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Diagnostic sensitivity and specificity in a retrospective clinical, radiographic and histopathological study of 166 cystic jaw lesions

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Abstract

Aim: To assess specificity and sensitivity of the clinical and radiographic diagnoses of cystic jaw lesions in relation to the histology-based final diagnoses, and evaluate characteristics of cystic jaw lesions treated in a university hospital over a 6-year period.
Material and Methods: Retrospective analyses of clinical, radiographic and histopathological records of 166 patients diagnosed with, and treated for, cystic jaw lesions at the Department of Oral and Maxillofacial Surgery, Aarhus University Hospital from 2005 to 2010.
Results: Specificity was generally high for all cystic jaw lesions, but a low diagnostic sensitivity in relation to the keratocystic odontogenic tumour (KCOT) was revealed. The radicular cyst, dentigerous cyst and KCOT were the most frequently observed cystic jaw lesions.
Conclusion: In general, a high diagnostic specificity for all cystic jaw lesions was observed. A low diagnostic sensitivity for KCOT was revealed, which is the major reason why histology-based final diagnoses should be regarded as the gold standard whenever KCOT is to be included in the differential diagnosis of cystic jaw lesions. Frequency of cystic jaw lesions in the present study was in agreement with previous studies.

Introduction

A cyst is defined as a non-preformed cavity, lined by an epithelium and filled with gas, fluid or semi-fluid[1]. Cysts are relatively common pathologic lesions in the jaws. Jaw cysts are either odontogenic (lined by epithelium originating from the dental organ) or non-odontogenic (lined by epithelial remnants of other origin). Odontogenic cysts can be classified into inflammatory or developmental cysts according to their pathogenesis[2]. The correct diagnosis of cystic jaw lesions is important because some of these lesions are known to have an aggressive behaviour and a tendency to recur. An example of an odontogenic cyst with potentially aggressive behaviour is the odontogenic keratocyst (OKC), which has been reclassified as an odontogenic tumour, keratocystic odontogenic tumour (KCOT) according to the World Health Organization[3]. Therefore, the final diagnosis of cystic jaw lesions usually requires a combined analysis of clinical, radiographic and histopathologic findings resulting in the histology-based diagnosis.

Studies of cystic jaw lesions have been reported from several different countries including Turkey[4,5], Spain[6], Brazil[7–10], Mexico[11,12], United Kingdom[13,14], Canada[15], Italy[16] and Chile[17] (Table 1). It is evident that there are differences in diagnoses depending on patients' demographic characteristics, socio-economic factors and availability of dental care[1].

A low accuracy in the clinical diagnosis of oral lesions has been shown in several studies[18,19]. Therefore, routinely, surgical specimens should be submitted for pathologic examination and diagnosis. Furthermore, admission of relevant clinical and radiographic information has been shown as pivotal to the diagnostic pathologist in the diagnosis of jaw bone lesions[20].

Diagnostic specificity and sensitivity of cystic jaw lesions is not readily available in the current literature.

Thus, the primary aim of the present study was to assess the specificity and sensitivity of clinical and radiographic diagnoses of cystic jaw lesions in relation to the histology-based final diagnoses. Furthermore, it was also in the scope of this study to evaluate the prevalence and clinical characteristics of cystic jaw lesions treated in a university hospital over a 6-year period (2005–2010) and to compare results with findings available in the literature.

Material and methods

During the period from 2005 to 2010, a total of 188 patients with clinically and/or radiographically verified cystic lesions were referred to and examined at the Department of Oral and Maxillofacial Surgery, Aarhus University Hospital, Aarhus, Denmark. Inclusion criterion for this study was patients were clinically and radiographically diagnosed with a cystic lesion in the jaws during the examination period. Exclusion criterion was patients were diagnosed with a cystic lesion but did not receive treatment in the department.

Parameters registered were gender and age at time of examination. Anatomic location of the cystic lesions was classified as: maxillary molar, maxillary premolar, maxillary incisor and canine, other location in the maxilla, mandibular ramus, mandibular molar, mandibular premolar, mandibular incisor and canine. After clinical and radiographic examination, 22 patients were either referred back to their regular dentist for treatment or did not meet for further treatment in the hospital and were subsequently excluded from the study. Therefore, a total of 166 patients were enrolled in the study.

