

Complications requiring hospitalization after third-molar surgery

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A retrospective study of patients hospitalized for complications after third-molar surgery during a 10-year period showed that of the total 19 cases, 15 presented as infections. Five admissions were attributable to surgery performed by oral surgeons, including two cases of postoperative bleeding, two infections, and one displaced root fragment. Fourteen patients admitted after surgery by general dental practitioners included 12 acute and 2 chronic infections. Apart from daily smoking, no medical problems or other risk factors were associated with the complications. According to assessments of regional volume of third-molar surgery by general dental practitioners and oral surgeons, the rates of serious postoperative infections were $2.8 \cdot 10^{-4}$ and $6.5 \cdot 10^{-5}$ cases per operation, respectively. This difference in infection rates may be explained by less surgical training and experience in general dental practice. □ *Complications; impacted teeth; oral surgery; third molars*

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The removal of incompletely erupted third molars is one of the most frequently performed oral surgery procedures, both in general and specialist practice. A proportion of these procedures is followed by postoperative complications. Postoperative alveolitis, infections, neurosensory disturbances, bleeding, and periodontal healing defects (1–8) appear to be the most frequently reported complications after third-molar surgery.

Most of these complications are of small to moderate severity and are normally managed on an outpatient basis. A small group of patients do, however, experience more serious complications, requiring hospitalization for adequate and effective evaluation and treatment.

Because these cases represent considerable morbidity and increased expenses, the incidence rates of such complications and the identification of possible predisposing factors would be of interest. Decision-making on both indications for removal of asymptomatic, incompletely erupted third molars and the optimal level of care—by general practitioners or specialists—would benefit from knowledge on the occurrence of and factors predisposing for serious complications requiring hospitalization.

The aims of this study were to assess the rate of postoperative complications requiring hospitalization after third-molar surgery and evaluate possible predisposing factors leading to such complications, including providing level of primary treatment.

University Hospital, Bergen, Norway, was carried out, on the basis of ICD-9 diagnoses listed in Table 1. The search was completed for the 10-year interval 1985 through 1994. Two hundred and twenty-one records were reviewed for identification of links to preceding third-molar surgery and indicated residence within the county of Hordaland. Nineteen patients hospitalized for complications related to ambulatory third-molar surgery were thus included in the study.

The records were reviewed for medical history, clinical examination, and all progress notes. Results from routine laboratory tests and bacteriologic cultures were included when available.

The term appearing in the discharge notes was entered as diagnosis (Table 2). Both diffuse soft-tissue infection (phlegmon) and true abscess, with a definite collection of pus, were included in the term 'acute infection' (Table 2). Both day of admission and day of discharge were included in 'days of hospital stay'.

A telephone survey of three oral surgery clinics associated with the university hospital, dental school, and public dental health service and four part-time private oral surgery practices, constituting the total oral surgery service to the county of Hordaland, was carried out in December 1994, to determine the total number of third-molar surgical procedures performed in specialist services during the year 1994.

Materials and methods

A computer search for case records at Haukeland

Statistics

To test single proportions, an approximate standard normal test (Z-test) was used.

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

ICD-9 code	Description
520.6	Impacted tooth
525.3	Radix relecta
526.0-2	Jaw cysts
526.4-5	Osteomyelitis, alveolar osteitis
528.3	Abscess, phlegmon
998.1	Postoperative hemorrhage/hematoma
998.5	Postoperative infection

Results

A total of 19 subjects admitted for evaluation and treatment of postoperative complications after ambulatory third-molar surgery were identified, 6 women and 13 men, with a mean age of 28.2 years (median, 26; standard deviation, 9.9 years) at the time of admission. Characteristics of patients, symptoms, and morbidity are cross-tabulated in Table 2.

Daily smoking was indicated by 9 of 13 (69%) of the patients, compared with 37% daily smokers in the general population (9). This overrepresentation of daily smokers was statistically significant ($p < 0.05$).

Information on alcohol consumption was available from 11 records; of these, one was an abstainer, nine patients indicated that they were moderate or social users (three times a week or less), and one had an

alcohol problem. This pattern of alcohol consumption did not differ from that of the general population (10).

