

# Inability to work after surgical removal of mandibular third molars

Trond Inge Berge

Department of Oral Surgery and Oral Medicine, University of Bergen, Bergen, Norway

Berge TI. Inability to work after surgical removal of mandibular third molars. *Acta Odontol Scand* 1997;55:64–69. Oslo. ISSN 0001–6357.

Inability to work after mandibular third-molar surgery was studied in 201 patients operated on in a specialist clinic. Mean indicated inability to work was 1.07 days; 95% confidence interval, 0.91–1.23 days; range, 0–6 days. Eighty-six (43%) patients did not indicate any reduction in working ability. Duration of operation more than 14 min, heavy smoking (>19 cigarettes/day), and female sex were associated with prolonged inability to work. Self-administered analgesic consumption and pain scores over the first postoperative week showed positive correlations with inability to work:  $r = 0.44$  and  $0.41$ , respectively. Other indicators of the normal postoperative reaction were to a lesser extent associated with reduced ability to work. Total sick-leave cost in Norway associated with surgical third-molar removals, adjusted for age-related income, employment rate, treatment rate, and provider of treatment, was 46.4 million NOK per year. □ *Analgesics; impacted teeth; oral surgery; sick leave*

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

Consumption of sick-leave days has been used as indicator of treatment outcome for various surgical procedures, including vasectomies (1), pilonidal cyst treatment (2), laparoscopic cholecystectomy (3, 4), meniscectomy (5), and transurethral prostatectomy (6). In the field of oral surgery the use of sick leave has been considered in rigid internal fixation in maxillofacial traumatology and orthognathic surgery (7), in third-molar extraction (8), and in evaluation of different drugs (9–11) and different providers of treatment in third-molar surgery (12).

Decisions and recommendations on third-molar removal should rely on a comprehensive cost-benefit analysis. Attempts at such analyses have been made (13, 14), using, however, somewhat inadequate background data. Cost analysis of third-molar surgery should include all costs related to surgery: professional fees, travel expenses, and costs related to inability to perform normal work as a consequence of the procedure. Inability to work can easily be attributed to monetary costs.

No attempts have been found in the literature to assess possible relations between pre- and post-operative variables and inability to work after third-molar surgery, nor any assessments of monetary costs related to postoperative sick leave. Such information would be useful in attempts to reduce sick leave, thereby saving costs. It would also make valuable contributions to preoperative patient information and to an overall cost analysis.

The aims of this study were to assess inability to work and its costs after mandibular third-molar surgery in a specialist clinic and the influence of possible pre- and post-operative indicators on duration of inability to work.

## Materials and methods

### *Patients*

A total of 228 consecutive patients in general good health volunteered to enter the study. The age distribution is shown in Fig. 1. All patients were referred to or had reported to the oral surgery clinic at the Dental School of Bergen. All patients were in need of surgical removal of a single retained or partially erupted third molar. Two hundred and one patients completed the required registration forms and were included in the further analyses. Non-responders were evenly distributed in accordance with age groups. Indications for removal included partial eruption/orthodontic considerations, 112 (56%); previous or present infection, 51 (25%); present pain, 22 (11%); caries, 14 (7%); and resorption and cystic lesion, 2 (1%). Thirty-six patients were taking medications regularly, including 28 women taking oral contraceptives and 8 patients taking non-steroid antiallergic/antiasthmatic medication. Other preoperative characteristics are shown in Table 1.

### *Surgical procedure*

All patients received standardized preoperative information and a 1-min preoperative mouthrinse with a 2% chlorhexidine gluconate (Hibitane®, ICI) solution. No pre- or post-operative antibiotics were used. After induction of local anesthesia with lignocaine hydrochloride with adrenaline (Xylocain®, Astra) (20 mg/ml + 12 g/ml), a buccal mucoperiosteal flap was raised via a standard envelope incision. Burs were used for bone removal and tooth sectioning with liberal saline irrigation. A gauze drain impregnated with chlortetracycline (Aureomycin®, Lederle) ointment was inserted

