Per- and post-operative variables of mandibular third-molar surgery by four general practitioners and one oral surgeon

Trond Inge Berge and Ole Th. Gilhuus-Moe
Institute of Oral Surgery and Oral Medicine, University of Bergen, Bergen, Norway

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Per- and post-operative indicators in 25 patients who had lower third-molar surgery performed by 4 general practitioners (GP) in their own practices were compared with those of a control group of 25 patients operated on by an oral surgeon. The preoperative variables age; sex; general health; use of medications, alcohol, and tobacco; and depth, position, and presence of infection of the third molar were considered in individual matching of the patients. The operations performed by the GPs lasted 17.9 min ($p = 0.0001$) longer than those of the oral surgeon. Increased rates of postoperative alveolitis ($p = 0.03$) and secondary healing ($p = 0.0005$) were found in the GP patient group, as was a tendency for increased postoperative pain and consumption of strong analgesics. The number of days unable to work was 1.9 in the GP group, compared with 0.6 in the surgeon group ($p = 0.0012$). No differences in swelling and trismus were found. □ *General practice; impacted teeth; oral surgery; third molars*

Trond Inge Berge, Dept. of Oral Surgery and Oral Medicine, Årstadveien 17, N-5009 Bergen, Norway

The number of surgical third-molar removals in Norwegian general dental practice exceeds 50,000 a year (1). In addition, a considerable number of referrals to oral surgeons for third-molar surgery are made by general practitioners (2). The total number of surgical removals of third molars in Norwegian oral surgery clinics is not known, but data from Sweden indicate that the number is lower than in general practice (3). A considerable variation in treatment decisions from general practitioners has been described (4, 5), whereas referral decisions from Norwegian general practitioners seem to be of reasonable quality (5).

According to the current philosophy of health care, services should be delivered at the lowest possible level, provided that the quality of treatment is adequate. For third-molar surgery this includes comparable results with regard to the postoperative short- and long-term results. Pain, swelling, and trismus are common sequelae after mandibular third-molar surgery, in addition to reduced working capacity and use of sick-leave days (6–9). The incidence of postoperative complications like alveolar osteitis, infections, and sensory disturbances is also an important indicator of the quality of treatment (10).

Referrals to oral surgeons for third-molar removal have economic consequences, both for the patient's out-of-pocket expenditure and for public or other health insurance costs, and consequences in the form of use of time, according to known travel time for patients to specialists (1). Possible differences in postoperative indicators would thus be relevant to decisions on when to refer and when to perform third-molar surgery in general practice.

The aim of this study was to compare per- and post-operative variables within the 1st week after surgical removal of partially erupted mandibular third molars by general practitioners and an oral surgeon.

Materials and methods

Patients, general practitioners (GP) group

Twenty-five patients in general good health without any regular medication and in need of surgical removal of a single, partially erupted mandibular third molar without major local pathologic conditions volunteered to enter the study. Preoperative variables of the GP group of patients are listed in Table 1. The third molars were judged by the GPs to be technically acceptable for surgery, and surgery was performed by the GPs in a general dental practice setting.

Patients, oral surgeon (OS) group

From 150 consecutively operated patients in a specialist clinic, 25 patients were individually matched to the GP group by the following criteria: depth and position of the third molar, presence of chronic pericoronitis at the time of operation, patient's use of alcohol and tobacco, age, sex, and general health condition, including use of regular medications. The actual matching was performed by an independent oral surgeon not involved in operations or registrations. A comparison of the two patient groups is given in Table 1.

Operating practitioners

The GP group of patients was treated by four male general practitioners, who were selected by interview for their level of surgical activity in practice. All patients in the OS group were operated on by the same surgeon, who had approximately 6 years of experience as a qualified surgeon.