Radiographic examination was based on a panoramic radiography. On indication, periapical radiographs or computed tomography scans supplemented the panoramic radiography. The lesions were classified as unicystic or multicystic. Relation to teeth, including root resorption and displacement of teeth, was also registered.

At the first clinical examination, patient symptoms such as pain, sensory changes and infection were registered. Following the first examination, a diagnosis based on clinical and radiographic findings was established and a treatment plan was initiated. Treatment options were classified as decompression, enucleation or block resection. Decompression included biopsy of the cystic lesion and placement of a drain tube. Postoperatively the patients were followed clinically, and radiographic evaluation was made on indication. Decompression was the treatment of choice in cases where enucleation was evaluated to increase the risk of post-operative complications such as jaw fracture. Decompression was always followed by a second surgical procedure. When indicated, root canal treatment was performed prior to treatment of the cystic lesions. Furthermore, during surgery, root resection or tooth extraction was performed on indication. Treatment modality with regard to anaesthesia (general or local) was also recorded. When possible, a biopsy specimen was obtained during surgery and subsequently evaluated at the Department of Pathology. Decompression followed by a second surgical procedure involved a second biopsy specimen. The samples were stained and examined using light microscopy and a histological

Table 1 Categories of cystic jaw lesions from selected references (histology-based final diagnoses)

	Radicular cyst (%)	Dentigerous cyst (%)	Residual cyst (%)	KCOT (%)	LPC (%)	NPDC (%)
Denmark (Therkildsen *et al*)	38.6	21.1	7.2	9.6	1.2	5.4
Turkey (Acikgöz *et al.*)[4]	54.1	26.3	13.6	3.2	0.2	1.5
Turkey (Tekkesin *et al.*)[5]	55.1	10.4	9.5	20.6	0.2	1.3
Spain (Nuñez-Urrutia *et al.*)[6]	50.2	21.8	4.3	1.0	1.7	–
Brazil (De Souza *et al.*)[7]	61.4	20.1	4.9	6.4	1.2	–
Brazil (Grossmann *et al.*)[8]	61.0	25.3	–	7.2	–	2.2
Brazil (Avelar *et al.*)[9]	52.2	30.7	–	–	2.2	–
Brazil (Prockt *et al.*)[10]	69.3	22.2	4.3	3.9	0.4	–
Mexico (Mosqueda-Taylor *et al.*)[11]	39.9	33.0	2.2	21.5	0.8	–
Mexico (Ledesma-Montes *et al.*)[12]	38.8	35.5	4.9	18.7	1.0	–
UK (Jones *et al.*)[13]	52.3	18.1	8.0	11.6	0.4	–
UK (Jones and Franklin)[14]	53.4	17.9	9.3	9.8	0.4	–
Canada (Daley *et al.*)[15]	65.1	24.1	–	4.8	–	–
Sicily (Tortorici *et al.*)[16]	84.5	11.4	–	1.3	–	–
Chile (Ochsenius *et al.*)[17]	50.7	18.8	11.2	14.3	0.6	–

KCOT, keratocystic odontogenic tumour; LPC, lateral parodontal cyst; NPDC, nasopalatine duct cyst.

diagnosis was established. Based on clinical, radiographic and histopathologic data the final diagnosis was established and the treatment plan was adjusted accordingly. Primary and secondary biopsies were compared before a histological diagnosis was obtained.

After enucleation and establishment of final histology-based diagnosis, the treatment plan was reevaluated and the patients were followed according to the department standard, which prescribed clinical and radiographic examination after 1 year. Patients diagnosed with a KCOT were followed annually for 5 years.

In cases with recurrent cystic lesions during the observation period, a second treatment was performed and the above-mentioned parameters were registered.

Medical records and radiographs of the 188 patients were examined by a single observer (NT) and registered in a spreadsheet (Excel, Microsoft Office 2003, Microsoft, Redmond, WA, USA). Data management, descriptive statistics and assessment of specificity and sensitivity were undertaken in SPSS 18.0 (IBM, Armonk, NY, USA). The study was performed in compliance with the Helsinki Declaration.

