Incidence of large third-molar-associated cystic lesions requiring hospitalization

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A retrospective study of patients hospitalized for treatment of cystic lesions associated with retained third molars during a 10-year period showed a total of 32 cystic lesions in 25 patients. Twelve cysts were or had been infected, and seven were detected by routine radiographic investigation. Male to female ratio was 1.8, and mean age, 44.7 years; range, 16–76 years. Three of four lesions were found in the mandible. A compromised general health situation was found in eight patients. Mean largest diameter of the lesions was 48 mm; range, 26–72 mm. No differences in patient age or size of the lesions were found between infected and non-infected cases. All cysts were treated surgically, with a complication rate of 19%. Infection and age did not influence complication rate. Crude incidence rate was 0.038 per year per 1000 at risk—that is, persons more than 16 years old with at least one retained third molar present. ☐ *Dentigerous cyst; impacted teeth; oral surgery; third molars*

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Cystic lesions constitute one of the most frequently occurring pathologic changes associated with completely impacted or retained teeth (1, 2). The prevalence of cystic lesions is reported in the range of less than 1% to 6% (3–7). Shear & Singh (8) reported an incidence rate of nine cases per year per million white population in South Africa. Stephens et al. (9) claimed that the risk of developing a dentigerous cyst associated with retained third molars has been greatly overemphasized and based on anecdotal reports and misinterpreted studies.

Most cystic lesions will be of comparatively small dimensions when diagnosed and will be amenable to adequate ambulatory treatment. A few cysts will, however, reach considerable size before being detected or before the patient's general medical condition indicates that hospitalization will be required for adequate treatment.

The controversy of prophylactic removal of incompletely erupted third molars has existed for several years. This discussion relies on an evaluation of risks and benefits of removal—in other words, evaluation of the likelihood of problems arising from a persistent third molar against the risks and costs of the operative procedure. Low-incidence events of this type will be relevant in the ongoing discussion on indications for asymptomatic third-molar removal, as each case represents substantial monetary expenses associated with the hospitalization. Knowledge of incidence rates of large cysts will contribute to the global risk and cost assessments of leaving third molars untreated. Girod et al. (10) pointed out the need for further research to identify risk factors so as to be able to selectively remove retained third molars at risk before large cysts develop and to calculate the risks when asymptomatic third molars are left in place.

The aims of the present study were to evaluate incidence rate and possible predisposing risk factors of cystic lesions associated with retained third molars requiring hospitalization in a Norwegian population.

Materials and methods

A computer search for case records at Haukeland University Hospital, Bergen, Norway, on the basis of the ICD-9 diagnoses listed in Table 1, was completed for the 10-year interval 1985 through 1994. Two hundred and sixty-five records were reviewed for identification of links to third-molar teeth and indicated residence within the county of Hordaland. Sixty-eight records were found; of these, 19 cases of postoperative complications were excluded and reported separately (15), as were 17 cases of serious infections related to a present incompletely erupted third molar (16). Four cases of metastasis to the mandibular angle region were further excluded. Three admissions for recurrences of lesions initially treated before 1985 were excluded as well.

All records were reviewed for medical history and clinical examination at admission. Results from available laboratory tests including bacteriologic cultures, histopathologic reports, and reports on progress and final outcome of the treatment were examined. Available radiographs were examined for extent of the lesions and other possible predisposing pathologic conditions. The largest diameter of the lesions was conservatively measured directly on orthopantomo-

Table 1. Case records search criteria on the basis of ICD-9 classifications

ICD-9 code	Description
170	Malignant tumors of facial bones
213.0-1	Benign tumors of facial bones
198.5	Metastatic tumors to bone and marrow
520.6	Impacted tooth
522.8	Radicular cyst
525.6	Residual root
526.0-2	Jaw cysts
526.4-5	Osteomyelitis, alveolar osteitis
528.3	Abscess, phlegmon

grams. Both day of admission and day of discharge were included in 'days of hospital stay'.

Infection was recorded in the presence of purulent discharge and signs of acute inflammation. Previous infection was recorded from history of previous episodes of swelling, pain, purulent discharge, and clinical effect of administration of antibiotics. Confirmation of information was obtained whenever possible by cross-references. All hospital records were typed and contained information on possible previous admissions. No major changes in superior staff or admission policy occurred during the period of registration. For patients with multiple admissions for lesions in different locations, the total number of in-hospital days was entered as days of hospital stay.