Table 1. Preoperative variables of 50 patients undergoing mandibular third-molar surgery by four general practitioners and one oral surgeon

	No. of patients		
	General practitioners	Oral surgeon	*p*
Sex			
Females	2	14	<0.005
Males	23	11	
Age, years, mean (range)	21.8 (20–30)	23.5 (17–34)	NS†
Tobacco use			
None	16	16	
1–9 cigarettes/day	1	2	NS
10–19 cigarettes/day	6	3	
20 and more cigarettes/day	2	4	
Alcohol use			
Never	12	6	
Once a month	4	7	NS
Once a week	9	12	
Depth			
Superficial*	15	13	
Deep	10	12	NS
Angle			
Vertical (−5°–29°)	7	8	
Mesial (30°–74°)	11	10	NS
Horizontal (>74°)	6	3	
Distal (<−5°)	1	4	
Pericoronitis			
Present	11	5	
Not present	14	20	NS

* More than one-third of crown above the level of the cementoenamel junction of second molar.

† NS = not significant.

Registrations

Patients were interviewed about general medical history, including use of regular medication, alcohol, and tobacco, and history of earlier or present local symptoms. Preoperative clinical examination, including measurements of interincisal distance, was made on the day of operation. Pericoronitis was recorded if any of the symptoms redness, swelling, tenderness, or visible purulent material were present in the soft tissue surrounding a partially erupted third molar.

On the 1st postoperative day a clinical assessment of swelling, recorded on a 50-mm vertical visual analogue scale (VAS), was made by the operating dentist. On the 7th postoperative day a clinical evaluation of the healing and possible postoperative complications was performed by oral surgeons or residents on the basis of defined criteria. Secondary healing was recorded if the wound was more than 2 mm wide, and postoperative alveolitis was recorded if the patients indicated increasing pain after an intermediary period of no or low-intensity pain.

Patients were further asked for any sensory disturbances in lower lip and tongue. Postoperative infection was recorded in the case of increasing local swelling and tenderness after 4–6 days or in the case of visible pus. Reduction of interincisal distance (trismus) was calculated as relative to the preoperative opening capacity, and the recordings were made on the 1st and 7th postoperative day.

Surgical methods

The minimum requirements for entering this study was the need for mobilization of a mucoperiosteal flap and that at least one suture was required for closure. Intraoperative recordings were made of the number of tooth divisions and the operating time in minutes from the time of incision to the completion of the last suture. Lignocaine hydrochloride with adrenaline (Xylocaine®, Astra) (20 mg/ml + 12 μg/ml) was used to induce local anesthesia, and liberal saline irrigation was used in both groups. A gauze drain impregnated with chlortetracycline

Table 2. Duration of mandibular third-molar surgery, percentage reduction in interincisal distance (trismus) on 1st and 7th postoperative day (POD), and indicated days of inability to work, in 50 patients, operated on by 4 general practitioners and 1 oral surgeon

Operator	No. of patients	Operating time, min		% Trismus				Days of inability to work	
				1st POD		7th POD			
		Mean	Range	Mean	Range	Mean	Range	Mean	Range
General practitioners	25	27.4	8–90	28.7	0 to 65.5	9.2	−3.9 to 51.0	1.9	0–5
Oral surgeon	25	9.5	5–17	34.3	−2.0 to 59.0	7.3	−6.1 to 40.7	0.6	0–4
P =		0.0001		NS		NS		0.0012	

NS = not significant.

hydrochloride (Aureomycin®, Lederle) ointment was inserted in the wound and removed the 1st postoperative day.

All patients were given five tablets of a standard analgesic preparation consisting of 500 mg paracetamol and 30 mg codeine (Pinex Forte®, AL), with instructions to take one tablet within the 1st h and then one tablet every 3rd h as needed. Additional analgesics were available on request. A 1-min preoperative mouthrinse with chlorhexidine gluconate 2% (Hibitane®, ICI) was applied by all patients, but no antibiotics were used. All patients were given identical written postoperative instructions concerning food intake, possible bleeding problems, and information on anticipated pain and swelling.

A one-sheet self-registration form was given to each patient with verbal and written instructions to fill in VAS scores for pain and swelling and to answer other questions at specified times. At the end of the week the patients were asked to indicate the number of days unable to work, including the day of surgery. Wording and timing of other questions are indicated in the text and tables in the Results section.

Statistics

The paired Student's *t* test and McNemar's test were used to evaluate differences between means and paired, discrete variables, respectively. Differences did not reach significance at the 5% level unless stated.