Results

A total of 166 cystic lesions were treated in the 6-year period including 87 (52.4%) specimens from males, and 79 (47.6%) from female patients. Mean age and age range varied for each diagnosis (Table 2). Histology-based diagnostics revealed five odontogenic cyst variants and one non-odontogenic cyst in the material. Moreover, diagnoses such as granulation tissue, traumatic bone cavity and a combined group defined as 'other diagnoses' (e.g. benign or malignant tumours) were also identified by combining clinical, radiographic and histology findings. The most commonly diagnosed cystic jaw lesion was the radicular cyst, followed by the dentigerous cyst and the KCOT (Table 2). In seven patients, surgical treatment did not result in a biopsy specimen and diagnosis was based on preoperative and perioperative clinical findings in combination with radiography. The clinical diagnoses were eruption cyst (two patients), gingival cyst of the newborn (three patients) and an increased incisive fossa/canal (two patients).

Location of the cystic lesions varied for each diagnosis (Table 3). The most commonly affected location was the mandible (72.3%) (Table 3). The diagnoses radicular cyst, dentigerous cyst, KCOT and the group 'other diagnoses' were most frequently observed in the posterior part of the mandible, while traumatic bone cavity was more often observed in the anterior part. Of the total number of lesions 27.7 % were observed in the maxilla. Radicular cysts were observed in all locations, while nasopalatine duct cysts were concentrated to one anatomical site in the maxilla.

Radiographic examination revealed predominantly unicystic lesions in the material (92.2%). Based on diagnoses of odontogenic lesions, unicystic appearance occurred in 97.1% of the dentigerous cysts, followed by 95.3% of the radicular cysts, 91.7% of the residual cysts, 88.9% of the nasopalatine duct cysts and 87.5% of the KCOT. The odontogenic lesion most frequently found to be multicystic was the KCOT (12.5%). More than half of the lesions were anatomically related to the root of a tooth (56.6%).

Pathology, associated with each of the diagnoses, varied (Table 4). Displacement of teeth/roots, root

Table 2 Distribution of cysts according to diagnosis, gender and age (histology-based final diagnoses)

Diagnosis	Number	%	Male (*n*) (%)	Female (*n*) (%)	Age range (years)	Mean age (SD) (years)
Odontogenic						
Radicular cyst	64	38.6	36 (56.3)	28 (43.7)	8.0–91.8	52.7 (17.2)
Dentigerous cyst	35	21.1	20 (57.1)	15 (42.9)	11.6–76.0	48.2 (18.6)
Residual cyst	12	7.2	4 (33.3)	8 (66.7)	30.0–67.6	53.0 (10.8)
KCOT	16	9.6	8 (50.0)	8 (50.0)	16.0–80.75	56.7 (6.9)
LPC	2	1.2	0 (0.0)	2 (100)	56.7–66.4	53.0 (10.8)
Non-odontogenic						
NPDC	9	5.4	6 (66.7)	3 (33.3)	7.4–66.2	44.3 (17.7)
Other						
Granulation tissue	3	1.8	2 (66.7)	1 (33.3)	19.9–62.8	34.6 (24.4)
TBC	7	4.2	4 (57.1)	3 (42.9)	11.6–77.1	23.9 (23.6)
Other diagnosis	11	6.6	3 (27.3)	8 (72.7)	8.8–84.0	39.4 (30.7)
No biopsy	7	4.2	4 (57.1)	3 (42.9)	14.5–63.9	44.3 (21.1)
Total	166	100	87 (52.4)	79 (47.6)	7.4–91.8	48.3 (20.8)

KCOT, keratocystic odontogenic tumour; LPC, lateral parodontal cyst; NPDC, nasopalatine duct cyst; TBC, traumatic bone cavity.

resorption and pain was most commonly seen in relation to dentigerous cysts. Pain was also a frequent finding in relation to nasopalatine duct cysts. Sensory changes were most commonly found in relation to KCOT, and predominantly paraesthesia was observed.