The seasonal distribution of admissions can be seen in Fig. 1. Two-thirds of the admissions were in autumn and spring. In Table 3 are listed the mean, median, and standard deviation of duration of preadmission symptoms and length of hospital stay for all patients and those with acute infections. The distribution of diagnoses according to the initial provider of treatment is shown in Fig. 2. Specific information on time from surgery to admission was not available in most cases. One patient (No. 19 in Table 2) was admitted because of a low-grade infection in a large residual cystic lesion.

In four patients (Nos. 1, 5, 7, 8 in Table 2) alpha-hemolytic streptococci were isolated from routine aerobic and anaerobic bacteriologic cultures, and a sample from Patient 2 showed no growth. In the other cases no cultures were made.

Twelve of the 19 patients had received antibiotics before admission, phenoxymethylpenicillin being the most frequently used medication; however, in 3 of 8 patients receiving penicillin the dosage was less than 4 mill IU/day. The lower right third molar accounted for 11 and the corresponding left molar for 7 of the 19 cases. Only one maxillary third molar was present in this group of patients. Trismus, increased rectal temperature, and increased erythrocyte sedimentation rate were found in most (87% to 80%) of the infection cases, whereas leukocytosis was found only in 47%.

All infections were successfully treated with intra-

Table 2. Patients admitted to Haukeland University Hospital with postoperative complications after third-molar surgery, 1985-94

	Patient no.																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age (years)	21	26	18	30	24	24	37	27	20	26	31	25	26	19	57	23	21	33	48
Sex	F	F	F	M	M	F	M	M	M	M	M	M	M	M	M	F	F	M	M
Tobacco use*	-	1	0	-	-	0	3	0	3	3	-	-	-	0	2	2	1	2	3
Duration of symptoms before admission (days)	5	-	5	2	2	-	-	11	5	45	-	5	-	3	60	2	3	30	-
Initial treatment by†	G	G	G	G	G	G	G	G	G	G	Os	Os	Os	Os	G	G	G	Os	-
Preoperative infection	-	+	+	+	0	-	-	-	+	+	-	0	0	+	-	+	0	0	0
Preadmission antibiotics‡	PM	Cl	0	P	0	(P)	0	(P)	E	(P)	0	0	0	P	P	T	Cl	P	-
Trismus	+	-	+	+	+	+	+	+	+	+	-	+	0	+	-	+	+	0	0
Rectal temperature (°C)	37.5	38.3	39.3	N	39.9	38.2	38.0	40.5	39.4	38.2	38.0	38.2	-	37.8	-	37.5	N	N	N
ESR§ (mm/h)	57	N	86	36	74	N	65	52	30	50	24	-	-	34	42	27	60	N	N
CRP¶	23	N	132	-	-	-	-	-	-	-	-	-	-	-	-	89	72	-	N
Leukocytes (·10 ⁹)	17	N	19	12	16	N	11	12	N	12	N	-	-	N	N	N	N	N	N
Diagnosis	A	O	A	A	A	A	A	A	A	A	PH	A	PH	A	O	A	A	R	C
Hospital stay (days)	4	11	5	6	7	1	6	9	5	7	5	5	3	5	5	3	3	6	5

N = within normal range; - = missing information; + = present; 0 = none, abstainer.

* Tobacco use: 1 = 1-9 cigarettes/day; 2 = 10-19 c/d; 3 = 20 or more c/d.

† G = general dental practitioner; Os = oral surgeon.

‡ P = penicillin; (P) = penicillin, <4 mill IU/day; M = metronidazole; Cl = clindamycin; T = tetracycline.

§ ESR = erythrocyte sedimentation rate.

¶ CRP = C-reactive protein.

|| Diagnoses: A = abscess/phlegmon; O = chronic osteomyelitis; PH = postoperative hemorrhage; R = dislocated root fragment; C = residual cyst.

