

Postoperative pain after mandibular third-molar surgery

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The pain experienced after 116 operative removals of mandibular third molars was studied in a homogeneous group of patients consisting of 85 healthy university students. Pain was recorded daily on a visual analogue scale during the postoperative week. It was shown that preoperative inflammation and the difficulty and duration of the operation increased the intensity of pain. □ *Clinical study; inflammation; oral surgery; visual analogue scale*

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Pain after operative measures is a subjective reaction that is influenced by several factors, including individual pain threshold, psychologic assessment, general health, and pain perception (1, 2).

Surgical removal of lower third molars is the commonest measure in oral surgery and serves as an excellent model for studying pain (1, 3). It has been shown that pain experienced after this operation is more severe than that after gingivectomy, periodontal flap surgery, or apicectomy (4). The biochemical background to postoperative pain is that mechanical damage of blood vessels causes the production and release of biochemical pain mediators which irritate free nerve endings (1).

Despite active research, it has not been ascertained which preoperative and intraoperative factors influence the intensity of pain after mandibular third-molar surgery. Most postoperative pain research has been carried out in conjunction with testing the efficacy of various drugs or surgical measures on patients with a wide age range. The present aim was to study factors affecting the intensity of postoperative pain after third-molar surgery in healthy university students in whom standardized surgical procedures were used.

Materials and methods

Altogether, 85 healthy, unmedicated patients (45 men, 40 women; mean age, 23.9 years; range, 20-29 years) with 116 operative removals of mandibular third molars were included in this assessment of postoperative pain. These patients were selected from 145 consecutive mandibular third-molar operations conducted at the Student Health Service Clinic of Oulu. The 29 cases excluded were ones in which healing was complicated by alveolitis sicca dolorosa, as described in an earlier paper (5).

Of the mandibular third molars 67% were removed prophylactically because of impaction (symptom-free preoperatively), 10% removed because of acute pericoronitis (inflammation around the tooth had been treated with antibiotics for 2 weeks preoperatively, and the tooth was symptomless at operation), and 23% because of periods of inflammation around the tooth during the last 3 weeks or more preoperatively, diagnosed as chronic pericoronitis. Most of the mandibular third molars were partially visible through the oral mucosa (Table 1).

It was estimated from orthopantomograph that the teeth were situated in a vertical position in accordance with Winter's classi-

Table 1. Preoperative and postoperative findings for 116 extractions of mandibular third molars

Findings	n
Indication for extraction	
Prophylactic	78
Acute pericoronitis	11
Chronic pericoronitis	27
Degree of eruption	
Partially erupted	70
Unerupted	46
Angulation of the tooth	
Vertical	66
Mesioangular	38
Distoangular	4
Horizontal	8
Presence of ipsilateral upper third molar	
Erupted	55
Partially or totally unerupted	28
None	33
Difficulty of operation	
Easy	26
Conventional	16
Difficult	74

fication (6) in 57% of cases, mesioangularly in 33%, distoangularly in 3%, and horizontally in 7%. The upper third molar on the same side was extracted conventionally in 47% and removed operatively in 24% (Table 1).

All the operations were performed by the same oral surgeon in the same operating room and under similar conditions. Anesthesia was induced by blocking the mandibular, lingual, and buccal nerves with lidocaine adrenalin (Xylocaine®, Astra Alab, Södertälje, Sweden) or prilocaine felypressin (Citanest®, Astra Alab).

Lidocaine was always the drug of choice and was replaced by prilocaine only when the patient reported previous problems with lidocaine. The incision was horizontal, an 'envelope flap', in all cases and extended from the mesial corner of the first mandibular molar distally to the retromolar region. The tooth was extracted either after lifting it with an elevator or after cutting into the cemento-enamel junction with burs and separating the roots. Osteotomy was performed whenever necessary. Drilling was always accompanied by sterile physiologic

saline irrigation. The duration of the operation of the mandibular third molar, measured as the time interval between the first incision and the last suture, varied from 3 to 20 min (mean, 8 min). Difficulty was rated on a scale ranging from *easy* (tooth lifted with an elevator after incision and folding back of the mucoperiosteal flap), to *conventional* (tooth additionally separated in the neck region and between the roots when necessary), and *difficult* (additional osteotomy performed and the roots separated before the tooth could be lifted) (Table 1).

