

THE EFFECT OF DEXAMETHASONE IN REDUCING PAIN AND SWELLING AFTER ORAL SURGICAL INTERVENTIONS

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Abstract

In case of tissue injury that leads to inflammation. Symptoms of inflammation can be prevented by careful and atraumatic workup and by anti-inflammatory drugs. Dexamethasone as an anti-inflammatory drug is very often used because of its higher potency, low sodium retention ability and longer half-life.

The aim of the paper is to determine the impact of dexamethasone depending on the method of application on postoperative morbidity after surgical extraction of impacted third molars. Interventions were performed in third molars, after which ampoules of Dexamethasone 4mg were administered as an anti-inflammatory drug. In all studied groups, a statistically significant difference in the degree of pain between the two time intervals was found for $p < 0.05$, i.e. pain was significantly lower on the seventh postoperative day compared to the first postoperative day in all groups.

In all studied groups, a statistically significant difference in the degree of swelling between the two time intervals was found for $p < 0.05$, i.e. swelling was significantly lower on the seventh postoperative day compared to the first postoperative day in all groups. Locally applied dexamethasone immediately after surgical intervention has a positive effect in reducing swelling and pain in the first postoperative days, resulting in faster healing of the surgical wound, and thus faster recovery of the patient's comfort.

Keywords: Anti-inflammatory drug, Dexamethasone, swelling, pain.

Introduction

Surgical removal of impacted third molars is one of the most common interventions in oral surgery. It involves deliberate trauma to the bone and soft tissues leading to an inflammatory reaction. In these patients, pain, swelling and trismus often occur postoperatively as routine sequelae [1].

These sequelae lead to patient discomfort in terms of eating, speech, sensation, appearance, pain and interference with daily activities [2].

The reduction of these reactions can significantly improve this postoperative period.

In tissue injury that leads to inflammation. Symptoms of inflammation can be prevented by careful and atraumatic workup and by anti-inflammatory drugs [3].

This group also includes corticosteroids, which today are widely used to reduce postoperative morbidity after operative extractions of impacted teeth [4].

Corticosteroids, such as dexamethasone and methylprednisolone, are the most commonly used in oral-surgical practice, due to their almost pure glucocorticoid effects, the absence of mineralocorticoid effects, and the lowest degree of leukocyte chemotaxis side effects [5].

Dexamethasone is also very often used due to its greater potency, the low ability to retain sodium and the longer half-life [6].

Most of the studies related to the use of corticosteroids in oral surgery have been done with oral, intramuscular and intravenous application, but a consensus has not yet been built on the submucosal application and the dose of the corticosteroid used [7].

Aim of the paper

To determine the impact of dexamethasone depending on the method of application on postoperative morbidity after surgical extraction of impacted third molars.

Material and method

The study that was performed was randomly controlled and was performed at the Clinic for Oral Surgery and Implantology at UDC "St. Panteleimon" - Skopje. The research was done on a total of 60 patients who were scheduled for surgical extraction of a tooth, grouped into three groups: Controlled group (without dexamethasone application), a second group with Submucosal application of dexamethasone (4 mg) immediately after the end of the surgical extraction, and a third group with intramuscular application of dexamethasone (4 mg) immediately after completion of surgical extraction.

Inclusion criteria: Impacted mandibular third molars with a moderate degree of severity, patients older than 18 years and with the absence of acute during its performance.

Exclusion criteria: Patients in whom corticosteroids are contraindicated, pregnant or lactating women, patients with uncontrolled systemic diseases, patients who refuse to participate in the research, antibiotic prescription after the intervention.

Operative extraction was performed by one surgeon in all patients using a standard technique. The anesthesia applied was conduction anesthesia for the inferior alveolar nerve as well as the buccal nerve using 2% Scandonest with a vasoconstrictor. The surgical approach was made from the buccal side by raising a triangular mucoperiosteal flap. Osteotomy and separation of the crown was done with steel and carbide burs with constant irrigation with sterile physiological solution.

After the extraction of the tooth, a complete inspection of the alveolus was performed, the granulation tissue and the present sac was excised and removed, and after abundant rinsing with saline, the flap was sutured with a non-resorbable thread, a superficial tamponade was performed, and each patient was administered an ampoule of Dexamethasone 4 mg.