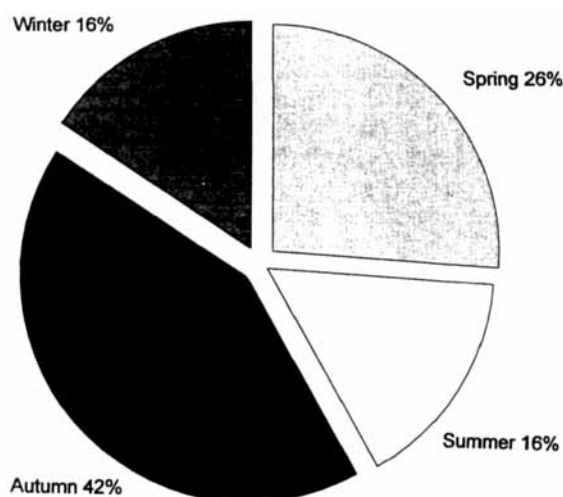


Fig. 1. Seasonal distribution of admissions for postoperative complications after third-molar surgery in 19 patients.

venously administered antibiotics and fluid substitution. Most patients received benzylpenicillin and metronidazole; however, one patient (No. 3 in Table 2) was given erythromycin owing to previous allergic reactions. One patient (No. 8 in Table 2) was switched to clindamycin after 4 days owing to lack of clinical improvement; however, bacteriologic resistance to penicillin could not be demonstrated.

The results from the telephone survey indicated that a total of 3100 third-molar operations were performed in 1994 by specialists in oral surgery in the county of Hordaland and that this surgical activity had been constant over the past years. The volume of third-molar surgery in general practice in Hordaland was estimated to total approximately 4500 operations annually, on the basis of data from a recent nationwide survey (11). The infection complication rates were $2.8 \cdot 10^{-4}$ and $6.5 \cdot 10^{-5}$ cases per operation for general practitioners and oral surgeons, respectively. The overall com-

plication rate in this study was $2.5 \cdot 10^{-4}$ cases per operation.

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 with a population of 420,000. All subjects with oral and maxillofacial problems to be evaluated for hospitalization are referred to this unit. The criteria for the hospital record search and the additional measures for excluding cases with a questionable relation to third-molar surgery should ensure that no cases were missed or incorrectly included.

All records had been typed, reducing the risks 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. As to the diagnoses, broad classifications were chosen, to prevent errors in interpreting available information. Data dependent on assessments from patients or doctors may be less reliable; the quality of these data are, however, not crucial for the final conclusions.

The use of only hospitalized patients limits this study to only serious complications. This method of selection has been used in a study of deep space infections associated with third molars (12). Criteria for admitting patients and thereby possible inclusion in this study, included compromised general condition, as indicated by the clinical examination and the increased rectal temperature and infection variables of the hematologic investigation. Trismus and dysphagia to the extent that dehydration was present and intravenous administration of fluids and antibiotics were judged necessary were furthermore emphasized. In general, an overall clinical judgement of the situation by experienced clinicians formed the basis for the decision whether to admit the patients. The present results (Table 2) do not indicate any shift in admitting criteria during the registration period.

The present overrepresentation of daily smokers in the group of postoperative infections suggests that smoking may be a risk factor. Smoking has earlier been associated with impaired healing of intraoral wounds (13) and increased risk of developing postoperative osteitis/dry socket (14, 15) and osteomyelitis (16).

The age distribution of this patient group agrees well with that of third-molar patients in general, indicating that older patients may not be at substantially higher risk for serious complications. The absence of major general health problems suggests that such patients are adequately identified by the general practitioners, and appropriate measures taken, such as referral to specialist clinics.

Table 3. Duration of symptoms and length of hospital stay in 19 patients admitted for postoperative complications after third-molar surgery

	Days		
	Mean	Median	SD
Duration of symptoms before admission			
All patients ($n = 19$)	12.9	5	18.5
Acute infections ($n = 13$)	7.5	4	12.1
Length of hospital stay			
All patients ($n = 19$)	5.3	5	2.1
Acute infections ($n = 13$)	5.1	5	1.9

SD = standard deviation.

