The influence of prophylactic Dexamethasone on postoperative swelling and trismus following impacted mandibular third molar surgical extraction

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ABSTRACT
Background: Pain, swelling and trismus are the main minor complications encountered after surgical extraction of impacted third molars, minimizing these postoperative complications is the center of many studies, one proposed method is the prophylactic administration of corticosteroids, the aim of this study is to evaluate the effect of prophylactic Dexamethasone administration on facial swelling and trismus after surgical extraction of impacted third molars.

Materials and methods: 20 patients were included in this study, they were randomly divided into 2 groups of 10 patients each; a study group in which patients were given 8 mg. Dexamethasone 1 hour before surgical extraction of impacted third molar and 4 mg. 6 hours postoperatively, and a control group in which no drug was given, mouth opening and direct facial measurements were done preoperatively and 2 days postoperatively, data were collected and analyzed.

Results: The study group showed less facial swelling and trismus postoperatively, in facial swelling the difference was statistically significant, while for trismus the difference was not significant.

Conclusion: Prophylactic administration of Dexamethasone reduces facial swelling and trismus after surgical extraction of impacted third molars.

Keywords: Prophylactic, Dexamethasone, Swelling, Trismus, Impacted third molar, Surgical extraction. (J Bagh Coll Dentistry 2010;22(4):85-90).

INTRODUCTION
An impacted tooth is the one that fails to erupt into a proper, functional position in the dental arch within the expected time (1). Several classifications of impacted third molars have been described, Winter suggested a classification of the angulation of the third molar based on the relationship of the impacted tooth on the long axis of the second molar (2), Pell and Gregory (3) classified the depth of the impaction into two categories; the first category, Figure (1), is as follows:

Position A: the highest portion of the impacted tooth is on the same level or above the occlusal plane of the second molar.
Position B: the highest portion of the impacted tooth is below the occlusal plane but above the cervical line of the second molar.
Position C: the highest portion of the impacted tooth is below the cervical line of the second molar.

The second category related the impacted third molar to the ascending ramus of the mandible as follows:

Class I: none of the crown is in the ramus of the mandible.
Class II: less than half of the crown is in the ramus.
Class III: more than half of the crown is in the ramus.

Killey and Kay (4) classified the state of eruption of impacted third molars into:
1. Erupted.
2. Partly erupted.
3. Unerupted.

Surgical removal of impacted lower third molars under local anesthesia is widely carried out in dental practice (5), and continues to be the most common surgical procedure performed in the specialty of oral and maxillofacial surgery (6). As in every surgery, inflammatory response appears almost systematically after the surgical extraction of lower third molars (7).

Inflammation is a protective reaction of vascular connective tissue to damaging stimuli, it is associated with vasodilatation, increased vascular permeability, recruitment of inflammatory cells and the release of inflammatory mediators from these cells (8), the most important of these mediators are the Prostaglandins and the Leukotrienes; which are the products of the Arachidonic acids via the Cyclooxygenase enzyme released by the inflammatory stimulus (7).

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Pain, swelling and trismus are the main complaints following impacted third molar extraction, these are considered by some authors as minor complications that subside without further treatment, while major complications are those that require further treatment and may result in irreversible consequences (10).

Non steroidal anti-inflammatory drugs (NSAID) and steroids are the main medications used to reduce the postoperative inflammation following third molar extraction both preoperatively and postoperatively, some authors use a combination of both to enhance their anti-inflammatory effect (5, 9, 11).

NSAID inhibit the Cyclooxygenase enzyme, limiting the production of prostaglandins of the Arachidonic acid of the inflamed tissue, while Steroids inhibit the formation of Arachidonic acid, reducing the immediate and the non-immediate manifestations of the inflammation; they inhibit vascular dilatation, reduce fluid transudation and formation of edema, diminish cellular exudation and reduce deposit of fibrin around the inflamed area. Dexamethasone is a potent synthetic member of the glucocorticoid class of steroid drugs, it is 20-30 times more potent than the naturally occurring hormone hydrocortisone and 4-5 times more potent than Prednisone (5, 7).

There is no effective and objective method for measuring inflammatory response. Pain quantification is difficult since it is a subjective experience, however, pain measurement scales like Four-point category scale and visual analogue scale (VAS) were used by some authors (5, 9, 12).

Numerous researchers have tried various techniques to objectively measure edema using; standardized stereo-radiographic or photographic measurement, computerized tomography, modified face bow devices, ultrasonography, facial plethysmographs, hand-held Laser scanning, Magnetic resonance imaging or various means of direct facial measurement (5, 7, 13, 14). The direct facial measurement method uses determined reference points and the distance between these points are compared pre and postoperatively to estimate the quantity of facial swelling, among the used points are: the lateral palpebral corner, the tragus of the ear, the alar base of the nose, the angle of the mandible, the angle of the mouth and the soft tissue pogonion (7, 9, 12).

Trismus is measured by measuring the maximum interincisal mouth opening, the reference points being the incisal edge of the maxillary central incisor and the incisal edge of the mandibular central incisor at maximum mouth opening available (5, 7, 10, 11, 12).