Mouth rinses with 0.2% chlorhexidine (Hibitane Dental, 2 mg/ml, ICI Pharma) were prescribed twice a day during the first postoperative week for all patients. No preoperative or postoperative antibiotics were necessary.

All the patients were given the same anti-inflammatory analgesic medication postoperatively (telfonamic acid, 200 mg), with advice to take the first dose before the anesthesia disappeared and the next ones every 8 h during the first 2 postoperative days and in accordance with the intensity of pain thereafter.

The pain ratings were made on a 10-cm horizontal visual analogue scale (VAS), which was divided into 10 equal parts (7, 8), the end points being marked 'no pain' and 'most severe pain'. A score for the most intense pain before taking the analgesic was recorded by the patients on each of the 6 postoperative days until the check-up visit.

The figures illustrate the means of the scores. The confidence interval was used to estimate the statistical significance of differences between mean values. The differences between the means and their confidence intervals are shown above each postoperative day. When the lower limit of the confidence interval is higher than or the higher limit is lower than the zero level, there is statistical significance between the means ($p < 0.05$).

Results

The pain ratings on the VAS were higher during the first 3 postoperative days in cases

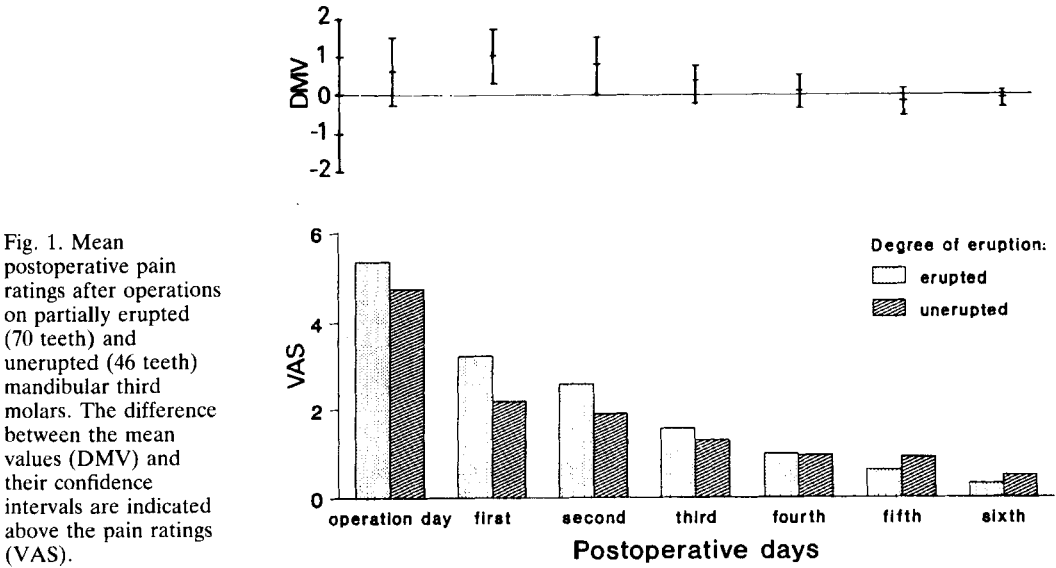


Fig. 1. Mean postoperative pain ratings after operations on partially erupted (70 teeth) and unerupted (46 teeth) mandibular third molars. The difference between the mean values (DMV) and their confidence intervals are indicated above the pain ratings (VAS).

in which the tooth was partially erupted than if it had not perforated the oral mucosa (Fig. 1). The pain during the whole postoperative week was more intense after surgery that lasted 8 min or longer (long operation) than if the operation lasted 7 min or less (short operation). This difference was statistically

significant ($p < 0.05$) on the 4th, 5th, and 6th postoperative day (Fig. 2). The pain experienced after difficult operations was more intense in the middle and end of the first postoperative week than that after extractions defined as easy (Fig. 3). Although no statistically significant difference was observed, there was a tendency