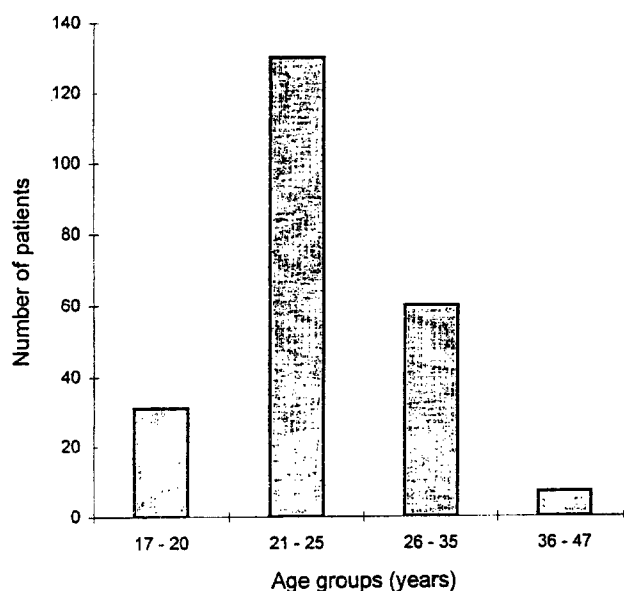


Fig. 1. Age distribution of 228 patients undergoing mandibular third-molar surgery.

into the wound, which was closed with polyglactin (Vicryl, Ethicon) sutures. Operating time was recorded from incision to completion of last suture. The drain was removed on the 1st postoperative day. Mean operating time was 9.8 min (standard deviation,

Table 1. Preoperative characteristics of 204 patients undergoing mandibular third-molar surgery

	n	%
Sex		
Females	102	50
Males	102	50
Age, years: mean (range)	25.1	(17-47)
Use of tobacco		
None	49	61
1-9 cigarettes/day	38	18
10-19 c/d	30	15
20 c/d and over	12	6
Side		
Left	104	51
Right	100	49
Depth		
Superficial*	100	49
Deep	104	51
Angle†		
Distal (< -5°)	40	20
Vertical (-5° to 29°)	78	38
Mesial (30° to 74°)	68	33
Horizontal (>74°)	18	9
Pericoronitis		
Present	28	14
Not present	176	86

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

† Relative to axis of adjacent second molar.

4.9 min; range, 3-34 min). All patients were given five tablets of a standard analgesic combination (paracetamol, 500 mg + codeine, 60 mg (Pinex Forte®, AL)), with written and verbal instruction to take the first tablet immediately after completion of the procedure, then one tablet every 3rd h as needed for pain. Patients were also given written instructions about food intake, possible bleeding problems, and information on anticipated pain and swelling.

#### Registrations

Reduction in mouth opening capacity (interincisal distance) was recorded the 1st postoperative day. Trismus was calculated as percentage reduction compared with recorded preoperative opening capacity. All patients were given a one-sheet self-registration form with verbal and written instruction to complete visual analogue scale registrations of pain and swelling at specified times, and indicate dysphagia and sleeping disturbances by using the following verbal rating scale: insignificant-moderate-severe. Finally, they were asked to indicate the number of days, including day of surgery, when they were unable to perform usual working activities ('inability to work').

#### Statistics

Pearson's product moment correlation coefficient was applied to correlate continuous variables. Turkey's pairwise comparisons were used in the analysis of variance between continuous and classified variables. Multiple classification analysis (15) was used to evaluate bi- and multi-variate effects of predictor variables in addition to proportion of variance of dependent variables explained by the predictors simultaneously (multiple  $R^2$ ). Level of statistical significance was set to 5% unless otherwise indicated.

#### Results

No difficulties in understanding the terms used in the registration forms were noted.

Mean indicated inability to work was 1.07 days; 95% confidence interval was 0.91 to 1.23 days. Distribution of indicated days of inability to work on the basis of sex is shown in Fig. 2. Mean inability was 0.92 days and 1.23 days for males and females, respectively. This difference was not statistically significant.

Table 2 shows positive but weak correlations with pain, swelling, and consumption of analgesics the 1st postoperative week, with trismus the 1st postoperative day, and with duration of operation. Increased inability to work was also associated with moderate postoperative sleeping disturbances ( $P = 0.001$ ) and moderate postoperative dysphagia ( $P = 0.014$ ) (Table 3).