The aim of this study is to assess the influence of prophylactic Dexamethasone on postoperative swelling and trismus following impacted lower third molar surgical extraction.

MATERIALS AND METHOD

This prospective clinical study included 20 patients who underwent surgical removal of completely impacted lower third molars at the department of Oral and Maxillofacial surgery in the college of dentistry/university of Baghdad, from October 2009 until May 2010. The patients were 11 males and 9 females with an age range of 17-36 years (mean 23.1 years), they were otherwise healthy and all the impacted third molars were asymptomatic at the time of surgery. Patients older than 40 years, those having systemic diseases, female patients during the menstrual cycle or any pathological conditions associated with the impacted teeth were excluded from this study.

For all the patients a standardized case sheet was filled and an Orthopantomogram (OPG) (Figure 2), and a periapical radiograph were taken, accordingly the angulation of the impacted teeth was classified after Winter's classification. The depth of the impaction was classified according to Pell and Gregory category (A-C).

The patients were randomly divided into 2 groups, a study group and a control group, of 10 patients each, the patients of the study group were given 8 mg. Dexamethasone (Iraqi Pharmaceutical Industry, IPI) orally 1 hour before the operation, and 4 mg. 6 hours postoperatively, while for the control group of patients Dexamethasone was not given.

The study was explained for all the patients who gave their consent for participation. Direct facial measurement was undertaken using a tape measure taking the sum of two measurements; the first measurement was from the lower ear lobe to the soft tissue pogonion point passing through the point corresponding to the mandibular third molar on the outside part of the cheek, the second measurement was from the lower ear lobe to the angle of the mouth (labial commisure) (Figure 3). The facial measurements were done immediately before surgery and were repeated 2 days postoperatively.

The interincisal mouth opening was measured using vernier calibrated caliper preoperatively and after 2 days postoperatively.

Pain measurement was excluded from this study. The surgical procedures were carried out by the authors under local anesthesia (Lidocaine 2% with
Adrenaline 1:100,000), a buccal mucoperiosteal flap was reflected, buccal bone removal (bone guttering) and/or tooth sectioning under copious irrigation with sterile normal saline and tooth extraction was followed by a thorough irrigation of the tooth socket and suturing the flap with 3/0 black silk suture. The duration of the operation was recorded in minutes from the time of the incision to the time of the end of the last suture.

Tables 1 & 2 summarize the clinical data of the patients in control and study groups. Antibiotics (Amoxicillin 500 mg./8 hours and metronidazole 200 mg./8 hours) and analgesics were prescribed for all the patients who were instructed for postoperative care, the follow-up was carried out on the 2nd and the 7th days postoperatively. The sutures were removed after 7 days.

**Statistical analysis**

Data were analyzed using SPSS (Statistical Package for Social Sciences) for Windows (v 14.0, SPSS Inc, Chicago, IL). T-test was used for the facial swelling and mouth opening, the level of significance was set at P<0.05.

**RESULTS**

Twenty patients with completely impacted mandibular third molars were enrolled in this study, 11 (55%) were males and 9 (45%) were females, the age range was from 17-36 years with a mean of 23.1 years.

The radiographic analysis of the angulation of the impacted teeth according to Winters classification was as follows:
- 11 (55%) were mesioangular, 7 (35%) in the control group and 4 (20%) in the study group.
- 4 (20%) were vertical, 2 (10%) in the control group and 2 (10%) in the study group.
- 4 (20%) were horizontal, 1 (5%) in the control group and 3 (15%) in the study group.
- 1 (5%) was distoangular in the study group.

The depth of the impacted teeth according to Pell and Gregory category (A-C) was as follows:
- Position A: 4 (20%), 2 (10%) in the control group and 2 (10%) in the study group.
- Position B: 13 (65%), 6 (30%) in the control group and 7 (35%) in the study group.
- Position C: 3 (15%), 2 (10%) in the control group and 1 (5%) in the study group.

The duration of the procedures ranged from 10-50 minutes with a mean of 24.5 minutes (22.9 minutes in the control group and 26 minutes in the study group).

The facial swelling in the study group was less than that of the control group 48 hours postoperatively, the difference between the two groups was statistically significant (P<0.05). The study group showed less trismus than the control group, but the difference was statistically insignificant. (Tables 3 & 4)

None of the patients developed infection, alveolar ostitis or paresthesia of the inferior dental nerve or the lingual nerve postoperatively.

**DISCUSSION**

Postoperative pain, swelling and trismus are acute reversible inflammatory complications of surgical removal of the impacted mandibular third molars and are generally regarded as short term outcomes of third molar surgery (13).

There are few reports about minor complications and their prevention (10). Most studies in recent time are centered on ways of preventing or minimizing these short term minor complications (1).

One technique that has been proposed for reduction of postoperative inflammation is the administration of Corticosteroids which have the capacity to interfere with the physiologic process of inflammation (16).

