

Incidence of infections requiring hospitalization associated with partially erupted third molars

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A retrospective study of patients hospitalized for infections associated with partially erupted third molars during a 10-year period (1985–94) showed a total of 17 cases: 6 women and 11 men, aged 18 to 57 years. Eight patients were in the third decade. No deviation from the habits of the general population with regard to cigarette smoking and alcohol consumption or overrepresentation of general health problems was found. All infections were of pericoronal origin. Bacteriologic cultures from six patients showed mixed aerobic–anaerobic oral flora, without any penicillin-resistant strains. The incidence rate of serious orofacial infections associated with partially erupted third molars was calculated to be 0.016 cases per year per 1000 patients at risk. □ *Adverse effects; impacted teeth; oral surgery; risk assessments*

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Recommendations for prophylactic removal of symptomless, partially erupted third molars should be based on an evaluation of probabilities of pathologic conditions arising from a third molar, balanced against the risks and costs associated with the operative procedure (1). Infection seems to be the most frequently occurring pathologic condition associated with partially erupted third molars (2–4). These infections will in most cases be of low to moderate severity and will normally be treated on an outpatient basis.

A small proportion will, however, be more severe and require hospitalization for adequate treatment (5, 6). However, no attempts to describe incidence rates have been found, making assessments of the individual risk of developing such infections difficult. An evaluation of incidence rates of serious infections will consequently be relevant in the ongoing discussion of indications for asymptomatic third-molar removal, as they will contribute to the global risk assessments of leaving third molars untreated.

Identification of possible predisposing factors for serious infections will further be of value in the clinical decision-making process of selective prophylactic third-molar removal.

The aims of this study were to evaluate the incidence rate of infections requiring hospitalization associated with partially erupted third molars in a Norwegian population and to evaluate possible predisposing conditions.

for the 10-year interval 1985 through 1994. One hundred and sixty-nine records were reviewed for identification of links to third-molar teeth and indicated residence within the county of Hordaland. Fifty-eight cases were found; of these, 19 cases of postoperative complications reported separately were excluded (7), and 22 cases of cystic lesions related to a present third molar will be reported separately.

All records were reviewed for the medical history and clinical examination at admission. Results from available laboratory tests including bacteriologic cultures, nursing reports, and reports on progress and final outcome of the treatment were examined. Available radiographs were examined for predisposing pathologic conditions and position of the third molars. Both day of admission and day of discharge were included in 'days of hospital stay' (Table 3). 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 senior staff or admission policy occurred during the period of registration.

Bacteriologic specimens were obtained by needle aspiration, transferred in Møller's transport substrate, and cultured under both aerobic and anaerobic conditions. Partial eruption was defined as visible tooth partly covered with soft tissue or tooth detectable by blunt probing—that is, follicular space in communication with oral cavity.

Statistics

To test single proportions, an approximate standard normal test (*Z*-test) was used. The chi-square test was used to test differences of proportions. None of the tested differences reached significance at the 5% level.

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

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

ICD-9 code	Description	No. of cases*
475	Peritonsillar abscess	0
520.6	Impacted tooth	17
523.3	Pericoronitis	5
525.3	Residual root	0
526.0-2	Jaw cysts	0
526.4-5	Osteomyelitis, alveolar osteitis	0
528.3	Abscess, phlegmon	14

* More than one ICD-9 code per case.

Table 2. Age and sex of 17 patients admitted to Haukeland University Hospital for infections related to partially erupted third molars

	n	Age at admission (years)	
		Mean	Range
Female	6	29.0	18-57
Male	11	32.1	22-47
Total	17	31.0	18-57

Results

Seventeen cases with a final diagnosis of acute infection, including both diffuse soft-tissue infection (phlegmon)

and definite collection of pus (abscess) and a relationship to a partially erupted third molar, were identified. No chronic infections (such as osteomyelitis) with a third molar present were found.

The distribution on the basis of age and sex is shown in Table 2. The male to female ratio was 1.8. Eight of the patients (47%) were in the 3rd decade. Characteristics of the patients are cross-tabulated in Table 3. Patient 10 was admitted because of a systemic antithrombin-3 deficiency and acute pericoronitis. Patient 12 was pregnant. The other 15 patients had no major general health problems.