Results from multiple classification analyses (Table 4)

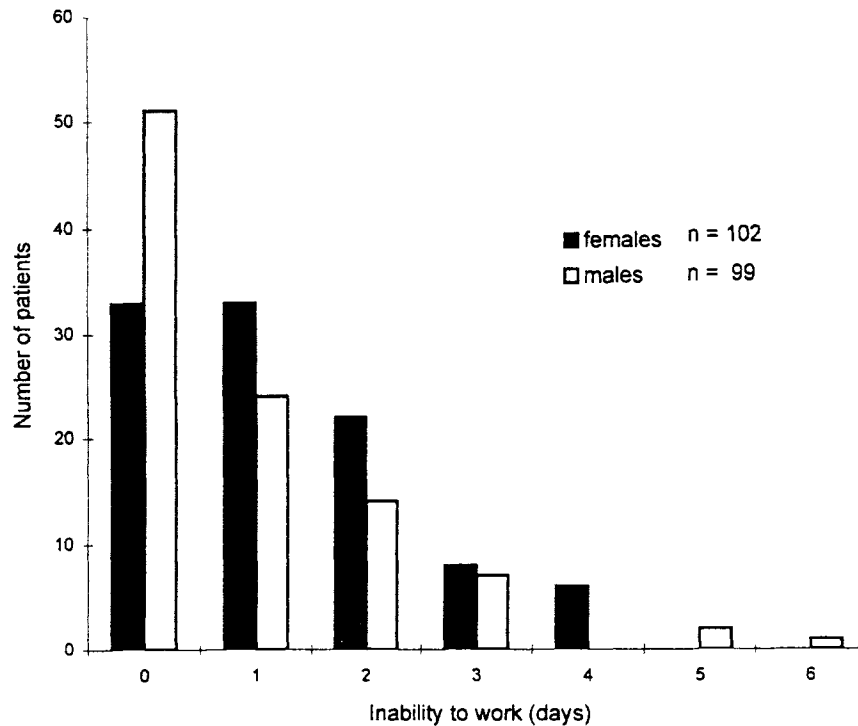


Fig. 2. Days of inability to work, by sex, in 201 patients after mandibular third-molar surgery.

indicate that of the preoperative indicators heavy smoking and prolonged operating time were the two most important negative prognostic factors, whereas short operative procedures on distally inclined teeth in male patients seem to be associated with a slight reduction in working inability (Table 5).

Squared correlation coefficients and multiple classification analyses show that preoperative indicators together explained 15% of variation in trismus and 9% to 11% of variation in pain, swelling, and inability to work, respectively. Fig. 3 summarizes the explanatory powers of both pre- and post-operative indicators on the

duration of inability to work. Variations in consumption of analgesics during the 1st postoperative week explained 19% of the variation in inability to work, whereas 17% was explained by total pain score, these two factors being predominant.

## Discussion

The present patient age distribution—71% less than 26 years old—and treatment indications reflect current recommendations (16, 17). Visual analogue scale assessments of pain and swelling have been found useful in studies of postoperative reactions after third-molar surgery (12, 18). The term inability to work was preferred in this study to include patients not regularly employed, as a considerable proportion of patients in the relevant age groups are students or otherwise unemployed (Table 5). To use sick leave as an indicator of postoperative strain, all categories of patients must be included. This distinction between reduced functional ability and sick leave has also been discussed by Sindet-Pedersen et al. (10).

Van Gool et al. (8) found a mean of 2.5 days of inability to work after third-molar removals. Fifty-five per cent of their patients indicated that they had not worked for at least 1 day after third-molar extractions in general. Refinement in treatment procedures during the past 2 decades may to some extent explain the present increase in ability to work after third-molar surgery.

Table 2. Pearson's product moment correlation coefficients ( $r$ ) of pre- and post-operative indicators with reported days of inability to work after mandibular third-molar surgery in 204 patients

	$r$	$P <$
Total* analgesics	0.441	0.01
Total† pain	0.410	0.01
Trismus‡	0.251	0.01
Total† swelling	0.239	0.01
Duration of operation (min)	0.174	0.05
Patient age (years)	0.038	NS§

\* Sum of analgesic consumed during the 1st postoperative week.

† Sum of visual analogue scale registrations the 1st postoperative week.

‡ Reduction in opening capacity (interincisal distance) the 1st postoperative day (percentage reduction compared with preoperative opening capacity)

§ Not statistically significant.