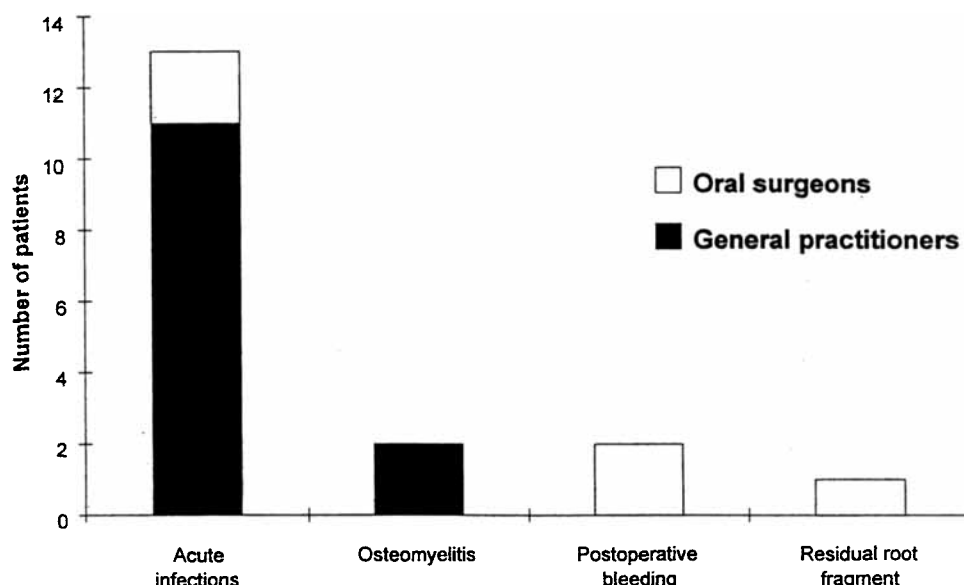


Fig. 2. Distribution of diagnoses according to initial provider of treatment in 18 patients admitted for complications after third-molar surgery.

Preoperative infection was present in 7 of the 16 infection cases, whereas 3 records positively stated that there was no preoperative infection. The size of the present material does not enable us to draw definite conclusions; however, it suggests further consideration of preoperative infection as a possible predisposing factor. Twelve of 15 (80%) patients with infections were receiving peroral antibiotics, predominantly penicillin, on admission. This did not prevent a serious development of the disease, possibly due to effects of local symptoms (trismus, dysphagia) making the peroral route of administration insufficient. This assumption is supported by the observed efficacy of the intravenously administered fluids and antibiotics.

A mean stay of 5.3 days for this type of complications represents total hospital costs of approximately NOK 14,860 per patient, in addition to expenses related to sick leave, lost income, later follow-up visits, travel, and so on. Estimates for the entire country add up to hospital expenses of about NOK 300,000 which is remarkably low compared with an estimated total annual cost of NOK 168 mill. for third-molar surgery in Norway.

The overall complication rate of $2.5 \cdot 10^{-4}$ cases per operation confirms the rare occurrence of postoperative complications in need of hospitalization, compared with the $3 \cdot 10^{-2}$ to 0.24 overall complication rates after third-molar surgery (3, 17, 18). Serious risks associated with this type of surgery thus seem to be low, which is relevant in the discussion of prophylactic removal of symptomless third molars.

The predominance of postoperative infections among patients treated by general practitioners may suggest

that the surgical hygiene standards in general practice are inadequate. Differences in formal surgical training and experience, as indicated by increased operating time and less use of tooth divisions in similar cases by general practitioners (17), may contribute to the observed difference as well. An increased rate of postoperative alveolitis has been found after treatment by general practitioners (17), indicating increased risk of both minor and serious complications after third-molar operations in general practice. Since the fourfold increase in postoperative infections requiring hospitalization in cases treated by general practitioners is based on the current decision level with regard to referrals, it is suggested that a shift towards more referrals of patients at risk of developing infections—for example, teeth with preoperative infection, with preoperative associated pathologic lesions, or in a difficult position, as suggested by Osborn et al. (3), would tend to reduce this difference. The overall low complication rate confirms the rational basis for the current practice of ambulatory third-molar surgery widespread in Scandinavia.

Conclusions

Complications requiring hospitalization after third-molar surgery are generally rare. Mandibular third molars operated on by general practitioners seem to be at fourfold increased risk of developing serious postoperative infections, compared with surgery performed by oral surgeons. Daily smoking seems to be a risk factor for developing serious postoperative infections.

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