Eight patients were admitted in the spring (March-May), five in autumn (September-November), and two each in winter and summer. Three of four admissions were in spring and autumn. The annual fluctuation of admissions is shown in Fig. 1. Seventy-one per cent of the admissions were in the second half of the registration period. Daily smoking was indicated by 8 of 15 (53%) of the patients. Information on alcohol consumption was available in 14 records: 2 patients had an alcohol problem (nos. 6 and 9, Table 3), two patients (nos. 1 and 12) were abstainers, and the other 10 were moderate or social users: three times a week or less.

The patients indicated a mean duration of subjective and/or clinical symptoms of 6 days before admission (range, 2-20 days). Most of the patients had symptoms

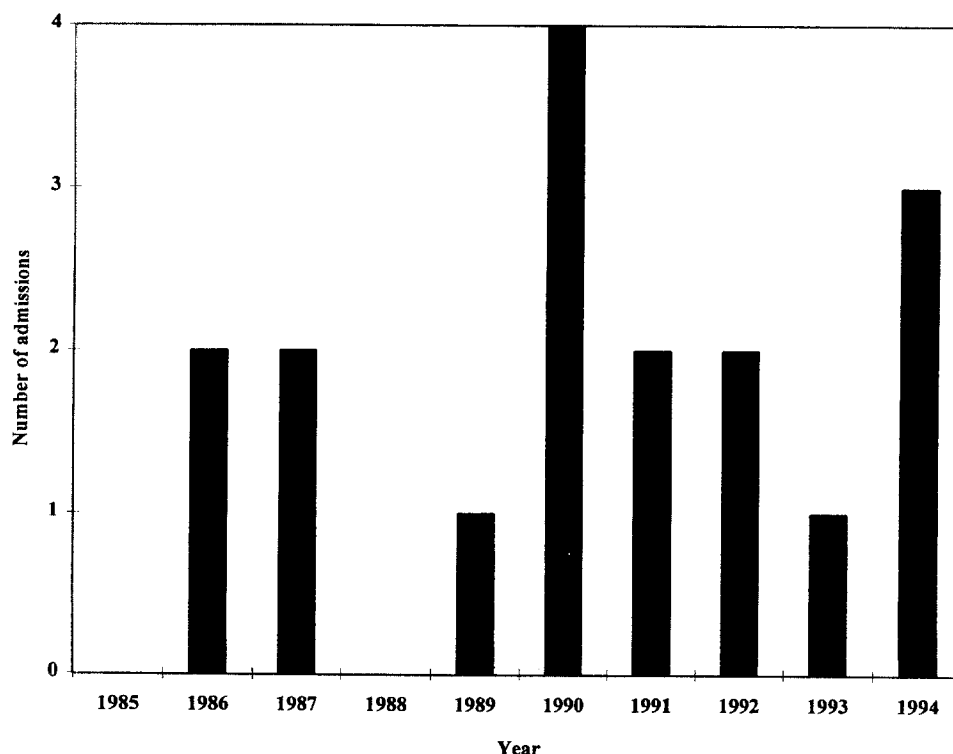


Fig. 1. Annual fluctuation in admissions to Haukeland University Hospital, 1985-94, for serious infections related to partially erupted third molars.

Table 3. Characteristics of 17 patients admitted to Haukeland University Hospital for infections related to partially erupted third molars

	Patient no.																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Age (years)	18	57	36	22	20	23	23	34	28	27	25	27	47	42	37	18	43
Sex	F	F	M	M	F	M	M	F	M	M	M	F	M	M	M	F	M
Anamnestic information																	
Tobacco use*	0	2	3	1	2	3	—	—	2	0	1	0	0	0	0	1	0
Duration symptoms (days)†	4	20	10	3	4	4	15	—	3	—	4	6	6	2	6	5	2
Antibiotics†§	P	0	PM	0	—	—	—	T	0	0	0	0	P	—	(P)	PM	P
Days of antibiotics†§	1	0	9	0	—	—	—	2	0	0	0	0	3	—	4	5/1	2
Findings at admission																	
Swelling	+	+	+	+	0	+	+	+	+	+	+	0	+	+	+	+	+
Dysphagia	+	0	—	+	+	+	+	—	+	—	+	+	+	+	+	+	+
Trismus‡ (mm)	20	N	13	10	20	5	8	<30	15	N	3	13	2	20	<30	<25	<25
Rectal temp. (°C)	37.9	38.1	37.9	39.7	38.0	39.6	38.3	38.5	38.8	—	38.3	39.0	37.8	N	37.8	38.4	38.1
ESR (mm/h)	19	N	54	90	22	48	40	70	32	N	27	80	24	16	23	34	—
CRP	23	—	—	—	N	—	—	—	—	—	—	118	11	81	13	26	48
Leukocyte count ($\times 10^9$)	N	N	15	21	N	N	12	12	17	N	N	18	N	14	N	N	18
Tooth of origin	18	48	38	38	38	38	48	48	38	38,48	48	48	48	48	48	38	38
Hospital stay (days)	5	4	11	5	7	10	2	7	5	4	6	5	2	4	3	3	4

