Clinical comparative study of the effectiveness of two dosages of Dexamethasone to control postoperative swelling, trismus and pain after the surgical extraction of mandibular impacted third molars

Jose Rodrigues Laureano Filho [1], Paul Edward Maurette [2], Marvis Allais [2], Milane Cotinho [3], Caio Fernandes [4]

(1) DDS, Ph.D. Associated Professor. OMS Department. Dental School of Pernambuco University. Recife. PE-Brazil
(2) DDS, MSc. Ph.D Student, Oral and Maxillofacial Surgery. OMS Department. Dental School of Pernambuco University. Recife. PE-Brazil
(3) DDS, MSc Student, Oral and Maxillofacial Surgery Program. OMS Department. Dental School of Pernambuco University. Recife. PE-Brazil
(4) Graduate Student

Correspondence:
Dr. Jose Rodrigues Laureano Filho
Faculdade de Odontología de Pernambuco
Departamento de Cirurgia Bucomaxilofacial
Av. Gal. Newton Cavalcanti,1.650.
Camaragibe - PE - Brasil
CEP 54753-220
E-mail: paul@cirugia-maxilofacial.net

Received: 22/2/2007
Accepted: 08/11/2007

Indexed in:
-Index Medicus / MEDLINE / PubMed
-EMBASE, Excerpta Medica
-SCOPUS
-Indice Médico Español
-IBECS

Filho JRL, Maurette PE, Allais M, Cotinho M, Fernandes C. Clinical comparative study of the effectiveness of two dosages of Dexamethasone to control postoperative swelling, trismus and pain after the surgical extraction of mandibular impacted third molars. Med Oral Patol Oral Cir Bucal. 2008 Feb1;13(2):E129-32.

URL: http://www.medicinaoral.com/medoralfree01/v13i2/medoralv13i2p129.pdf

Summary

Purpose: The aim of this study was to evaluate the effect of two different concentrations (4 and 8 mg) of dexamethasone to decrease the swelling and trismus after the surgical extraction of mandibular impacted third molars.

Methods: This randomized clinical trial comprised thirty (30) adult patients of both genders with no local or systemic problems, with bilateral impacted lower third molars in similar position, where surgical extraction had been indicated. They were given 4 mg and 8 mg of dexamethasone 1 hour before the surgical procedure at the first or second surgery. The choice of which side to operate first and the amount of concentration of medication to use was made randomly and double-blindly. Postoperative pain was evaluated using a visual analog scale (VAS) and the degree of swelling was evaluated through facial reference points' variation. The presence of trismus was analyzed through measurement of the interincisal distance (IID). These assessments were obtained before the operation and 24h and 48h after the surgery.

Results: Based on statistic analysis (pared t-student and Wilcoxon tests), the results showed a significant difference in the measurements of the degree of swelling and trismus of the treated sample. 8 mg of dexamethasone promoted a greater reduction of symptoms than 4mg of dexamethasone

Conclusions: The administration of 8 mg of the dexamethasone was more effective than 4mg of the dexamethasone to reduce the degree of swelling and trismus. However, it had no effect on pain control.

Key words: *Pain control, corticosteroids, dexamethasone, swelling, trismus, impacted third molars, Oral Surgery.*

Introduction

Third molars' surgical extraction is a traumatic procedure and the most common in the Oral and Maxillofacial field. (1-9) Being a highly vascularized area, predominantly constituted by loose connective tissue, a series of functional and structural alterations is expected, among them, the liberation of exudate and subsequent swelling, trismus and pain (9-11). To control postoperative inflammation and symptoms associated, it is necessary to provide an adequate anti-inflammatory therapy (1-15).

Hench et al. (1950) (6), reported the anti-inflammatory effects of cortisone and Adrenocorticotropic Hormone (ACTH) in the treatment of Rheumatoid Arthritis (RA), fact that increased its popularity among medical authorities. For several decades surgeons administered corticosteroids before or just after third molars' surgery to reduce inflammation and associated symptoms after oral surgery.