Control examinations were performed on the first and seventh postoperative days, during which the presence of swelling was monitored (on a scale of 0 to 3, depending on the involvement of soft tissues and the ratio with the tragus, pogonion, lateral angle of the eye, angle of the lower jaw and external corner of the mouth, on the first and seventh days after the intervention. 0 indicates the absence of swelling and 3 indicates the presence of severe swelling) and pain (on a scale of 0 to 3, with 0 indicating the absence of pain and 3 indicating the presence of severe pain that is difficult to reduce even after receiving analgesics).

Results

Pain and swelling as parameters were tested among the three studied groups in two time intervals (first and seventh postoperative day), as well as in the studied groups themselves between the two time intervals. Mann-Whitney U test, two tailored, was performed.

In all studied groups, a statistically significant difference in the degree of pain between the two time intervals was found for $p < 0.05$, i.e. pain was significantly lower on the seventh postoperative day compared to the first postoperative day in all groups. (Tables 1,2,3)

Table 1. Pain in group I, day 1 and 7. p=0.0018

Result Details

Sample 1
 Sum of ranks: 526
 Mean of ranks: 26.3
 Expected sum of ranks: 410
 Expected mean of ranks: 20.5
 U-value: 84
 Expected U-value: 200

Sample 2
 Sum of ranks: 294
 Mean of ranks: 14.7
 Expected sum of ranks: 410
 Expected mean of ranks: 20.5
 U-value: 316
 Expected U-value: 200

Sample 1 & 2 Combined
 Sum of ranks: 820
 Mean of ranks: 20.5
 Standard Deviation: 36.9685

Table 2. Pain in II group day 1 and 7. p=0.0008

Result Details

Sample 1
 Sum of ranks: 533.5
 Mean of ranks: 26.68
 Expected sum of ranks: 410
 Expected mean of ranks: 20.5
 U-value: 76.5
 Expected U-value: 200

Sample 2
 Sum of ranks: 286.5
 Mean of ranks: 14.32
 Expected sum of ranks: 410
 Expected mean of ranks: 20.5
 U-value: 323.5
 Expected U-value: 200

Sample 1 & 2 Combined
 Sum of ranks: 820
 Mean of ranks: 20.5
 Standard Deviation: 36.9685

Table 3. Pain in group III, day 1 and 7. p=0.0000

Result Details

Sample 1
 Sum of ranks: 580
 Mean of ranks: 29
 Expected sum of ranks: 410
 Expected mean of ranks: 20.5
 U-value: 30
 Expected U-value: 200

Sample 2
 Sum of ranks: 240
 Mean of ranks: 12
 Expected sum of ranks: 410
 Expected mean of ranks: 20.5
 U-value: 370
 Expected U-value: 200

Sample 1 & 2 Combined
 Sum of ranks: 820
 Mean of ranks: 20.5
 Standard Deviation: 36.9685

On the first postoperative day, for $p < 0.05$, a significant difference in the degree of pain was found between the first and second examined groups and between the first and third examined groups, i.e. pain was significantly greater in the group of subjects who did not receive dexamethasone. There was no significant difference in the degree of pain on the first postoperative day between the groups that received dexamethasone by any means.

On the seventh postoperative day, for $p < 0.05$, a significant difference was found in the degree of pain between the first and the third ie. pain was significantly higher in the group of subjects who did not receive dexamethasone compared to the group that received dexamethasone intramuscularly. Between the groups that received dexamethasone in any way, as well as between the first study group and the group that received dexamethasone submucosally, there was no significant difference in the degree of pain on the seventh postoperative day.

In all studied groups, a statistically significant difference in the degree of swelling between the two time intervals was found for $p < 0.05$, i.e. swelling was significantly lower on the seventh postoperative day compared to the first postoperative day in all groups. (Tables 4,5,6)

Table 4 Swelling in group I, day 1 and 7. $p = 0.0001$
 $p = 0.0001$

Result Details
<i>Sample 1</i>
Sum of ranks: 554
Mean of ranks: 27.7
Expected sum of ranks: 410
Expected mean of ranks: 20.5
<i>U</i> -value: 56
Expected <i>U</i> -value: 200
<i>Sample 2</i>
Sum of ranks: 266
Mean of ranks: 13.3
Expected sum of ranks: 410
Expected mean of ranks: 20.5
<i>U</i> -value: 344
Expected <i>U</i> -value: 200
<i>Sample 1 & 2 Combined</i>
Sum of ranks: 820
Mean of ranks: 20.5
Standard Deviation: 36.9685

Table 5. Swelling in group II, day 1 and 7.