Results

Operative procedures

Table 2 shows that the mean operating time of the GPs was 17.9 min longer than that of the oral surgeon. The oral surgeon applied splitting of the tooth during the procedure more frequently than the GPs: the surgeon divided 22 of 25 teeth (up to 4 divisions), whereas the GPs divided 6 of 25 teeth (up to 2 divisions) ($p = 0.052$). The volume of administered local anesthesia was equal in the two groups; however, the GP group of patients indicated a mean duration of the local anesthesia of 3 h and 30 min, whereas the patients operated on by the oral surgeon indicated 20 min longer duration. This difference was not statistically significant.

Postoperative variables during the first week

VAS-recorded pain. Significantly ($p = 0.02$) more pain at 3 h postoperatively was found in the GP group. Fig. 1 shows decreasing pain differences recorded in accordance with time elapsed after surgery.

VAS-recorded swelling. No significant differences could be detected from the observer assessments on the 1st postoperative day or from any of the patients' own assessments (Fig. 2).

Interincisal distance. Apart from a tendency towards slightly less trismus (5.6%) on the 1st postoperative day in the GP group, no differences were detected (Table 2).

Use of analgesics. A tendency towards increased use of strong analgesics (Pinex Forte and equivalent drugs) in the GP group (0.72 tablets; $p = 0.062$) was indicated on the 1st postoperative day (range, GP group: 0–5; OS group: 0–3 tablets); otherwise there was only a slight increase in analgesic consumption in the GP group (Fig. 3). The range of use of strong analgesics in both groups on the day of operation was zero to five tablets. No differences in additional use of mild, over-the-counter analgesics (paracetamol, acetylsalicylic acid (ASA)) were found.

Days of incapacity to work. The GP patient group indicated a mean of 1.3 days of increased duration of inability to work, compared with the oral surgeon group (Table 2).

Postoperative 1-week result

Significantly ($p = 0.0005$) increased secondary healing was found in the GP group—15 of 25, compared with 1 of 25 in the oral surgeon group—and a significantly ($p = 0.031$) increased rate of postoperative alveolitis—6 of 25 in the GP group and 0 of 25 in the oral surgeon group. Of the six alveolitis