Table 3. Days of inability to work on the basis of indicated postoperative dysphagia and sleeping disturbances after mandibular third-molar surgery in 200 patients

	Dysphagia			Sleeping disturbances		
	n	Mean	95% confidence interval	n	Mean	95% confidence interval
Severe	11	1.33	2.02-0.64	10	1.60	2.91-0.29
Moderate	112	1.26	1.51-1.01	42	1.60	2.02-1.18
Insignificant	77	0.77	0.97-0.57	64	0.75	0.96-0.54

Sick leave or reduced ability to work has been used along with other variables, such as pain and complication rate, as measurements of outcome in comparison of different treatment modalities. Happonen et al. (11) found sick leave of from 1.6 to 1.9 days after third-molar surgery by an oral surgeon in different groups of patients receiving per- and post-operative antibiotics or placebo. Sindet-Pedersen et al. (10) used influence on daily functional activity as an indicator of naproxen's superiority over acetylsalicylic acid as postoperative medication after third-molar surgery. Fifty-seven per cent of their patients indicated no reduction in daily functional ability, compared with 42% found in this study.

Apart from duration of preoperative symptoms in lumbar disc surgery (19), no analyses of influence of preoperative indicators on consumption of sick-leave days have been found. Van Gool et al. (8) speculated that illness and fever were initially important, followed by swelling and trismus in explaining inability to work after third-molar surgery. Happonen et al. (11) stated that pain was the reason most commonly given for inability to work. Tables 2 and 3 indicate that in addition to postoperative pain and swelling, trismus, dysphagia, and sleeping problems are also associated with inability to work. As reduction in working ability can be attributed to a combination of several indicators of the postoperative reaction, working inability may in future studies be useful as an overall indicator of total strain after surgery.

Of the preoperative indicators, female sex, pericoronitis, and heavy smoking were main negative prognostic factors. This may partly be due to increased perception of illness associated with these characteristics as seen from general studies of consumption of sick leave, in which female sex (20) and smoking (21) are at increased risk. Level of postoperative reaction as seen from other indicators (pain, swelling, trismus) was not increased in these patients. Duration of operation can be taken as an overall measurement of operative difficulty. Van Gool et al. (8) found less reduction of ability to work after simple third-molar extractions as compared with surgical removals. The present results indicate that even though individual associations were weak, the presence of these factors may contribute to extended need for sick leave after the first postoperative day.

Total analgesic consumption was found to explain 19% of variations in inability to work. This may be a reflection of analgesic use as an overall co-indicator of the total strain after surgery. This assumption is supported by the 16% explanatory power of total pain. Side effects of analgesics may be a confounding factor, as it may contribute to reduced ability to work. Common side effects of the paracetamol-codeine combination used in this study are tiredness, nausea, and dizziness (22). In the present study the medication was self-administered, except for the initial dose. No spontaneous reports of side effects were noted. However, as such reports were not specifically asked for, the

Table 4. Multivariate (adjusted for independents) negative influence of preoperative indicators on inability to work after mandibular third-molar surgery. Increase in days of inability to work compared with a grand mean of 1.07

	Deviation from grand mean
Heavy smoking (> 19 cigarettes/day)	0.78
Long operation (> 14 min)	0.34
Female patients	0.14
Chronic pericoronitis	0.14
Deeply located tooth*	0.08
Mesial angulation (30° to 74°)†	0.07

\* More than one-third of crown below cemento-enamel junction of adjacent second molar.

† Relative to axis of adjacent second molar.

Table 5. Multivariate (adjusted for independents) positive influence of preoperative indicators on inability to work after mandibular third-molar surgery. Decrease in days of inability to work compared with a grand mean of 1.07

	Deviation from grand mean
Short operation (< 6 min)	-0.25
Distal angulation (< -5°)*	-0.20
Male patients	-0.14
Superficially located tooth†	-0.08
No smoking	-0.07
No chronic pericoronitis	-0.02

\* Relative to axis of adjacent second molar.

† More than one-third of crown above cemento-enamel junction of adjacent second molar.