Corticosteroids' mechanism of action includes the inhibition of the enzyme Phospholipase A2 (PLA 2), which reduces the release of araquidonic acid in the cells of the inflamed focus. This will decrease prostaglandins' and leukotrienes' synthesis, therefore reducing the accumulation of neutrophiles, what justifies, at least partly, the greatest power of corticosteroids compared to non steroidal anti-inflammatory drugs (NSAID'S) (9-14).

Several studies have demonstrated a better effect in the control of the swelling and trismus when using steroid anti-inflammatory drugs versus non steroidal anti-inflammatory drugs (6-22). However, the clinical use of this type of drugs should be moderate and rational, for limited time and dose because, according to endocrinology analyses, after the 5th day of use, the therapy has already begun to produce immunosuppresion, condition that in some patients may take up to 9 months to return to normal levels (10). Some studies show the use of different doses but they don't compare them (7,9,12).

Taking into account these facts, the purpose of the present study was to observe and compare the effects of two different dosages of dexamethasone (4 mg and 8 mg), administered as one dose in the preoperative of the surgical third molar surgery.

Materials and Methods

A prospective, randomized, controlled, blind, parallel-group design study was performed with the approbation of the Institutional Review Board Ethics in Research Commission of the University of Pernambuco; the surgical and experimental procedures were explained verbally and in writing, and informed consent was obtained before enrollment.

Thirty (30) patients with impacted lower third molars, between 18 and 26 years (mean 19.5 years) were operated by the same oral surgeon. A complete medical history was elicited and an oral examination was performed, including a panoramic radiograph, to confirm the need for third molar removal. The choice of which surgical procedures were going to be the experimental (8 mg of dexamethasone) and which were going to be part of the control sample (4 mg of dexamethasone) was made randomly. The oral surgeon was not allowed to know the dosages used for the respective sides. After 1 hour of the random choice of the side and the ingestion of a determined dose of dexamethasone, the surgical procedure was performed.

For standardization of the sample, we used the following clinical criteria: 1) age between 14 and 30 years, 2) bilateral impacted third molars in the vertical, mesioangular or distoangular positions (Winter's classification), 3) equivalent degree of surgical difficulty comparing one side with the other, 4) no use of medication that could interfere with the healing process, and 5) no systemic disease.

All the patients made a mouthwash with clorexidine 0.2% before given local anesthesia (lidocaine 2% with epinefrine 1:200.000) in the area to be operated. Local anesthesia of the inferior alveolar nerve and terminal infiltration of buccal fold was performed and the surgical procedure to remove third molars were made.

During the preoperative period, all patients had clinical and radiological evaluations, In the postoperative period, a nonsteroidal anti-inflammatory drug (Paracetamol 750 mg; 1 tablet every 6 hours for 4 days) was prescribed.

The pain was evaluated in the postoperative period using a visual analog scale (VAS) of 10 mm. Mouth opening was measured using the maximum mouth opening before the surgical procedure and evaluated at 24 hours and 48 hours post extraction.

The evaluation of the facial swelling was performed using a horizontal and vertical guide with a flexible ruler and a Vernier caliper following control points as described by Neupert et al. (19). The facial measures corresponded to mentalis angle and four (4) facial points in relation with the angle of the mandible: 1. Ear tragus, 2. External canthal of the eye, 3. Nose wing and 4. Buccal comissure. The percentage of facial swelling was obtained from the difference of the measures made in the preoperative and postoperative periods, dividing the result by the value obtained in the preoperative period and multiplying it by one-hundred (100). The evaluation of the postoperative facial swelling was carried out at 24 hours and 48 hours after the procedure. The established period of time between the surgeries, determined previously, was fifteen (15) days.

The collected data were stored electronically and analyzed using the Statistical Analysis System (SAS) by means of descriptive statistic and the test t-student and test of Wilcoxon of signaled ranks. The level of significance used in the statistical decisions was of 5,0%.