Result Details
<i>Sample 1</i>
Sum of ranks: 600
Mean of ranks: 30
Expected sum of ranks: 410
Expected mean of ranks: 20.5
<i>U</i> -value: 10
Expected <i>U</i> -value: 200
<i>Sample 2</i>
Sum of ranks: 220
Mean of ranks: 11
Expected sum of ranks: 410
Expected mean of ranks: 20.5
<i>U</i> -value: 390
Expected <i>U</i> -value: 200
<i>Sample 1 & 2 Combined</i>
Sum of ranks: 820
Mean of ranks: 20.5
Standard Deviation: 36.9685

Table 6. Swelling in group III, day 1 and 7. $p = 0.00124$

Result Details

Sample 1

Sum of ranks: 530
Mean of ranks: 26.5
Expected sum of ranks: 410
Expected mean of ranks: 20.5
U-value: 80
Expected *U*-value: 200

Sample 2

Sum of ranks: 290
Mean of ranks: 14.5
Expected sum of ranks: 410
Expected mean of ranks: 20.5
U-value: 320
Expected *U*-value: 200

Sample 1 & 2 Combined

Sum of ranks: 820
Mean of ranks: 20.5
Standard Deviation: 36.9685

On the first postoperative day, a significant difference in the degree of swelling was found for $p < 0.05$ between all three studied groups, i.e. swelling was significantly greater in the group of subjects who did not receive dexamethasone and the groups that received dexamethasone in any way, but the swelling was also greater in the group that received dexamethasone submucosally compared to the group that received dexamethasone intramuscularly immediately after the intervention.

On the seventh postoperative day, a significant difference in the degree of swelling was found for $p < 0.05$ between the first and second and the first and third examined groups, i.e. swelling was significantly higher in the group of subjects who did not receive dexamethasone compared to the groups that received dexamethasone submucosally and intramuscularly. There was no significant difference in the degree of swelling on the seventh postoperative day between the groups that received dexamethasone by any means.

Discussion

Dexamethasone with its anti-inflammatory effect significantly reduces swelling and pain in the postoperative period, which was proven by the results obtained in this study.

Hooley and Francis studied 26 patients who received a prophylactic dose of oral betamethasone immediately before surgery, which resulted in less swelling, 50% less pain, and 50% less use of analgesics after the intervention compared to a control group [8].

In this study, we applied dexamethasone prophylactically to reduce swelling and pain postoperatively, but its application was immediately after the surgical intervention. Messer and Keller conducted a study of 500 patients who were administered 4 mg of dexamethasone intramuscularly immediately after surgical extraction of impacted third molars and concluded that dexamethasone reduced the postoperative findings of swelling, trismus, and pain [9].

Huffman found a statistically significant reduction in early swelling in patients who were given methylprednisolone in an amount of 125 mg intravenously immediately before the intervention, but after one week there were no significant differences [10].

These authors also conducted a study with 40 mg of the same corticosteroid and obtained similar results. In this study, dexamethasone was applied topically and gave statistically significant results indicating the fact that topical application has a greater effect in reducing swelling and pain postoperatively.

The reduction in swelling in the postoperative period is greatest after the third day, and there is no swelling at all on the seventh postoperative day, which coincides with the studies of Hargreaves and Costello who found a decrease in the release of immunoreactive bradykinin 3 hours after surgery by 62% after the application of 125 mg methylprednisolone [11].

Skjelbred and Lokken used betamethasone in an amount of 9 mg, but they applied the cortico preparation intramuscularly, 3 hours postoperatively. Their results show a reduction in swelling on the third postoperative day by 55% and on the sixth day by 69% in 23 out of 24 patients from the study group [12].

El Hag et al. injected 10 mg of dexamethasone intramuscularly for one hour preoperatively and another 10 mg 10-18 hours postoperatively. Administration of dexamethasone resulted in a significant reduction in swelling and trismus after surgical extraction of impacted third molars, although it was not shown to reduce pain [13].

Pederson conducted a study using 4 mg of dexamethasone injected intramuscularly preoperatively and showed a 50% reduction in swelling. 50% on the second postoperative day, but after 7 days there were no significant differences [14].

Milles and Desjardins obtained a reduction in swelling of 42% on the first day after the intervention, 34% on the second day, and 19% on the third day after the intervention, after administering 20 mg methylprednisolone [15].

Conclusion

Locally applied dexamethasone immediately after surgical intervention has a positive effect in reducing swelling and pain in the first postoperative days, resulting in faster healing of the surgical wound, and thus faster recovery of the patient's comfort.

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