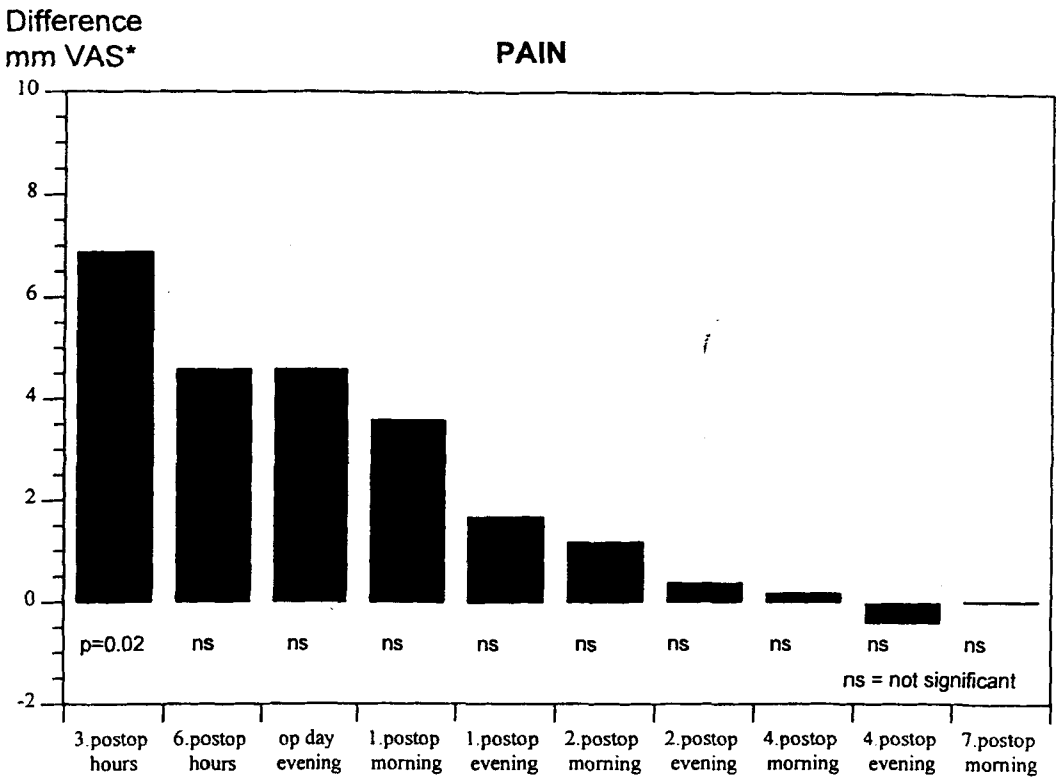

Fig. 1. Visual analogue scale (VAS)-registered differences in pain after mandibular third-molar surgery in patients operated on by four general practitioners ($n = 25$) and one oral surgeon ($n = 25$). *Positive values indicate increased pain in the general practitioner group. 50-mm VAS scale.

cases four occurred in patients without pericoronitis. No neurologic complications or infections were found in either group.

Discussion

The participating GPs were selected on the basis of their surgical activities in practice through interviews. The indicated frequency and distribution of surgical activities and surgical experience were compared with data for Norwegian GPs (2), and the selected practitioners were found to be representative for the whole population of 3725 GPs (1). The participating oral surgeon had average experience as a surgeon when compared with the approximately 30 active oral surgeons in Norway.

The patients in the GP group were selected by the GPs on the basis of clinical and radiographic assessment of the preoperative situation. This resulted in the selection of relatively simple cases, and the results are consequently valid only for such cases. However, it is likely that surgery on more advanced cases by the GPs would have resulted in even greater differences in postoperative variables, but inclusion of such cases would have been unethical.

A possible cross-over design was left out for two reasons: it was considered ethically difficult to ask a patient to have the second operation performed by a less competent dentist in this field, and the possibility of a cross-over effect on the VAS registration of pain and swelling was not known. The matching of the two groups of patients was

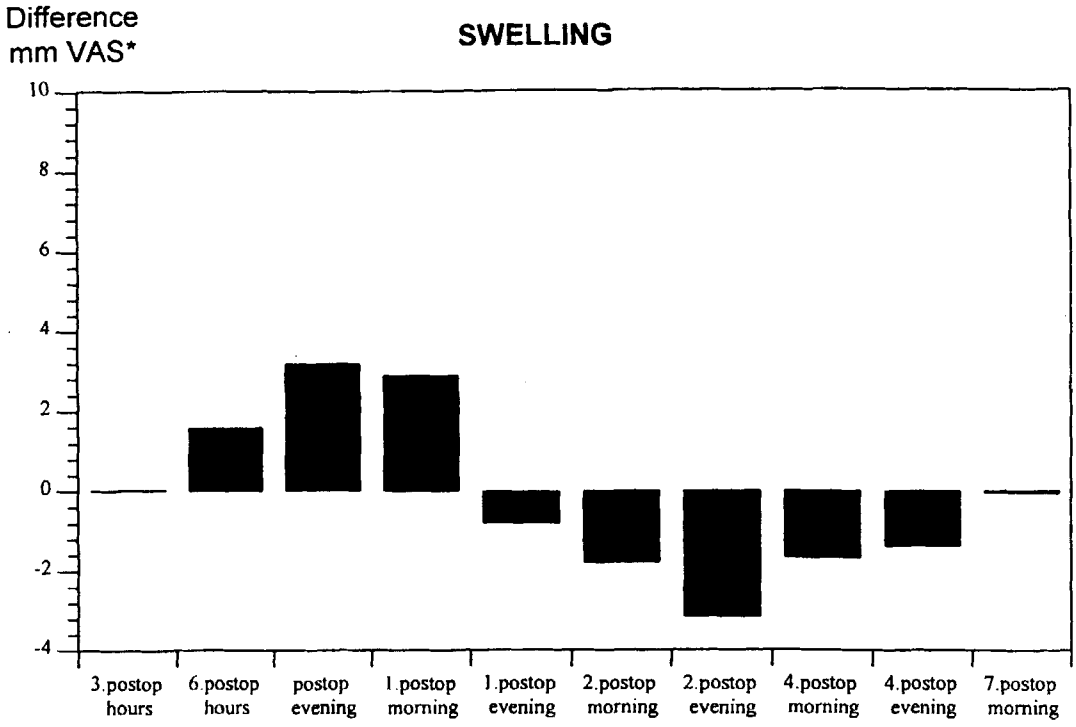

Fig. 2. Visual analogue scale (VAS)-registered differences in swelling after mandibular third-molar surgery in patients operated on by four general practitioners ($n = 25$) and one oral surgeon ($n = 25$). Positive values indicate increased swelling in the general practitioner group. 50-mm VAS scale.

