	2	100.0
Acute and chronic infection	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Ameloblastic fibroma	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Anerysmal Bone cyst	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Burket lymphoma	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0

DISCUSSION

This study was conducted on 52 patients having radiolucent lesions of the jaws presented to Khyber College of Dentistry, Peshawar. In this study males and females ratio was equal. These show that the radiolucent lesions affect both genders equally. Similar results were reported by Kumavat et al. on India population. In the current study, the mean age was 29.71±15.35 years. The age range was from 6 to 70 years. This shows that lesions occurred at young ages. Similar mean age was reported by Kumavat et al.[18]

The current results showed that the most common radiolucent lesion of jaws were radicular cyst (25%), odontogenic keratocyst (15.4%), dentigerous cyst (9.60%), adenoid cystic carcinoma (5.80%), follicular ameloblastoma (5.80%), plexiform ameloblastoma (3.80%), and giant cell granuloma (3.8%). While Kumavat et al. reported that dentigerous cyst was the most common one.[18] The difference of our results from Kumavat et al. may be due to genetic, ethnic and environmental variations.[18] Koivisto et al. conducted a study to examine the frequency and location of radiolucent jaw lesions, including apical granulomas, apical cysts, keratocystic odontogenic tumours (KOTs), central giant cell lesions (CGCLs), ameloblastomas, and metastatic lesions that were submitted for biopsy along with associated demographics. They reported that apical cysts and apical granulomas together comprised 73% of the radiolucent lesions we considered. Eight hundred fifty-seven (8.8%) KOTs, 129 (1.3%) CGCLs, 114 (1.2%) ameloblastomas, and 25 (0.3%) metastatic lesions were reported. In our study as contrary to Koivisto et al. had not included apical granuloma. Apical cysts (radicular) had the highest prevalence in Koivisto et al. study which is similar to current study.[19]

This study showed that 37.5% of odontogenic keratocyst and 33.3% of Adenoid Cystic carcinoma were multilocular. Boffano et al. conducted a study on a Keratocystic Odontogenic tumour on epidemiologic, clinical, and radiologic features of 261 lesions from University of Turin and reported that OKC (83.5%) were unilocular and 43 (16.5%) were multilocular.The frequency of multilocular OKC is more in our study as compared to Boffano et al.20 The difference may due to a small sample of our study, other reason may be of genetic and ethnic variation.

In this study, haemorrhage was found in all cases of hemangioma, aneurysmal bone cyst, residual cyst, glandular odontogenic cyst, giant cell granuloma, and Burkitt lymphoma. Hemangioma is a benign lesion formed by a collection of excess blood vessels. Hemorrhagic-aneurysmal bone cysts (HABCs) are quite rare, benign, non-neoplastic, expansive, and vascular locally destructive lesions. They are considered sequelae of an earlier trauma are causing an overflow of blood into the bone.[21] The haemorrhage in these lesions may be their invasion of blood vessels in surrounding bone.

Most of the dentigerous cysts and OKC were present in posterior of jaws. All cases of unicystic ameloblastoma were in the posterior mandible. Radicular cysts were present almost all in the periapical areas, and maxillary and mandibular anterior teeth were involved. Similar results were found in previous studies.[5, 14, 22]

CONCLUSION

The common radiolucent lesions of the jaws were a radicular cyst, odontogenic keratocyst, and dentigerous cyst. The common locations for these were posterior region. Most of the lesions were unilocular. The cortical expansion is the most common effect of these lesions. Most of these were benign and occurred at early ages.

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