Patients were treated with enucleation (79.5%), decompression (19.9%) or block resection (0.6%). Concomitant treatment of teeth, such as tooth extraction (35.5%) or apical surgery (11.5%), was sometimes necessary. Treatment was undertaken using local anaesthesia (64.5%) or general anaesthesia (35.5%). A decompression was always followed by a second procedure of enucleation. During the second procedure, teeth were extracted (41.9%), and apical surgery performed (16.1%) on indication.

Recurrence occurred in 5 of the 16 patients diagnosed with KCOT (31.3%) within the study period.

Specificity of the clinical and radiographic diagnoses compared with the histology-based final diagnoses was high for all odontogenic and non-odontogenic cystic lesions as well as for the traumatic bone cavity lesions (Table 5). Sensitivity of the clinical and radiographic diagnoses compared with the histology-based final diagnoses was relatively low for KCOT compared with the remaining cystic lesions (Table 5).

Discussion

The primary aim of this study was to assess the specificity and sensitivity of clinical and radiographic diagnoses compared with the histology-based final diagnoses of cystic jaw lesions. Diagnostic specificity was high for all odontogenic and non-odontogenic cystic lesions as well as for the traumatic bone cavity

Table 3 Distribution of cystic jaw lesions according to anatomical site (histology-based final diagnoses)

Diagnosis	%	Maxilla				Mandible			
		Molar	Premolar	Incisor	Other	Molar	Premolar	Incisor	Ramus
Radicular cyst	38.6	5 (7.8)	2 (3.1)	9 (14.1)	2 (3.1)	25 (39.1)	12 (18.8)	7 (10.9)	2 (3.1)
Dentigerous cyst	21.1	1 (2.9)	–	–	2 (5.7)	30 (85.7)	1 (2.9)	–	1 (2.9)
Residual cyst	7.2	2 (16.7)	1 (8.3)	–	3 (25.0)	3 (25.0)	2 (16.7)	–	1 (8.3)
KCOT	9.6	1 (6.3)	–	1 (6.3)	–	6 (37.5)	6 (37.5)	–	2 (12.5)
LPC	1.2	–	–	–	–	–	1 (50.0)	1 (50.0)	–
NPDC	5.4	–	–	–	9 (100)	–	–	–	–
Granulation tissue	1.8	1 (33.3)	1 (33.3)	1 (33.3)	–	–	–	–	–
TBC	4.2	–	–	–	–	1 (14.3)	2 (28.6)	4 (57.1)	–
Other diagnosis	6.6	–	1 (9.1)	1 (9.1)	–	5 (45.5)	4 (36.4)	–	–
No biopsy	4.2	1 (9.1)	–	2 (28.6)	–	–	1 (9.1)	3 (42.9)	–
Total	100	11 (6.6)	5 (3.0)	14 (8.4)	16 (9.6)	70 (42.2)	29 (17.5)	15 (9.0	6 (3.6)

Data in parentheses are presented as percentage (%).

KCOT, keratocystic odontogenic tumour; LPC, lateral parodontal cyst; NPDC, nasopalatine duct cyst; TBC, traumatic bone cavity.

Table 4 Pathologies associated with cystic jaw lesions (histology-based final diagnoses)

Diagnosis	Displacement of tooth/root	Root resorption	Infection	Pain	Sensory changes
Radicular cyst	6 (9.4)	1 (1.6)	7 (10.9)	12 (18.8)	5 (7.8)
Dentigerous cyst	22 (62.9)	6 (17.1)	4 (11.4)	15 (42.9)	1 (2.9)
Residual cyst	1 (8.3)	–	1 (8.3)	3 (25.0)	1 (8.3)
KCOT	5 (31.3)	–	2 (12.5)	6 (37.5)	2 (12.5)
LPC	–	–	–	–	–
NPDC	1 (11.1)	–	2 (22.2)	4 (44.4)	–
Granulation tissue	–	–	1 (33.3)	2 (66.7)	–
TBC	–	1 (14.3)	–	–	–
Other diagnosis	5 (45.5)	1 (9.1)	–	2 (18.2)	1 (9.1)
No biopsy	–	–	2 (28.6)	–	–
Total	40 (24.1)	9 (5.4)	19 (11.4)	44 (26.5)	10 (6.0)

Data in parentheses are presented as percentage (%).