Statistics

To test single proportions, an approximate standard normal test (Z-test) was used. Pearson's product moment correlation coefficient was used to assess correlation between continuous variables.

Results

A total of 32 cystic lesions associated with third molars in 25 Caucasian patients were found. Mean age was 44.7 years; median age, 49 years, and range, 16–76 years. Male to female ratio was 1.8. Characteristics of the patients are cross-tabulated in Table 2 for 14 patients with 17 non-infected cysts and in Table 3 for 11 patients with 12 infected and 3 non-infected cysts. No age and sex differences were found between these two groups.

Information on smoking and alcohol habits was available from 20 and 15 records, respectively. No alcohol problems were elicited from the histories or records of previous admissions. The distribution of these habits in the present group of patients did not differ from that of the general population (11, 12). No differences in smoking and alcohol habits between infected and non-infected cases were found. History and records from previous admissions for eight patients indicated major general health problems (Table 4).

Of the 11 patients in Table 3 with histories of previous infections, 3 patients showed clinical signs of infection at admission. Patients 4 and 8 in Table 3 were subject to emergency admissions due to acute infections. Aerobic and anaerobic routine bacteriologic cultures from an extraoral fistula of several weeks' duration in Patient 21 (Table 3) showed a mixed flora of *Bacteroides* species, *Staphylococcus aureus* (coagulase-positive) and *Citrobacter*. No other bacteriologic cultures were available.

Twenty-four (75%) of the lesions were found in the mandible. The right to left distribution was 20:12. In 7 (28%) patients the lesions were discovered from routine radiographic examinations, and in the other 18 patients infection, pain, or swelling led to detection of the lesions. Mean largest diameter of the lesions was

Table 2. Patients admitted to Haukeland University Hospital in 1985–94 for evaluation and treatment of non-infected cystic lesions associated with third molars

	Patient no.													
	1	2	3	5	6	7	16	17	18	20	22	23	24	25
Sex	M	M	M	F	M	M	F	M	M	F	M	F	M	F
Age (years)	70	42	55	32	64	59	16	53	58	52	53	16	21	36
Anamnestic information														
Detected by	Swell	X-ray	Swell	Pain	X-ray	X-ray	X-ray	Swell	X-ray	Swell	X-ray	X-ray	Nasal stenosis	X-ray
Duration of symptoms (weeks)	10	0	5	2	0	0	0	>26	0	>52	0	0	>52	0
Findings at admission														
Clinical findings	Exp	0	–	Exp	0	Exp	0	Exp	Fistula	Exp	Resil	0	Resil	0
Maximum diameter of cyst (mm)	62	36	65	28	47	56	32	77	50	46	50	–/– 49/51	57	26
Tooth of origin	48	48	48	28	48	48	18	38	38	48	48	18/28 38/48	28	48
Diagnosis	C	C	C	C	C	C	K	C	C	A	K	K	K	C
Total hospital stay (days)	5	1	6	6	4	6	4	4	4	19	6	15	25	3

– = No information; 0 = none; swell = swelling; X-ray = routine roentgenographic examination; exp = expansion; resil = local resilience; C = ordinary epithelial-lined cyst; K = keratocyst; A = unicystic ameloblastoma.

Table 3. Patients admitted to Haukeland University Hospital in 1985–94 for evaluation and treatment of infected cystic lesions associated with third molars

	Patient no.										
	4	8	9	10	11	12	13	14	15	19	21
Sex	M	M	F	M	M	F	F	F	M	M	M
Age (years at admission)	68	20	21	41	31	38	58	76	17	49	75
Anamnestic information											
Duration of symptoms (weeks)	>6	>1	3	1	>4	>12	>17	2	>17	>10	>52
Preadmission antibiotics	P	P	–	P	P	P	0	PM	P	–	0
Findings at admission											
Clinical infection	+	+	0	0	0/0	0	0	0	0/0/0/+	0	+
Maximum diameter of cyst (mm)	72	65	64	58	50/37	38	27	32	40/41 41/35	52	44
Tooth of origin	38	38	38	48	38*/48	28	48	48	18/28 38*/48*	48	38
Diagnosis	C	K	K	C	C	C	C	K	K	C	C
Total hospital stay (days)	5	5	7	5	8	5	3	2	10	2	8

– = No information; 0 = none; + = present; P = phenoxymethylpenicillin; M = metronidazole; C = ordinary epithelial-lined cyst; K = keratocyst.
* Not infected.