Results

Thirty (30) patients of both genders, between 18 and 26 years (mean 19.5 years) with impacted lower third molars comprised the sample of this study.

The time of surgery using 4mg of dexamethasone was 27,59 ± 3,76 and using 8mg was 26,74 ± 5,54 without statistical differential among them (P=0,3250). It has no statistical differential between the used amount of anesthetic with both amounts of dexamethasone (P = 0,8550).
The results of facial measures, comparing time and dosage are showed in Table 1. It can be observe the increase of all mean measures between preoperative and postoperative time, except the interincisal distance that diminished in the period of 48 hour postoperatively, demonstrating the reduction of buccal opening. It was a statistical differential between the dosages in the preoperative measures of mandible angle to nose wing, and postoperative (24 and 48 hours) in mentalis angle and interincisal distance.
The table 2 shows the Mean and Standard Deviation (SD) of the absolute difference between postoperative (with 24 and 48 hours) and preoperative measures, in relation with the dosage. The only one Mean that does not increase was angle - ear tragus.
The evolution of the pain during the week was regressive being that wasno statistical difference between both doses.

Discusion

Surgery of impacted third molars is one of the most frequent procedures in Oral and Maxillofacial Surgery (1-9) and can lead to immediate postoperative pain and discomfort (1-15). Trismus is a direct sequel of the postoperative swelling, being able of compressing nervous structures and generate mild to severe pain (5,9,11-15).
dexamethasone was chosen for the study because it has shown to be a drug of safe administration, if time and dosages are strictly followed. The employed analgesic was Paracetamol, also a proven drug of safe administration and because of the fact that it doesn't modify platelet's aggregation, coagulation time or neutrophile's action (16).
The administration of dexamethasone 1 hour preoperatively, combined with the postoperative administration of 750 mg of paracetamol on the day of the operation and the 4 postoperative days, produced a clear reduction in postoperative pain and cheek swelling after impacted third molar removal.
Comparing both doses, the use of 8 mg of dexamethasone has a statistical differential between the dosages in the preoperative measures of mandible angle to nose wing, and postoperative (24 and 48 hours) in mentalis angle and interincisal distance, demonstrating therefore the effectiveness of the medicine.
Neupert et al.19 reported that mouth opening as measured by the interincisal opening pre and postoperatively was improved with 4 mg of intravenous (IV) dexamethasone in the first few days after surgery, but no difference was noted between the corticosteroid and placebo groups for pain or swelling.
Twenty-four hours after surgery the restriction of mouth

Table 1. Mean and Standard Deviation (SD) of the studied measures in relation with the evaluation time and dosage administered.

		Dosage		
Measures	Time	4 mg	8 mg	*P* value
		Mean (SD1)	Mean (SD)	
• Angle - ear tragus	Preoperative	52,52 (3,70)	53,63 (6,01)	P (2) = 0,1744
	24 hours post	53,30 (3,71)	54,19 (6,06)	P (2) = 0,4796
	48 hours post	53,52 (3,71)	54,74 (6,23)	P (2) = 0,2490
• Angle - External canthal of the eye	Preoperative	88,63 (4,89)	91,19 (4,62)	P (2) = 0,4231
	24 hours post	90,26 (4,90)	91,85 (4,56)	P (2) = 0,5023
	48 hours post	91,19 (4,28)	92,52 (5,11)	P (2) = 0,3540
• Angle - nose wing	Preoperative	100,52 (6,55)	102,85 (3,99)	P (2) = 0,0023*
	24 hours post	102,81 (7,75)	103,74 (4,02)	P (2) = 0,3482
	48 hours post	104,41 (6,69)	104,44 (4,05)	P (2) = 0,8872
• Angle - buccal comissure	Preoperative	78,63 (5,02)	80,67 (7,74)	P (2) = 0,0936
	24 hours post	82,07 (4,27)	82,22 (8,01)	P (2) = 0,8676
	48 hours post	84,30 (4,61)	82,30 (8,47)	P (3) = 0,3762
• Mentalis angle	Preoperative	92,70 (5,14)	92,74 (6,73)	P (2) = 0,3366
	24 hours post	96,56 (4,02)	94,19 (7,33)	P (2) = 0,0130*
	48 hours post	98,56 (4,71)	95,81 (7,54)	P (2) = 0,0048*
• Interincisal distance	Preoperative	45,44 (4,71)	47,74 (5,67)	P (2) = 0,0898
	24 hours post	30,93 (4,71)	37,19 (8,60)	P (2) = 0,0018*
	48 hours post	27,52 (3,42)	34,52 (8,04)	P (2) < 0,001*