KCOT, keratocystic odontogenic tumour; LPC, lateral parodontal cyst; NPDC, nasopalatine duct cyst; TBC, traumatic bone cavity.

Table 5 Sensitivity and specificity of clinical and radiographic diagnoses compared with the histologically verified final diagnoses

	Sensitivity	Specificity
Radicular cyst	0.72	0.90
Dentigerous cyst	0.82	0.92
Residual cyst	0.75	0.95
KCOT	0.31	0.95
LPC	1	0.99
NPDC	1	0.99
TBC	0.71	0.99

KCOT, keratocystic odontogenic tumour; LPC, lateral parodontal cyst; NPDC, nasopalatine duct cyst; TBC, traumatic bone cavity.

lesions. In accordance with earlier findings, the present study revealed a relatively low sensitivity for KCOT[19]. Therefore, it may be concluded that histology-based final diagnoses is the gold standard in the diagnosis of cystic jaw lesions, whenever KCOT is to be included in the differential diagnosis of cystic jaw lesions. The recurrence rate of KCOT within the study period was 31.3%. It may, however, be argued that a study period of 6 years is fairly short in comparison. The recurrence rate was in accordance with previous findings[21,22]. Relatively low sensitivity and a fairly high recurrence rate of the KCOT deem histology-based diagnoses as mandatory, whenever KCOT is to be included in the differential diagnosis of cystic jaw lesions. A preoperative biopsy of a cystic lesion carries the risk of not being representative of the cystic lesion[23]. We compared preoperative and secondary biopsies to obtain a histological diagnosis, and recommend this method to fellow surgeons.

The present study assessed the prevalence and clinical characteristics of cystic jaw lesions treated in a university hospital in Denmark over a 6-year period. Results of the present study are comparable to previous studies from different parts of the world (Table 1). A slightly lower occurrence of radicular cysts was observed.

The present study showed a difference in the location of cystic jaw lesions where 72.4% were found in the mandible and 27.6% in the maxilla. Many previous studies have found that the maxilla is the part of the jaw that is most frequently affected by odontogenic cysts[7,8,10,16,17], while other studies showed the mandible to be most frequently affected[6,9]. In the present study, it was confirmed that the inflammatory cysts were the most frequently seen odontogenic cysts. This is in agreement with other studies[6–10,13–17].

In general, radiographic findings, of all cystic jaw lesions, were predominantly found to be unicystic. Multicystic lesions were most frequently seen in cases with KCOT. This is in accordance with previous studies[4,24].

In conclusion, the present study revealed a high diagnostic specificity in relation to all cystic jaw lesions. Furthermore, a relatively low sensitivity and a fairly high recurrence rate for KCOT was observed, which is the major reason why histology-based final diagnoses should be regarded as the gold standard in the diagnosis of cystic jaw lesions whenever KCOT is to be included in the differential diagnosis of cystic jaw lesions. Generally, the frequency of odontogenic and non-odontogenic cystic jaw lesions in the current study was in agreement with previous studies.

