

Clinical Paper
Oral Surgery

Effect of the route of administration of methylprednisolone on oedema and trismus in impacted lower third molar surgery

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Abstract. Due to their anatomical position, the surgical removal of impacted third molars results in oedema, pain, and trismus. The purpose of this study was to evaluate the efficacy of suprapariosteal injection of methylprednisolone compared with an oral tablet form and intravenous (i.v.) injection in the prevention of postoperative pain and oedema associated with inflammation. This randomized, prospective, and controlled study included 44 patients. The patients were randomly divided into four groups: group 1 (control; no steroids), group 2 (local injection), group 3 (oral tablets), and group 4 (i.v. injection). On days 2 and 7 following surgery, linear oedema was determined using facial landmarks, and maximal mouth opening was measured. Postoperative mouth opening and swelling were evaluated for each route of methylprednisolone administration and compared. The female (59%) to male (41%) ratio was 1.44; the mean age of the patients was 29.6 years. The level of significance was set at $P < 0.01$ for mouth opening and $P < 0.05$ for oedema. With regard to trismus, all three routes of administration demonstrated better efficacy in comparison to the control. While oral administration and i.v. injection of methylprednisolone achieved similar results, masseter injection provided better results in reducing oedema and trismus when compared to the control following lower third molar surgery.

Key words: third molar surgery; methylprednisolone.

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The physiological response of the body tissues to injury of any cause is inflammation and pain, which vary for each patient. After every surgical intervention, inflammatory mediators (prostaglandins,

leukotrienes, bradykinin, platelet activating factor, etc.) are released into the tissues in response to this irritation, with a subsequent increase in vascular dilatation and permeability, causing oedema and

enhancing the interstitial tissue response.^{1,2}

Surgical removal of the mandibular third molars is the most common surgical procedure in oral and maxillofacial

surgery. Due to the anatomical position of impacted third molars, both soft and hard tissue trauma occur during surgery, resulting in postoperative oedema and trismus.³ Therefore, the control of postoperative inflammation by any means will increase patient comfort. With regard to the pharmacological approach, there are various strategies for minimizing the clinical manifestations after surgery by inhibiting the synthesis and/or release of the inflammatory mediators of acute inflammation. A reduced level of mediators at the site of tissue injury will lessen the increase in vascular permeability.¹ As a result, interstitial fluid accumulation and tissue pressure will be decreased. For the last 60 years, non-steroidal anti-inflammatory drugs (NSAIDs), various steroids, enzymes, and antihistamines have been used to reduce postoperative complications.³ Steroids acting as immune suppressors block both the early and late stages of the inflammation process.

Corticosteroids have an inhibitory action on the enzyme phospholipase A2, which reduces the release of arachidonic acid at the site of inflammation. Thus, the synthesis of prostaglandins and leukotrienes and also the accumulation of neutrophils are reduced.⁴ Various corticosteroids such as betamethasone, triamcinolone, prednisolone, hydrocortisone, dexamethasone, methylprednisolone, etc., are prescribed to control pain, trismus, and swelling.⁵

The aim of this study was to compare the efficacy of three different routes of administration of methylprednisolone on oedema and trismus after impacted lower third molar surgery.

Materials and methods

This randomized, prospective, and controlled study included 44 patients (26 female and 18 male) aged between 18 and 45 years (mean 29.6 years) who required removal of an impacted lower third molar and who were free of inflammatory symptoms. Patients who applied to the study clinic from 1 September to 31 December 2012 were assessed in terms of the study inclusion criteria. Among those patients who satisfied the criteria, 44 volunteered to participate in this study and were recruited. Patients were randomized to one of four study groups by the surgeon, who selected opaque envelopes on which the names of the patients were written. The first 11 patients constituted the control group (group 1). The remaining 33 patients were assigned to three further groups, with 11 patients in each:

local injection of methylprednisolone (group 2), oral methylprednisolone tablet (group 3), and intravenous (i.v.) methylprednisolone injection (group 4). This study was approved by the institutional human ethics committee and was carried out in accordance with the Declaration of Helsinki on medical protocol and ethics. All patients were recruited into the study upon request. Certain clinical criteria were used for standardization. Inclusion criteria were as follows: age between 18 and 45 years; no systemic disease; totally impacted mandibular third molars of class C, 1, 2, and 3 according to the Pell–Gregory classification.¹

In our clinic we perform the removal of an impacted tooth on the basis of evidence; teeth were extracted for various indications, such as pre-orthodontic preparation, prevention of post-orthodontic relapse, preparation for orthognathic surgery, prevention of second molar damage, and follicular expansion to rule out possible odontogenic cyst or tumour formation.

Exclusion criteria were the following: the use of medications that could interfere with the healing process, smoking, and pregnancy or lactation.

Group 1 patients (control group) received no preoperative or postoperative anti-inflammatories or steroids. Group 2 patients received a single dose of methylprednisolone 20 mg/ml by parenteral route (injection) into the masseter muscle; this was done via intra-buccal approach in the immediate postoperative period, directly after suturing of the surgical wound. Group 3 patients received a single 20-mg dose of methylprednisolone in the form of an oral tablet taken 1 h before the procedure. Group 4 patients received a single dose of methylprednisolone 20 mg/ml i.v. in the immediate postoperative period.

Surgical procedure

All patients were free of inflammatory symptoms in the oral cavity at the time

of surgery and were operated on by the same surgeon using a standard technique; mouthwash with 0.2% chlorhexidine was given prior to local anaesthesia. Local anaesthesia of the inferior alveolar nerve and lingual nerve, and terminal infiltration of the buccal fold was performed using 2% lidocaine hydrochloride and 1:200,000 adrenaline. Only one third molar was removed from each patient, hence a total of 44 teeth were extracted.

Surgical access was standardized and involved a linear incision on the alveolar ridge aligned with the buccal region of the second molar, combined with a 1-cm vertical incision. A standard triangular flap and the retentive bone around the third molar were removed under irrigation with 0.9% saline solution. After the extraction was completed, irregular bone borders were removed and the alveolus was irrigated with 10 ml 0.9% saline solution. The surgical site was sutured with 3–0 silk.

All patients received standard postoperative instructions. Antibiotics (amoxicillin and clavulanic acid 1 g oral tablets; one tablet every 12 h) and 0.2% chlorhexidine gluconate solution were prescribed for 5 days. The intraoral sutures were removed on postoperative day 7.

Data collection

Trismus and swelling were evaluated in comparison to the preoperative values (time 1) on day 2 (time 2) and day 7 (time 3) following the surgical procedure. For the assessment of trismus, the distance between the upper and lower incisal borders of the central incisors was measured using a digital calliper. Oedema was evaluated using three facial lines (Fig. 1): (1) the distance from the external canthus of the eye to the gonion angle; (2) the distance from the lower border of the tragus to the mouth commissure on the operated side; (3) the distance from the lower border of the tragus to the soft pogonion.

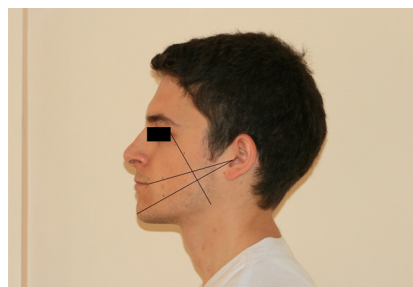


Fig. 1. Linear demarcation measures for swelling: canthus–gnathion line; tragus–commissure line; tragus–pogonion line.

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