The most frequently used route of administration of Corticosteroids is the intravenous one, at high and only dose (17,18).

In our study we used oral dose which is variable, simple to administer and has a better patient compliance, oral administration was used in other studies (7,19). The doses given were 8 mg. 1 hour preoperatively and 4 mg. 6 hours postoperatively, different doses with different routes of administration were given in other studies; 8 mg. preoperatively and 4 mg. postoperatively intravenously (5), 4 mg./8 hours for 3 days postoperatively, 1 mg. Dexamethasone in combination with other drugs, orally, once daily for 4 days postoperatively (9), 4 mg. Dexamethasone intravenously preoperatively (11) and 8 mg. Dexamethasone orally preoperatively (19).

Facial edema is 3-dimensional with an irregular, convex surface and can manifest itself internally as well as externally (5), direct facial measurement, although it is a 2-dimensional one, we think it is a simple procedure, easily reproducible and does not require special devices.

We used the sum of two measurements, which were also used in another study (10), other studies used one, two, three and five measurements (5, 7, 8, 10, 12).

For measuring trismus, we adopted the method used by all the authors; the maximal mouth opening between the incisal edges of the upper and lower incisors.
Measurements were done 2 days postoperatively, since the majority of patients will have swelling, trismus and discomfort which gradually reach the peak after 48 hours postoperatively and will resolve within a week (20). This finding was corroborated in another study (5) wherein all symptoms were restored to preoperative levels. In our study all the patients were symptom-free on the 7th day after surgery. Some studies (7,9), however, showed that some complications were still present but to a lesser degree after 5-7 days postoperatively. This study showed statistically significant reduction in facial swelling in the group of patients who received prophylactic Dexamethasone as compared to the control group, but in the case of trismus, although there was reduction in the degree of trismus in the this group but the difference was statistically insignificant, in this we agree with other studies that showed similar results (15,19).

In another study (11), the reduction in facial swelling and trismus was statistically significant. Other authors found no difference between NSAID and steroids in minimizing swelling and trismus that would justify the use of steroids (7). Trismus can be related to inflammatory edema, direct damage to the muscle following inferior dental nerve block local anesthesia (20) or to the effect of prolonged surgery on the masticatory muscles (6). This is probably the explanation that trismus was not significantly reduced by the anti-inflammatory drugs.

The duration of the procedures in this study ranged between 10-50 minutes, with a mean of 24.5 minutes, other studies showed different durations ranging from 18 minutes (6) to 40 minutes (12). In our study, the mean of the duration of the procedures in the study group was 26 minutes which was longer than that of the control group 22.9 minutes, facial swelling and trismus, however, were less in the study group than that of the control group. This, we think, confirms the desirable anti-inflammatory effect of prophylactic steroids administration, since the duration of the operation time was shown to have a significant relationship with the inflammatory response following impacted third molar surgical extraction (10).

In conclusion, prophylactic administration of Dexamethasone reduces postoperative facial swelling and trismus following surgical extraction of impacted third molar.
A limitation in this study is the small number of patients that was mostly due to loss of patients for follow up and lack of compliance, we suggest that more studies with larger number of patients to be conducted, in addition to including more variables such as the time of operation and the depth of impaction and their relationship with the inflammatory response. We also suggest conducting other studies that evaluate the anti-inflammatory effect of a combination of NSAID and steroids after impacted third molars surgical extraction.

Table 1: Data of the patients in the control group.

<table>
<thead>
<tr>
<th>S.N</th>
<th>Age/yr</th>
<th>Sex</th>
<th>Angulation</th>
<th>Depth</th>
<th>Preoperative</th>
<th>Postoperative</th>
<th>Time/ min</th>
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<td></td>
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<td></td>
<td></td>
<td>Facial measurement/cm</td>
<td>Mouth opening/mm</td>
<td>Facial measurement/cm</td>
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<td>M</td>
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<td>M</td>
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<td>M</td>
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<tr>
<td>10</td>
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<td>Male</td>
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<td>A</td>
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Table 2: The data of the patients in the study group

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<tr>
<th>S. N</th>
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<th>Angulation</th>
<th>Depth</th>
<th>Preoperative</th>
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<td>Mouth opening/mm</td>
<td>Facial measurement/cm</td>
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<td>B</td>
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<td>14+10.2</td>
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<tr>
<td>10</td>
<td>23</td>
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<td>V</td>
<td>C</td>
<td>13+10</td>
<td>35</td>
<td>13.2+10</td>
</tr>
</tbody>
</table>

S.N: serial number
Angulation;  M: mesioangular,  D: distoangular,  H: horizontal,  V: vertical
Depth; according to Pell and Gregory, category (A-C).

Table 3: Paired samples statistics.

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<th></th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
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Orral and Maxillofacial Surgery and Periodontology 89
Table 4: T-test between control and study groups.

<table>
<thead>
<tr>
<th>Pair</th>
<th>Variable</th>
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<th>Std. Deviation</th>
<th>T-test</th>
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* Level of significance P < 0.05.

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