References

1. Marx RE, Stern D, editors. Oral and Maxillofacial Pathology. A Rationale for Diagnosis and Treatment. Hanover Park, IL: Quintessence Publishing Co, Inc, 2003:573.
2. Neville BW, Damm DD, Allen CM, Bouquot JE, editors. Oral and Maxillofacial Pathology, 2nd edition. Philadelphia: WB Saunders Co., 2002:678–9.
3. Barnes L, Eveson JW, Reichart P, Sidransky D. World Health Organization Classification of Tumours. Pathology and Genetics of Head and Neck Tumours. Lyon: IARC Press, 2005:306–7.
4. Acikgöz A, Uzun-Bulut E, Özden B, Gündüz K. Prevalence and distribution of odontogenic and nonodontogenic cysts in a Turkish population. Med Oral Patol Oral Cir Bucal 2012;17:108–15.
5. Tekkesin MS, Olgac V, Aksakalli N, Alatli C. Odontogenic and nonodontogenic cysts in Istanbul: analysis of 5088 cases. Head Neck 2011;34:852–5. [Epub ahead of print].
6. Nuñez-Urrutia S, Figueiredo R, Gay-Escoda C. Retrospective clinicopathological study of 418 odontogenic cysts. Med Oral Patol Oral Cir Bucal 2010;15:767–73.
7. De Souza LB, Gordón-Nuñez MA, Nonaka CF, de Medeiros MC, Tores TF, Emiliano GB. Odontogenic cysts: demographic profile in a Brazilian population over a 38-year period. Med Oral Patol Oral Cir Bucal 2010;15:583–90.
8. Grossmann SM, Machado VC, Xavier GM, Moura MD, Gomez RS, Aguiar MC *et al*. Demo-graphic profile of odontogenic and selected nonodontogenic cysts in a Brazilian population. Oral Surg Oral Med Oral Pathol Oral Cir Radiol Endod 2007;104:35–41.
9. Avelar RL, Antunes AA, Carvalho RW, Bezerra PG, Oliviera Neto PJ, Andrade ES. Odontogenic cysts: a clinicopathological study of 507 cases. J Oral Sci 2009;51:581–6.
10. Prockt AP, Schebela CR, Maito FD, Sant'Ana-Filho M, Rados PV. Odontogenic cysts: analysis of 680 cases in Brazil. Head Neck Pathol 2008;2:150–6.

11. Mosqueda-Taylor A, Irigoyen-Camacho ME, Diaz-Franco MA, Torres-Tejero MA. Odontogenic cysts. Analysis of 856 cases. Med Oral 2002;7:89–96.
12. Ledesma-Montes C, Hernández-Guerrero JC, Garcés-Ortiz M. Clinico-pathologic study of odontogenic cysts in a Mexican sample population. Arch Med Res 2000;31:373–6.
13. Jones AV, Craig GT, Franklin CD. Range and demographics of odontogenic cysts diagnosed in a UK population over a 30-year period. J Oral Pathol Med 2006;35:500–7.
14. Jones AV, Franklin CD. An analysis of oral and maxillofacial pathology found in children over a 30-year period. Int J Paediatr Dent 2006;16:19–30.
15. Daley TD, Wysocki GP, Pringle GA. Relative incidence of odontogenic tumors and oral jaw cysts in a Canadian population. Oral Surg Oral Med Oral Pathol 1994;77:276–80.
16. Tortorici S, Amodio E, Massenti MF, Buzzanca ML, Burruano F, Vitale F. Prevalence and distribution of odontogenic cysts in Sicily: 1986–2005. J Oral Sci 2008;50:15–18.
17. Ochsenius G, Escobar E, Godoy L, Peñafiel C. Odontogenic cysts: analysis of 2,944 cases in Chile. Med Oral Pathol Oral Cir Bucal 2007;12:85–91.
18. Kondori I, Mottin RW, Laskin DM. Accuracy of dentists in the clinical diagnosis of oral lesions. Quintessence Int 2011;42:575–7.
19. Ali M, Baughman RA. Maxillary odontogenic keratocyst: a common and serious clinical misdiagnosis. J Am Dent Assoc 2003;134:877–83.
20. Ide F, Mishima K, Saito I, Kusama K. Diagnostically challenging epithelial odontogenic tumors: a selective review of 7 jawbone lesions. Head Neck Pathol 2009;3:18–26.
21. Brannon RB. The odontogenic keratocyst. A clinicopathologic study of 312 cases. Part I. Clinical features. Oral Surg Oral Med Oral Pathol 1976;42:54–72.
22. Myoung H, Hong SP, Hong SD, Lee JI, Lim CY, Choung PH *et al*. Odontogenic keratocyst: review of 256 cases for recurrence and clinicopathologic parameters. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001;91:328–33.
23. Zecha JA, Mendes RA, Lindeboom VB, van der Waal I. Recurrence rate of keratocystic odontogenic tumor after conservative surgical treatment without adjunctive therapies – A 35-year single institution experience. Oral Oncol 2010;46:740–2.
24. Buckley PC, Seldin EB, Dodson TB, August M. Multilocularity as a radiographic marker of the keratocystic odontogenic tumor. J Oral Maxillofac Surg 2012;70:320–4.