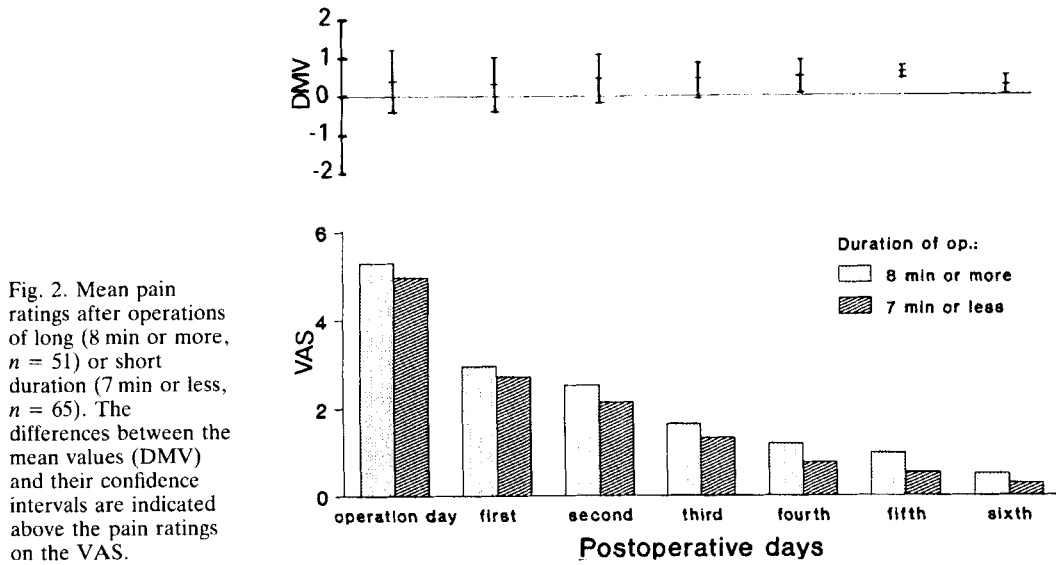


Fig. 2. Mean pain ratings after operations of long (8 min or more, $n = 51$) or short duration (7 min or less, $n = 65$). The differences between the mean values (DMV) and their confidence intervals are indicated above the pain ratings on the VAS.

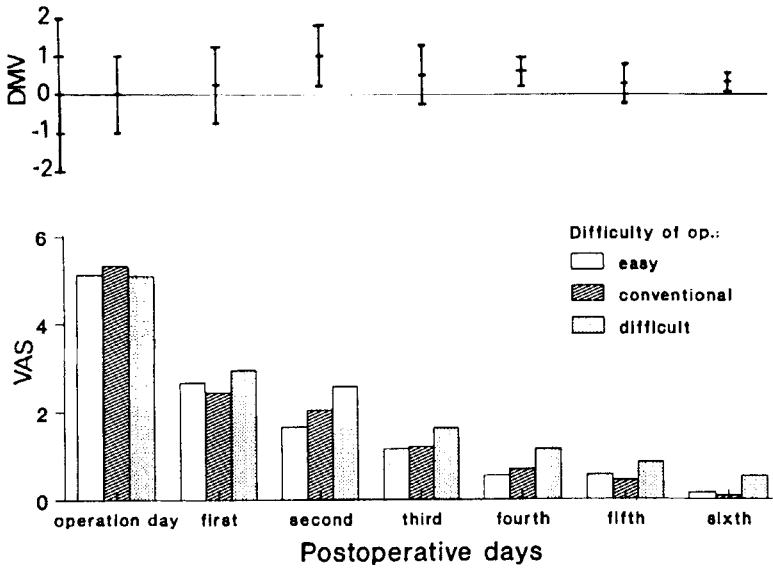


Fig. 3. Mean pain ratings in relation to the difficulty of the operation. The mean value (DMV) scale illustrates the differences in the mean values between the difficult ($n = 74$) and easy operations ($n = 26$) and their confidence intervals.

for more intense pain when the extracted tooth had been situated distoangularly (Fig. 4), when there had previously been periods of chronic or acute pericoronitis (Fig. 5), or when the opposite maxillary third molar was extracted conventionally at the same operation (Fig. 6). The degree of retention, the sex of the patient, and the type of anesthesia did not influence the postoperative pain to the same extent.

