Prevention of postoperative swelling and pain by dexamethasone after operative removal of impacted third molar teeth

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Summary. In a placebo-controlled double-blind study, we examined the effect of perioperative oral administration of 6 mg dexamethasone, given once 12 h before and once 12 h after osteotomy of two impacted molar teeth, on postoperative edema, limitation of jaw opening, and intensity of postoperative pain. On the first day after surgery, the difference in the increase in cheek swelling was 54.3% (P < 0.001) as measured with tape, 46% (P < 0.001) measured with a gauge in the first molar area and 29% (P < 0.056) by sonographic measurement of the cheek diameter in the molar area. The limitation in jaw opening was reduced by 17.7% (P < 0.002) after dexamethasone. Pain assessed by visual analog scale was reduced by dexamethasone by 50% (P < 0.01). The amount of analgesics required postoperatively (codeine phosphate) was reduced by 37% (P = 0.02) following dexamethasone administration. Seventy-six percent of our patients preferred perioperative medication of dexamethasone.

Key words: Dental pain, Swelling, Glucocorticoids; codeine, visual analog scale, ultrasound

Osteotomy of impacted third molar teeth often results in so much discomfort that patients are incapable of working for several days. The patient disability seems to depend on the degree of postoperative swelling and trismus. A skilled surgeon, a short operation and the application of cold dressings have a beneficial effect on the development of postoperative edema [6, 8].

However, in many cases additional therapy is necessary. This therapy generally consists of minor analgesics such as paracetamol or aspirin [2, 14, 20, 25, 27]. With these drugs, however, only the pain component is affected.

There are numerous uncontrolled studies that address the use of glucocorticoids in molar teeth extraction [11, 15, 16, 21, 26]. However, the benefit of this therapy has not been assessed by objective and statistically validated methods. More recently, in a valid study design and with objective measurements, Skjelbred and Lokken [23, 24] have reported on the use of betamethasone, given IM immediately before the operation, showing benefits with respect to pain, swelling, and analgesic consumption.

We investigated the effect of oral dexamethasone given at a low dosage 12 h before and 12 h postoperatively. This mode of administration was chosen in recognition of recent discoveries on the mode of action of steroids: steroid-induced synthesis of anti-inflammatory proteins requires several hours [4, 5].

Patients, materials and methods

In a placebo-controlled double-blind study we investigated the influence of an oral perioperative medication, 6 mg dexamethasone, on the reduction of swelling and pain after surgical removal of impacted third molar teeth when given 12 h before and again 12 h postoperatively. The study was approved by the Ethics Committee of the Hannover Medical School.

Forty volunteers took part who presented at our clinic for osteotomy of four "symmetrically" impacted third molar teeth (22 male and 18 female patients with an average age of 18 years). Excluded from the investigations were patients who had hypertension, stomach ulcers, a history of psychiatric illness, diabetes mellitus, bacterial infection, a history of thromboembolic events, any other chronic disease or patients who took any medications regularly or who were pregnant. All 160 wisdom teeth showed a complete vertical retention, and there was no case of difficult dentition.

Third molar teeth of the upper and lower jaw from one side were removed by buccal osteotomy with perioperative dexamethasone or placebo medication. Each patient served as his own control. In randomized sequence two teeth of one side were removed during dexamethasone and two during placebo administration. The time interval between the two operations was at least 6 weeks. Pain was assessed by the patients on 10 cm visual analogue scales (VAS) that ranged from "no pain" to "pain cannot be worse". In addition, the patients were asked 1 week after the second operation which of the two operations they preferred. Use of analgesics was permitted, but only the tablets (codeine phosphate, 30 mg) supplied by the investigators. The number of tablets used was recorded until the end of the first postoperative week.

The facial swelling in the jaw region was determined preoperatively and on the first, third and seventh day postoperatively by three methods. First, a gauge was placed between the oral mucosa located lateral to the edge of the first molar and the corresponding point at the skin surface [13]. Thereby the thickness of the cheek and the edematous increase of distance between skin surface and oral mucosa...
could be assessed. The second method consisted of tape measurement assessing three distances on the skin surface [7]. Swelling was quantified by using the sum of the three distances. Swelling was also assessed by a newly developed third method utilizing ultrasound of the cheek [18].

Ability to open the mouth was determined by using the Wood method [28] that compares the distances between the upper and lower jaw incisor edges with a calibrated gauge.

Compliance was controlled by measuring the serum concentrations of dexamethasone of each patient 24 h after each operation by radioimmuno assay [10].

Statistical analysis

The statistical comparison war made by means of MANOVA (f-test) with a confidence internal of 95% with \( P \) values of 0.05 or less being regarded as significant. All the results were analyzed for “period” and “carry over” effects. Neither was detected in any analysis.

Results

Of the 40 patients included, 25 completed the study. Nine patients were excluded because of a difference of more than 5 min in the operation time between the two operations. Five patients were excluded because they took additional drugs and one patient because of an allergic reaction to the ultrasound coupling gel.

On the first postoperative day dexamethasone caused a significant reduction in postoperative swelling (Fig. 1). A 54% reduction in swelling was assessed by tape measurement \((P < 0.001)\), a 46% reduction by gauge measurement \((P < 0.001)\) and 29% reduction by ultrasound \((P = 0.056)\). Mouth opening was also significantly improved by 17.7% with dexamethasone \((P = 0.002)\).

On the third postoperative day measurements of swelling showed a tendency for improvement: 31.5% by tape measurement, 16.6% by gauge measurement and 21.1% by ultrasound. Mouth opening was improved by 15% by dexamethasone. None of these changes except for the tape measurement \((P \leq 0.026)\) were significant. On the seventh postoperative day no significant difference between placebo and dexamethasone was found by any of the three methods.

In the placebo group, the analgesic consumption was 101 tablets compared to the study group with 64 tablets \((P < 0.02)\). Thus, analgesic consumption was reduced by 37% by dexamethasone. VAS showed a 50% improvement in postoperative pain on the first postoperative day \((P = 0.01)\), but no significant effect of dexamethasone on the third and seventh day after the operation. Seventy-six percent of the patients preferred the treatment under perioperative medication with dexamethasone when asked after the second operation.

The 50 operations resulted in the following complications: 5 wound infections during dexamethasone and 3 during placebo administration. Nausea or headaches were observed in 4 patients following dexamethasone and in 6 following placebo administration.

Discussion

This intraindividual double-blind study shows the efficacy of oral administration of dexamethasone on reduction of postoperative edema and pain following surgical removal of impacted third molars. Swelling measurements, visual analogue scale, assessment of pain and analgesic consumption all showed improvement with this small dose of dexamethasone. The effect of the drug was most pronounced on the first postoperative day when most of the swelling occurs and less obvious as swelling subsided. The data on reduction of swelling in our study resemble the results described by other authors. We found that the maxi-