— = no information; 0 = none; + = present; N = within normal range; ESR = erythrocyte sedimentation rate; CRP = C-reactive protein.

* Tobacco: 1 = 1–9 cigarettes per day; 2 = 10–19 c/d, 3 = >19 c/d.

† Before admission.

‡ Maximum interincisal distance.

§ Antibiotics: P = phenoxymethylpenicillin, >4 mill IE/day; (P) = phenoxymethylpenicillin, 3 mill IE/day; M = metronidazole; T = tetracycline.

of severe orofacial infection on admission: trismus and increased rectal temperature (15 of 17, 88%), facial swelling (14 of 17, 82%), and dysphagia (13 of 17, 76%). Of three routine laboratory indicators of infection, at least one of them was increased in 15 patients (Table 3). Two patients had no increase in these indicators. C-reactive protein (CRP) was increased at admission in seven patients; follow-up tests at the time of discharge were made in three patients (nos. 12, 14, and 17 in Table 3), all showing normalization of CRP values.

All infections were by history and examination assessed as originating from pericoronitis of a partially erupted third molar. Mandibular third molars were involved in 16 (94%) cases. Of the 16 unilateral cases, 7 involved the left and 9 the right side. Twelve teeth were located superficially with more than one-third of the

crown above the level of the cemento-enamel junction of the adjacent second molar and vertically (-5° to 19°) positioned, whereas three teeth were superficially located and mesially inclined (20° to 74°). The last two teeth were both deeply located, one being vertically and one horizontally (85°) angulated. All third molars were in close contact with the second molar.

The spread of infections involved one or more of the masseteric, submandibular, or parapharyngeal spaces. All patients were given fluid substitution and intravenous antibiotics: benzylpenicillin and metronidazole in combination or clindamycin, depending on indicated allergy and effect of preadmission treatment. Incision and drainage were done in six patients. Results of routine bacteriologic cultures are summarized in

Table 4. Reported results from routine aerobic and anaerobic bacteriologic cultures and preadmission use of antibiotics in six patients admitted to Haukeland University Hospital for infections related to partially erupted third molars

Patient no.*	Reported results	Preadmission antibiotics	
		Type†	Duration (days)
1	Alpha-hemolytic streptococci	P	1
3	Alpha-hemolytic streptococci and neisseria	PM	9
4	Anaerobic mixed flora and bacteroides	None	
6	Alpha-haemolytic streptococci and staphylococci‡	None	
11	No growth	None	
17	Bacteroides, citrobacter, and staphylococci‡	P	2

* See Table 3.

† P = Phenoxymethylpenicillin; M = metronidazole.

‡ Coagulosis-positive.

Table 4. No strains with indicated resistance to penicillin were found.

The mean duration of hospital stay was 5.1 days (range, 2–11 days). All infected third molars were removed during the hospital stay or in the oral surgery clinic within 2 weeks after discharge, except in Patient 9, in whom removal was postponed until 3 months after delivery. No complications were noted.

Discussion

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.

All records were typed, reducing the risk of misunderstanding the contents. Particular data, such as hospital days, temperature readings, laboratory values, and information on primary treatment, were regarded as sufficiently valid and reliable. Assessments by patients or physicians may be less reliable; the quality of these data is, however, not crucial for the final conclusions.

The decision to admit a patient was used in this study as the principal selection criterion, limiting this study to acute and serious cases. Criteria for admitting patients, and thereby inclusion, included compromised or threatened general condition as seen at the clinical examination, increased rectal temperature, and laboratory infection indicators. The presence of trismus and dysphagia to the extent that dehydration was imminent, and intravenous administration of fluids and antibiotics was judged necessary, was furthermore emphasized. In general, an overall clinical judgement of the situation by experienced clinicians formed the basis for the decision whether to admit a patient. The present results (Table 3) do not indicate any shift in admittance criteria during the registration period or inclusion of minor lesions or infections.