47.6 mm; median, 48 mm, and range, 26–72 mm (n = 30). No differences were found between infected and non-infected cysts. Thirteen lesions received a histopathologic diagnosis of keratocyst. Three patients, nos. 9, 15, and 23 in Tables 2 and 3, were diagnosed as having various expressions of a nevoid basal cell carcinoma (Gorlin) syndrome. One lesion, in Patient 20 in Table 2, was diagnosed as a unicystic ameloblastoma. The other 17 lesions were classified as ordinary epithelial-lined cysts.

All cysts were treated surgically, with cystectomy and removal of the third molar or using a stomy operation with biopsy and packing, later followed by cystectomy and tooth removal. Infections were initially treated with drainage and intravenously administered antibiotics, followed by surgery.

Mean hospital stay was 6.7 days; median, 5 days, and range, 1 to 25 days. No difference in length of hospital stay was found between infected and non-infected cases. Pearson's product moment correlation coefficient between age and hospital stay was −0.35. Postoperative complications were found after 6 of 32 operations (Table 5), giving a complication rate of 19%. Crude incidence rates were calculated in accordance with definitions of 'population at risk' (Table 6).

Discussion

Retrospective studies carry an inherent risk of drawing conclusions from data of doubtful quality. In the present study all records were typed, reducing risks of misunderstanding the contents. Confirmation of information was obtained whenever possible. No major changes in staff or admission policy occurred during the period of registration. Particular data, such as days of hospital stay, and diagnostic information such as roentgenograms, histopathology reports and so forth, were regarded as sufficiently valid and reliable. Data dependent on assessments by patients or physicians

Table 4. General health problems in 8 of 25 patients admitted to Haukeland University Hospital in 1985–94 for cystic lesions associated with third molars

Patient no.*	Disease
2	Angina pectoris, previous myocardial infarction
3	Epilepsy
4	Angina pectoris, previous myocardial infarction
6	Aortic valve stenosis
13	Allergy to local anesthetics, encephalomyelitis with sequelae
17	Subarachnoidal hemorrhage, hydrocephalus sequelae
18	Epilepsy, cerebral damage from exposure to industrial solvents
21	Partial frontal lobe infarction, epilepsy

* See Tables 2 and 3.

Table 5. Postoperative complications in 6 of 25 patients admitted to Haukeland University Hospital in 1985–94 for cystic lesions associated with third molars

Patient no.*	Preoperative infection	Complication
5	No	Hypoesthesia, infraorbital nerve, for 6 months
7	No	Pathologic fracture, infection, hypoesthesia inferior alveolar nerve, >6 months
8	Yes	Keratocyst, recurrence after 4 years
17	No	Hypoesthesia inferior alveolar nerve, for 4 months
19	Yes	Postoperative hemorrhage
22	No	Hypoesthesia inferior alveolar nerve, >2 months

* See Tables 2 and 3.

Table 6. Calculated incidence rates of cystic lesions associated with third molars requiring hospitalization in the county of Hordaland, Norway, on the basis of definition of population at risk

Population at risk		Incidence rate
Definition	*n*	per 1000 per year
Total population	430,000*	0.005
Population over 16 years with at least one incompletely erupted third molar	88,000†	0.025
Population over 16 years with at least one retained third molar	57,200†	0.038

* From Statistics of Norway (21).
† Proportions from Hugoson et al. (19).

may be less reliable; the quality of these data is, however, not crucial for the final conclusions.

The decision to admit patients was used in this study as the principal selection criterion. Assessments of need for in-hospital facilities for treatment of infections and evaluation of surgical accessibility and need for general anesthesia and appropriate in-hospital recovery facilities formed the basis of individual admission decisions. The present results (Tables 2 and 3) do not indicate any shift in admittance criteria during the registration period or inclusion of minor lesions. Admittance decisions have been used as entry criteria in similar studies of infections and complications related to third molars (13–16). This method of selection prevents inclusion of minor lesions, thus avoiding problems of defining downward limits of cyst formation, as discussed by Stephens et al. (9). Small cystic lesions will, however, be treated in ambulatory care and thus escape registration. Since several different providers are involved in ambulatory treatment of small cystic lesions, no attempts to assess the volume of such treatment were made, to keep uncertainties related to reporting and definitions at a minimum. The presented incidence rate will thus be valid only for large cystic lesions, and the incidence rate for all third-molar-associated cystic lesions will be higher.