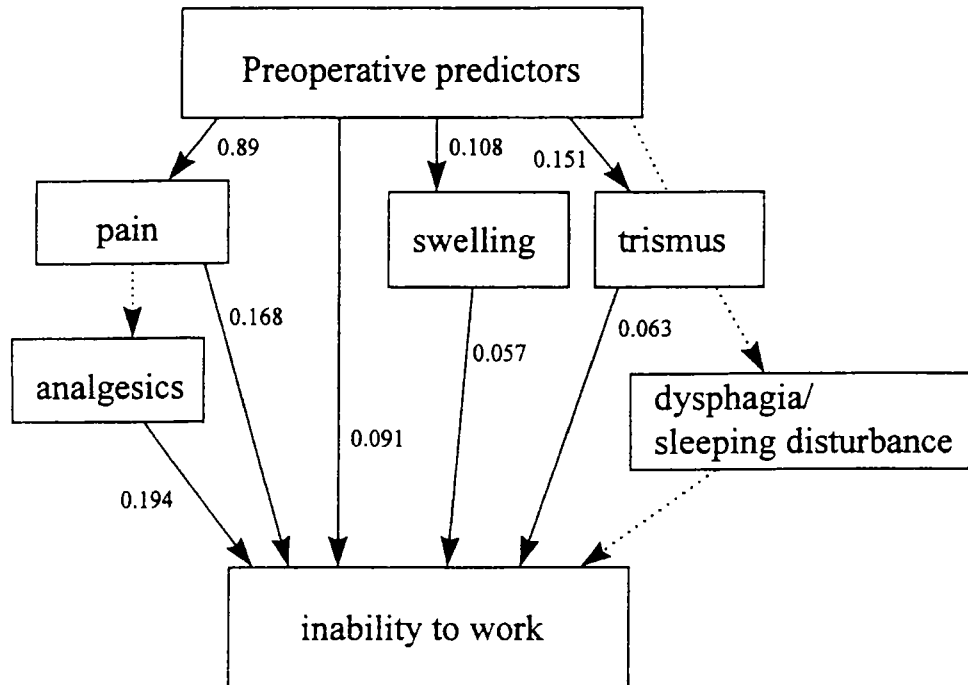


Fig. 3. Explanatory power of pre- and post-operative indicators on inability to work after mandibular third-molar surgery. Multiple  $R^2$  from multiple classification analyses. Dotted lines indicate lack of quantitative assessments of explanatory power.

extent of side effects could not be adequately assessed. Influence on ability to work due to side effects of postoperative analgesic medication therefore needs to be studied further.

The main part of variance in inability to work could not be explained by the indicators used in this study.

This makes prediction of need for postoperative sick leave difficult in clinical practice. In the preoperative information surgeons may include a slightly less than 50% chance that a patient will not need sick leave after mandibular third-molar surgery and that average inability to work is 1 day. The present results will be

Table 6. Monetary costs related to inability to work after third-molar surgery in Norway. Age-adjusted for employment rate, income, time of operation, and deliverer of treatment

Age (years)	Employment rate*	Income**†	Proportion operated on	Adjusted (product) expenses per day per patient (NOK)
16-24	0.56	421	0.62	146.2
25-34	0.83	659	0.32	175.0
35-54	0.87	875	0.06	45.7
				Total 366.70
Deliverer of treatment	Patients treated annually	Mean inability to work (days)	Total cost (mill NOK)	
General practitioners	55,000‡	1.9‡	38.3	
Oral surgeons	20,000§	1.1	8.1	
				Total 46.4

\* Statistics of Norway, Oslo, 1995.

† NOK per working day (incl. Saturdays).

‡ Berge & Gilhuus-Moe, 1993 (12).

§ Estimate based on Berge (24), Lysell (25), Spencer et al. (26).

useful for future studies, as it will provide possibilities for better control of background variables if inability to work is to be used as indicator of treatment outcome.

Assessment of overall sick-leave costs includes corrections for employment rates and income in relevant age groups. Furthermore, distribution of treatment between general practitioners and specialists will have to be considered when total costs for sick leave associated with third-molar surgery are calculated (Table 6). The resulting total sick-leave costs of approximately 46 million NOK accounts for about one-fourth of estimated total costs of third-molar surgery in Norway.

In conclusion, third-molar removals by oral surgeons are followed by an average of 1 day of inability to work. The duration of inability to work is related to postoperative analgesic consumption, pain, swelling, and trismus, whereas associations with preoperative indicators are weak. Sick-leave expenses account for one-fourth of total costs related to third-molar surgery in Norway.