done to ensure that preoperative factors known to affect postoperative indicators (11–14) were comparable. This resulted in significantly more females being selected in the OS group. Females have been found to indicate higher levels of pain (13, 14) and to be at increased risk of developing alveolitis (12). Others have, however, found no effect of sex on the rate of such complications (8, 15). As the pain levels and the rate of alveolitis in the OS group were lower than in the GP group, this discrepancy in sex distribution between the two groups of patients tends to strengthen our final conclusions.

Operative indicators: duration of operation and tooth splitting

The oral surgeon's experience in third-molar surgery was reflected in the marked difference in operating time and in the extensive use of splitting of the tooth during surgery. The patients' subjective experience of the procedure itself was not asked for, owing to the possibility of bias associated with the long-term relationship between the patient and his GP. Most likely, the reduction in operating time represents a substantial benefit for the patient.

Postoperative pain, swelling, and trismus

The difference in recorded pain 3 h postoperatively may be related to the increased duration of local anesthesia in the OS patient group. However, as only minor differences in duration of local anesthesia were reported, other peroperative variables may explain most of the pain difference. A strong tendency for more pain in the GP group was found, and the pain scores decreased with elapsed postoperative time in a consistent manner. The GP-operated patients also indicated a tendency for use of more strong

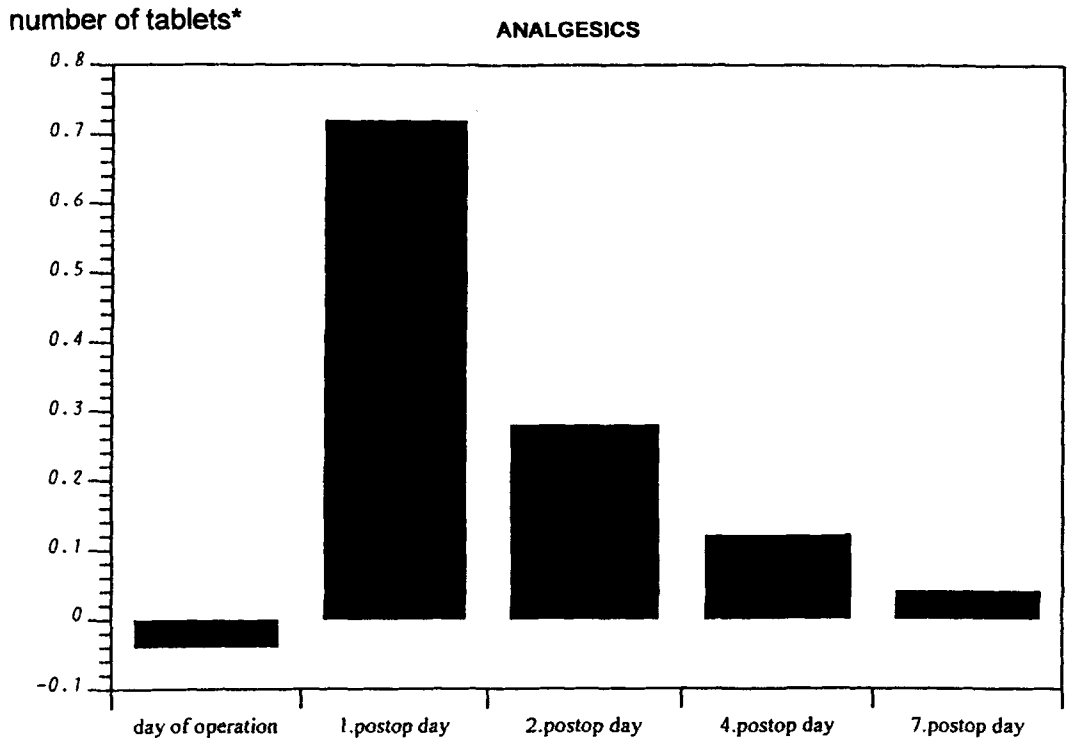

Fig. 3. Difference in analgesic (Pinex Forte®) consumption after mandibular third-molar surgery by four general practitioners ($n = 25$) and one oral surgeon ($n = 25$). Positive values indicate increased consumption in the general practitioner group.