The present male to female ratio of 1.8 is comparable with the 1.4 ratio reported by Shear & Singh (8). Mean age for detection of the present lesions was higher than in the report of Shear & Singh (8), especially with regard to females. Patients admitted for postoperative complications and infections related to third molars (15, 16) were also younger than the present groups. Occurrence of major general health problems will increase with increasing age in a population, and this may explain the increased occurrence of such problems in this patient group (Table 4). Likewise, alcohol and smoking habits did not differ from that of the general population (11, 12). No difference in size between infected and non-infected cysts was found, indicating that the risk of infection is not directly linked to the size of the lesion. Equivalent to postoperative complications (15) and infections related to partially erupted third molars (16), smoking and alcohol habits and impaired general health condition (Table 4) do not seem to increase the risk of infection. None of the investigated variables could thus be identified as general factors predisposing for development or infection of third-molar-associated cystic lesions. The likelihood of large cystic lesions becoming infected is still significant, as can be seen from the infection rate of 38%.

The infected cysts did not require increased in-hospital time for treatment and did not show an increased rate of complications. Infection does not seem to be a negative prognostic factor for the immediate treatment outcome. Patients with a compromised general health situation were not overrepresented in the complications group. Compared with a complication rate of 3% after elective ambulatory third-molar surgery (17), the total complication rate in these cases was increased by a factor of 6. The hospitalization period was similar to that for infections and complications (15, 16), indicating that age, general health problems, and infection do not result in significantly increased hospital expenses. However, sick-leave reimbursement will increase as mean income increases with age, increasing total costs of treatment.

Most of the present cysts were detected from the development of symptoms such as pain, swelling, or infection. The lesions were detected by routine radiologic examination in 28% of the patients. More widespread use of routine panoramic examinations would probably result in detection of an increased number of cystic lesions at an earlier stage. However, the gain from decreased expenses needed for ambulatory treatment of smaller cysts would not balance the costs of routine panoramic roentgenograms in terms of monetary costs and radiation load, even if limited to patients with known retained teeth. The reason is the low probability of each patient developing a cystic lesion, as apparent from the incidence rate.

Haukeland University Hospital is the only hospital with an oral and maxillofacial unit located within the geographic region of this study, the county of Hordaland. All patients with oral and maxillofacial problems to be evaluated for hospitalization are referred to this unit, which in this respect serves a mixed urban and rural population of 430,000. A well-defined and stable population and referral pattern thus make accurate calculations of incidence rates possible.

Table 6 shows calculated incidence rates related to different definitions of patients at risk. Shear & Singh (8) regarded the entire population as being at risk, even though a proportion will be missing third molars or their third molars will be completely erupted (18). A more meaningful definition would appear from only including these patients who are able to develop the actual lesion—in the present case, all patients with at least one retained third molar present. This will give relevant risk assessments for decisions on leaving completely impacted third molars in place.

The present incidence rate (Table 6) compares well with the 0.009 cases per year per 1000 at risk presented by Shear & Singh (8), in view of their inclusion of smaller-sized lesions, and use of a different 'at risk' definition. Other reports of the prevalence of dentigerous cyst (3–7), in the range of 0.81% to 5.8%, are not directly comparable, mostly owing to selected study populations or deviating definitions of pathologic changes.

When compared with known incidence rates for all types of problems related to incompletely erupted third molars—212 to 235 per year per 1000 at risk (19, 20)—the risk of developing large cystic lesions from a third molar left in place must be regarded as clinically insignificant and at the same level as the risk of developing serious postoperative complications (15) and serious infections associated with incompletely erupted third molars (16).

These incidence rates must be interpreted on the background of an unknown rate of previous prophylactic third-molar removals. An unknown number of third molars might have developed cystic lesions if they had been left in place. It is therefore difficult to draw conclusions on the appropriateness of prophylactic removals of symptomless third molars. Nevertheless, the present results do not support a concept of prophylactic removal of retained third molars.

Conclusions

Large cystic lesions associated with persistent retained third molars are occurring with an incidence rate of 0.038 per year per 1000 patients at risk—that is, patients with at least one retained third molar—in a mixed urban–rural population in Norway. Three of four lesions were found in the mandible; otherwise no predisposing factors were found. Thirty-eight per cent of the lesions were or had been infected. Infection and increased age did not influence length of treatment and complication rate. The likelihood of cystic development from leaving retained third molars without removal is so low that prophylactic removal does not seem appropriate for this reason.

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