Discussion

Homogeneity was achieved in these series in several ways. First, all the operations were performed by the same experienced oral surgeon under similar conditions and using similar operative and postoperative procedures. Second, all of the patients were healthy university students between 20 and 29 years of age, not taking any medication regularly. Third, all the patients were given the same

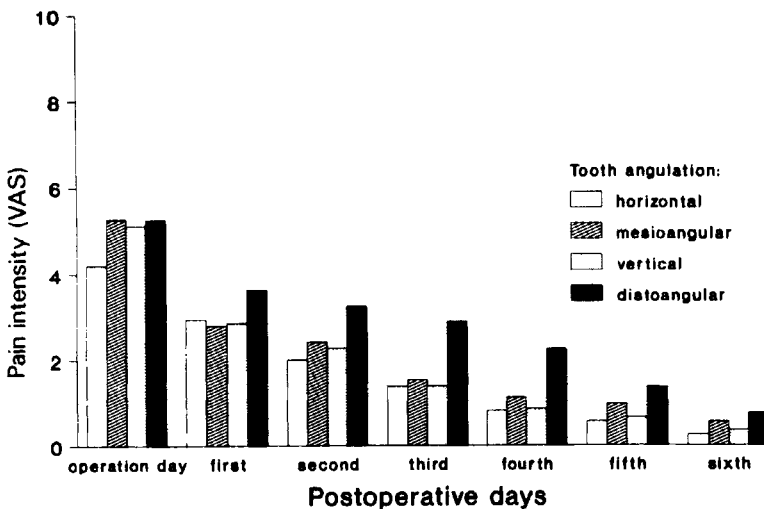


Fig. 4. Intensity of postoperative pain in relation to radiographic angulation of the mandibular third molars.

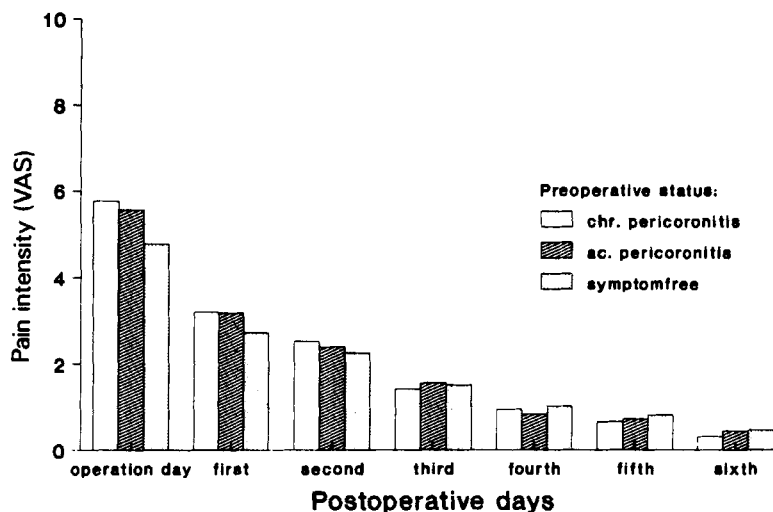


Fig. 5. Intensity of postoperative pain in relation to preoperative symptoms in the extracted mandibular third molars.

analgesics (tolfenamic acid, 200 mg), and, fourth, patients with alveolitis sicca dolorosa were excluded. This condition has been shown in an earlier paper to have occurred in 20% of the operations concerned, especially after pericoronitis of partly erupted molars (5).

This account therefore differs from previous postoperative pain surveys, which mostly compare various analgesics with a placebo (1, 9, 10) or with other analgesics (11, 12) and therefore may not give a comparable description of the pain in terms of

preoperative and intraoperative factors. The most informative study design for assessing the influence of such factors on postoperative pain would be one in which no analgesics were allowed during the assessment period, but this would be unethical. Consequently, the next best solution must be adopted, in which the patient has an opportunity to relieve the pain with adequate analgesics.