Table 2. Mean and Standard Deviation (SD) between the postoperative (with 24 and 48 hours) and preoperative measures, in relation with the dosage.

		Dosage		
Measures	Time	4mg	8mg	*P* value
		Mean(SD1)	Mean(SD)	
• Angle - ear tragus	24 hours post x pre	0,78 (0,93)	0,56 (0,70)	P (2) = 0,3950
	48 hours post x pre	1,00 (1,07)	1,11 (1,01)	P (2) = 0,6040
	24 hours post x pre	1,63 (2,66)	0,67 (0,96)	P (2) = 0,3761
• Angle - External canthal of the eye	48 hours post x pre	2,56 (2,64)	1,33 (1,27)	P (2) = 0,3037
	24 hours post x pre	2,30 (2,66)	0,89 (1,01)	P (2) = 0,0017*
	48 hours post x pre	3,89 (2,82)	1,59 (1,74)	P (2) < 0,001*
• Angle - nose wing				
	24 hours post x pre	3,44 (1,60)	1,56 (0,70)	P (2) < 0,001*
	48 hours post x pre	5,67 (2,45)	2,63 (1,04)	P (2) < 0,001*
• Angle - buccal comissure	24 hours post x pre	3,85 (4,23)	1,44 (0,85)	P (2) < 0,001*
	48 hours post x pre	5,85 (4,27)	3,07 (1,04)	P (2) < 0,001*
	24 hours post x pre	-14,52 (6,95)	-10,56 (8,59)	P (2) = 0,0059*
• Mentalis angle	48 hours post x pre	-17,93 (6,64)	-13,22 (7,82)	P (2) < 0,001*

opening was reduced by 9,3% using 8 mg of dexamethasone, and 48 hours after surgery it increased to 11,74%, showing clinical and statistic differential.

Beirne and Hollander (11) reported that 125 mg of IV Methylprednisolone after third molar surgery reduced pain levels during the first postoperative day. Swelling was less with the glucocorticoid administration through postsurgery day three (3), but did not seem to be correlated with pain levels. Trismus was minimally less with the corticosteroid medication, but not related to pain levels. No significant differences on pain control were found using neither 4 mg or 8 mg of dexamethasone.

Dionne et al. (20) used 4 mg of dexamethasone given 12 hours before and just after third molar surgery in thirty three (33) patients, twenty eight (28) received a placebo control. As markers of the extent of inflammation, samples of prostaglandin E2 (PGE2) and thromboxane B2 (TxB2) were collected over time at the mandibular surgical sites. Dexamethasone significantly decreased the levels of PGE2 and TxB2, but had a minimal effect on reported pain on the day of surgery. Similar results were reported by Sisk and Bonnington (21) with Flurbiprofen 50 mg, with an effective reduction of pain levels in the first few hours after third molar surgery when compared with IV Methylprednisolone 125 mg.

The evolution of pain during the week was diminishing with the two dosages mainly the first 4 days, we could observe that the patines who werer treated with 8mg had less pain but not showing statistical differential between the results.

In 2005 Tiwana et al. (23) reported that the administration of IV corticosteroids before third molar surgery offers a beneficial effect on health-related quality of life, we agreed with this, because having swelling and pain less the patient can return to his normal life.

Conclusion

We found that the dosage of 8 mg of dexamethasone was statistically more efficient in the trismus and swelling control than the lower dosage, without any evidence in the reduction of pain levels after surgery.

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