The present age and sex distribution is in accordance with reports of patients hospitalized for severe odontogenic infections (5, 6, 8) and of non-hospitalized pericoronar infections (9). Piironen & Ylipaavalniemi (10) reported a 2:1 female predominance for non-hospitalized pericoronitis. Others (9, 11) found no sex predilection, whereas, in accordance with the present report, Indresano et al. (6) found a male predilection in hospitalized patients with serious infections associated with third molars.

The indicated percentage of daily smokers in the patient group does not differ significantly from the 37% daily smokers in the general population (12). Nor did the indicated pattern of alcohol consumption differ significantly from that of the general population (13).

This study does not identify old age, compromised general health, or alcohol problems or daily smoking as predisposing factors for developing serious infections. The present population has, however, partly been subjected to prophylactic removal of third molars, which to some extent may contribute to the absence of older or medically compromised patients in this group.

The observed seasonal variation in incidence of third molar-associated infections corresponds with the distribution of non-hospitalized pericoronitis reported by Kay (9), with peaks in the spring and autumn. Upper respiratory tract infections was suggested by Kay (9) as a possible predisposing condition; no information on such preceding infections was available from the present records. Nitzan et al. (11), however, found corresponding incidence peaks in June and December, with suggested links to students' examinations and upper respiratory infections. A strong, but not statistically significant, tendency towards an increasing number of admissions for serious third molar-related infections after 1989 was noted.

The role of the mandibular third molar as the origin of orofacial infections (6, 14) is also confirmed in the present study. Haug et al. (5) and Indresano et al. (6) both reported alpha-hemolytic streptococci and bacteroides to be the most frequently isolated pathogens in patients hospitalized with odontogenic and third molar-related infections. More chronic forms of pericoronitis have been associated with fusobacteriae and spirochetes (11). Labriola et al. (15) found alpha-streptococci and bacteroides to be the most predominantly isolated organisms in orofacial abscesses. Alpha-haemolytic streptococci were found in half and bacteroides in one-third of routine isolates in the present group (Table 4). Cultures were, however, only obtained from six patients, making further conclusions unwarranted.

Ventä et al. (16) found distally inclined third molars at the occlusal level at increased risk of developing acute problems. In the present study superficially and vertically positioned teeth dominated but were not overrepresented according to the corresponding distribution in a normal population (17). A mean hospital stay of 5.2 days compares well with the 5 days reported by Mortenson (8) and 6.2 days reported by Indresano et al. (6). Cost estimates for the entire country adds up to approximately NOK 250,000 spent on hospitalization of patients with third molar-related infections. This is a remarkably low figure compared with an estimated total annual cost of NOK 168 million for third molar surgery in Norway (7). Additional costs, including sick leave, lost income, follow-up visits, travel, and so forth, have not been considered.

The population of the geographic region in question, the county of Hordaland, past the age of 16 years, was stable at around 330,000 (18) during the 10 years included in this study. On the basis of data from Sweden (17), approximately 90,000 individuals would be at risk, with at least one incompletely erupted third

molar present. Estimated incidence rate for serious infections related to third molars was thus 0.016 cases per year per 1000 patients at risk. No attempts to present incidence rates for serious infections related to incompletely erupted third molars have been found elsewhere in the literature.

The present incidence rate of serious infections is 0.06 times the rate of postoperative complications requiring hospitalization in the same population. Thus isolated risk assessments of infections versus complications at this level—that is, requiring hospitalization, do not support prophylactic removal of symptomless partially erupted third molars. General recommendations should, however, be based on risk assessments with regard to most third molar cases handled on an outpatient basis.

Conclusions

Cigarette smoking, abuse of alcohol, and general compromised health were not found to be associated with increased risk of developing serious third molar-related infections. The incidence rate of infections requiring hospitalization associated with partially erupted third molars was 0.016 cases per year per 1000 patients at risk in a mixed urban–rural population in Norway. This low probability of serious infections arising from leaving partially erupted third molars without removal does not support the concept of prophylactic removal of symptomless third molars.

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