## References

- Rose M, Kay L, Windfeld M. Recovery after ambulatory vasectomy. *Ugeskrift Laeger* 1991;153:1943-5.
- Al-Hassan HK, Francis IM, Neglen P. Primary closure or secondary granulation after excision of pilonidal sinus? *Acta Chir Scand* 1990;156:695-9.
- Hansen OH, Bardram L, Hakanson TU, Lauritsen K. Laparoscopic cholecystectomy—minimal invasive surgery. *Ugeskrift Laeger* 1991;153:3222-4.
- Wenner J, Graffner H, Lindell G. Laparoscopic cholecystectomy. Cost effective gallstone surgery. *Lakartidningen* 1995;92:763-5.
- Stenström A, Hagstedt B, Hansson LI, Ljung P. Meniscectomy. A comparison of two series treated as outpatients and inpatients. *Acta Orthop Scand* 1978;49:403-6.
- Meyhoff HH, Nordling J, Hald T. Economy in transurethral prostatectomy. *Scand J Urol Nephrol* 1985;19:17-20.
- Sindet-Pedersen S, Jensen J. Use of titanium osteosynthesis in maxillofacial traumatology and orthognatic surgery. *Tandlaegebladet* 1990;94:655-62.
- Van Gool AV, Ten Bosch JJ, Boering G. Clinical consequences of complaints and complications after removal of the mandibular third molar. *Int J Oral Surg* 1977;6:29-37.
- Henrikson P-Å, Thilander H, Wähländer LÅ. Voltaren® as an analgesic after surgical removal of lower wisdom teeth. *Int J Oral Surg* 1985;14:333-8.
- Sindet-Pedersen S, Petersen JK, Gøtzsche PC, Christensen H. A double blind randomised study of naproxen and acetylsalicylic acid after surgical removal of impacted lower third molars. *Int J Oral Maxillofac Surg* 1986;15:389-94.
- Happonen R-P, Backström A-C, Ylipaavalniemi P. Prophylactic use of phenoxymethylpenicillin and tinidazole in mandibular third molar surgery. *Br J Oral Maxillofac Surg* 1990;28:12-5.
- Berge TI, Gilhuus-Moe OT. Per and postoperative variables of mandibular third molar surgery by four general practitioners and one oral surgeon. *Acta Odontol Scand* 1993;51:389-97.
- Tulloch JFC, Antczak-Bouckoms AA. Decisions analysis in the evaluation of clinical strategies for the management of mandibular third molars. *J Dent Educ* 1987;51:652-60.
- Tulloch JFC, Antczak-Bouckoms AA, Ung N. Evaluation of costs and relative effectiveness of alternative strategies for the removal of mandibular third molars. *Int J Technol Assess Health Care* 1990;6:505-15.
- Andrews FM, Morgan JN, Sonquist JA, Klem L. Multiple classification analysis. A report on a computer program for multiple regression using categorical predictors. *Ann Arbor (MI): The University of Michigan*, 1975:1-28.
- Ahlström U, Kugelberg CF. Den retinerade visdomstanden i underkäken. Indikationer för och komplikationer till avlägsnande. In: *Odontologi-89*. Munksgaard, Copenhagen: 1989: 187-98.
- Report of a Workshop on the Management of Patients With Third Molar Teeth. *J Oral Maxillofac Surg* 1994;52:1102-12.
- Berge TI. Visual analogue scale assessment of postoperative swelling. A study of clinical inflammatory variables subsequent to third molar surgery. *Acta Odontol Scand* 1988;46:233-40.
- Nygaard OP, Romner B, Trumphy JH. Duration of symptoms as a predictor after lumbar disc surgery. *Acta Neurochir Wien* 1994;128:53-6.
- Isacson A, Hanson BS, Janzon L, Kugelberg G. The epidemiology of sick leave in an urban population in Malmö, Sweden. *Scand J Soc Med* 1992;20:234-9.
- Frost P, Breddam E, Bendsen J, Carlsen HB, Trykker HU. Sick leave in relation to occupational environment and family conditions. An analysis of data from a study on health and morbidity performed 86. *Ugeskr Laeger* 1995;157:2856-60.
- Skoglund L, Skjelbred P, Fyllingen G. Analgesic efficacy of acetaminophen 1000 mg, acetaminophen 2000 mg, and the combination of acetaminophen 1000 mg and codeine phosphate 60 mg versus placebo in acute postoperative pain. *Pharmacotherapy* 1991;11:364-9.
- Statistical yearbook of Norway. Oslo and Kongsvinger, 1992.
- Berge TI. Oral surgery in Norwegian general dental practice—a survey. Extent, scope, referrals, emergencies and medically compromised patients. *Acta Odontol Scand* 1992;50:7-16.
- Lysell L. Visdomstandsoperationer vid landstingens oralkirurgiska kliniker. *Tandlakartidningen* 1993;85:108-13.
- Spencer AJ, Brennan DS, Szuster FSP, Goss AN. Service-mix of oral and maxillofacial surgeons in Australia and New Zealand. *Int J Oral Maxillofac Surg* 1993;22:310-13.