analgesics than the patients operated on by the oral surgeon, which supports the assumption that more postoperative pain was experienced by the patients operated on by the GPs. This is in agreement with several reports on the postoperative relationship between duration of the operation and the amount of postoperative pain (7, 8, 16); however, others have found no such relationship (13, 14). The inverse relationship between rates of tooth splitting and duration of operations suggests that the former variable should be cautiously used for evaluation of degree of difficulty in third-molar surgery.

The validity of VAS assessment of swelling by patients and observers has been demonstrated earlier (9, 17). No differences in postoperative trismus and swelling were recorded. Since no correlation between duration of operation and postoperative swelling and trismus has been described earlier (7), it may be concluded that inexperienced surgeons do not cause their patients increased postoperative swelling or trismus.

The recorded differences in healing may reflect the surgical technique, where the oral surgeon to a greater extent mobilized the mucoperiosteal flap and thereby was able to perform a more complete wound closure than the GPs. The use of a gauze drain for 24 h may explain the lack of anticipated increased postoperative pain and swelling when tight closure was applied (18, 19). With regard to postoperative pain and analgesic consumption, secondary healing was not found to be superior to a tight wound closure combined with a 24-h gauze drain.

By using the characteristic pain pattern (15, 20) for registration of postoperative alveolitis, the risk of underestimating this incidence was minimized. Inexperienced surgeons and patients using tobacco represent risk factors for development of alveolitis (15, 21). Prolonged duration of surgery and

use of tobacco have both been associated with increased fibrinolytic activity, which is considered the main pathogenetic mechanism for development of postoperative alveolitis (20, 22). Since four of the six alveolitis complications occurred in patients without pericoronitis, the preoperative difference in pericoronitis frequency between the two groups of patients cannot explain the observed difference in occurrence of alveolitis. An increased rate of alveolitis, as expected from the increased number of female patients in the OS group (Table 1), was not found. The present results support earlier conclusions that increased operating time and inexperience of the surgeon represent risk factors in developing postoperative alveolitis. The GPs were performing surgery in a general dental practice setting, with less than optimal hygiene regimens, whereas the surgeon was operating under aseptic conditions. This difference in hygiene levels may represent a factor that, in addition to operating time and level of experience of the surgeon, to some extent may contribute to the difference in rates of postoperative alveolitis found in this study.

The significant difference in indicated days unable to work after third-molar surgery may be related to the increased pain experience and use of strong analgesics and the increased rate of postoperative alveolitis. Consumption of sick-leave days has been used as an indicator of the postoperative course (23, 24). The mean of 2.5 days of sick leave found by van Gool et al. (25) is markedly higher than the present result but may be related to the relatively simple cases included in this study. The use of the term 'inability to work' was preferred to 'sick-leave days', as several patients in the relevant age group are students or unemployed. The number of days of inability to work may then be considered an important indicator of the total strain experienced by the patients after third-molar surgery.

The present results indicate that referral for third-molar surgery to a specialist may be profitable both for the patient and the community, provided that the costs of referral are reasonable. These costs will depend greatly on the distribution of oral surgery services, which for Norway is indicated by the mean one-way travel time for patients of 1.3 h, ranging from 2.1 h in northern Norway and the region of Trøndelag to 1 h in the southeast region (1).

In conclusion, patients undergoing mandibular third-molar surgery by GPs experienced an extended period of being unable to work and an increased rate of postoperative alveolitis. In addition, a tendency for increased postoperative pain and use of strong analgesics was found. These negative factors should be balanced against possibly increased costs and travel time associated with specialist referrals when decisions are made on referral of relatively simple mandibular third-molar cases.

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