All the patients were given the same advice on the use of analgesics (every 8th h during the first 2 postoperative days and in accordance with the intensity of pain there-

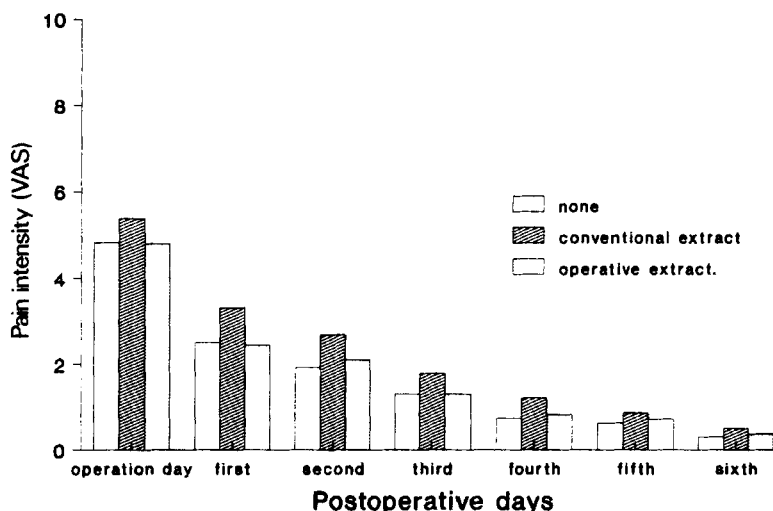


Fig. 6. Intensity of pain after mandibular third-molar operations in combination with operative removal of the maxillary third molar (unerupted or partially erupted tooth, $n = 28$), conventional extraction (erupted tooth, $n = 55$), or no removal ($n = 33$).

after). Since the half-life of telfonamic acid is 3 h, the pain intensity assessment should coincide with a time when the analgesic had only a slight influence. No escape analgesics were necessary in these cases.

Even though the intensity of the pain has been shown to be greatest during the 1st postoperative day (4, 13), and even though most of the pain examinations carried out in connection with drug testing have been performed within a few hours of surgery, we asked the patients to record their most intense pain once a day throughout the 1st week, to obtain comparative data and to be able to assess the duration of the pain. Several patients still recorded pain on the 6th postoperative day. A full estimate of the duration of pain would evidently have required monitoring for an even longer period.

The confidence interval was chosen to illustrate the deviation in the means because it was thought to be more descriptive than the unpaired *t* test, giving a view of the tendency for pain throughout the postoperative week. VAS has been used previously for measuring pain and has been regarded as a more reliable means of doing so than either a descriptive pain scale or a numerical rating (13, 14). It has also been shown to be beneficial for estimating the degree of postoperative swelling (15).

The results indicate that long duration of surgery and a more complicated operation will lead to more intense pain, contradicting earlier reports by Van Gool et al. (16), Seymour et al. (4, 13), and Fisher et al. (17). The traction of the mucogingival flap during third-molar surgery is more severe during a long, complicated operation than during an easier one, and this may be the reason for the more intense postoperative pain in these cases. It has been shown that a flap operation in periodontal surgery causes more intense postoperative pain than a gingivectomy (18), mechanical trauma of the tissues being the main reason for the release of pain mediators (1).

The finding that extraction of a pericoronitic tooth results in more intense pain has been reported earlier (4, 13) and should be taken into consideration when judging

the timing of the operation. Preoperative inflammation may explain why operating on a tooth that had perforated the oral mucosa resulted in more intense pain. The fact that postoperative pain was more intense in cases with simultaneous extraction of the ipsilateral maxillary third molar than in cases of operative removal or no removal can be explained by the possibility that the erupted opposite tooth causes inflammation of the soft tissue by mechanical irritation.

In conclusion, it can be stated that more intense pain after mandibular third-molar surgery is to be anticipated in cases of complicated operations of long duration on a partially erupted, distoangulated tooth after preoperative mechanical irritation by the opposite maxillary third molar.

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