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Effect of submucosal dexamethasone injection on postoperative pain, oedema, and trismus following mandibular third molar surgery: a prospective, randomized, double-blind clinical trial

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I.M. Mojsa, R. Pokrowiecki, K. Lipczynski, D. Czerwonka, K. Szczeklik, M. Zaleska: Effect of submucosal dexamethasone injection on postoperative pain, oedema, and trismus following mandibular third molar surgery: a prospective, randomized, double-blind clinical trial. Int. J. Oral Maxillofac. Surg. 2016; xxx: xxx–xxx.

Abstract. The aim of this study was to investigate the effect of the submucosal injection of 1 ml dexamethasone (4 mg/ml) on pain, swelling, and trismus following the extraction of retained lower third molars. Ninety patients (mean age 23.5 years) were split randomly into three equal study groups (30 patients in each): the 'before' group received dexamethasone 15 min before surgery and placebo 15 min after surgery; the 'after' group received placebo 15 min before surgery and dexamethasone 15 min after surgery; the 'placebo' group received placebo 15 min before surgery and placebo 15 min after surgery. Postoperative pain was recorded by the patients using a visual analogue scale, numerical rating scale, and the McGill Pain Questionnaire at 1, 2, 4, 6, 8, 12, and 24 h after surgery. The patients also recorded the total number of analgesic doses consumed during the 24 h after the procedure. Swelling (determined using linear measurements of the face) and trismus (determined through measurement of maximum mouth opening) were assessed at 48 h, 72 h, and 7 days following surgery. Better control of pain, swelling, and trismus was demonstrated for dexamethasone in comparison to placebo. Postoperative dexamethasone provided better pain control than preoperative dexamethasone. There was no difference in total rescue analgesic intake between the preoperative and postoperative dexamethasone groups.

Key words: third molar surgery; dexamethasone; pain; oedema; trismus.

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The removal of impacted mandibular third molars is a routine procedure in oral and maxillofacial surgery. Lower third molars are at least partially impacted. As a result, the procedure is considered to be surgically difficult and is associated with the risk of pain, swelling, and trismus in the postoperative period. Corticosteroids are one of the most widely employed medications administered to control these complications.[1–4]

Dexamethasone has a direct effect on the process of inflammation. This occurs through a number of actions stemming from the redistribution of leukocytes to other body compartments, thereby significantly reducing their blood concentrations, as well as through the modulation of inducible cyclooxgenase 2 (COX-2).[5,6] Further contributing effects of dexamethasone result from the steroid-mediated elevation of lipocortin, resulting in the inhibition of phospholipase A2 (PLA2); this inhibition leads to a reduction in the conversion of membrane-bound phospholipids to arachidonic acid, the precursor of leukotrienes and prostaglandins.[7]

The effects of the use of corticosteroids following third molar surgery have been assessed in various studies by comparison of the use of a single dose and placebo, different concentrations of a single drug, different routes of administration, and different types of corticosteroid.[8–12] However, the use of submucosal dexamethasone injection in the surgical extraction of impacted lower third molars remains underinvestigated.[13] Therefore, the aim of this study was to assess the efficacy of the submucosal injection of dexamethasone with regard to the control of pain, swelling, and trismus following the extraction of retained lower third molars. Furthermore, this research sought to determine whether it is more beneficial to use the drug in a pre-surgical approach or in a post-surgical approach and to compare it with placebo.

Materials and methods

This prospective clinical study was conducted on a group of 90 patients referred to the department of oral surgery of the study institution for the surgical extraction of an impacted lower third molar for orthodontic indications. Strict inclusion criteria based on clinical and radiological examinations were applied in this research. Patients undergoing the surgical extraction of a partially or totally impacted lower third molar (IIB or IIIB according to the Pell and Gregory classification[14]), with no associated inflammation of the tissue in its vicinity, were included. The patients had to be generally healthy and aged between 18 and 50 years. The following exclusion criteria were applied: hypersensitivity to the drugs or other substances used in the study, pregnancy, lactation, and any analgesic intake in the 24-h period immediately prior to surgery.

Patients who met the study criteria were split randomly into three equal groups (30 patients in each): the 'before' group received a submucosal injection of 1 ml dexamethasone (4 mg/ml solution) 15 min before surgery and a submucosal injection of 1 ml placebo 15 min after surgery; the 'after' group received a submucosal injection of 1 ml placebo 15 min before surgery and a submucosal injection of 1 ml dexamethasone (4 mg/ml solution) 15 min after surgery; the 'placebo' group received submucosal injection of 1 ml placebo 15 min before surgery and submucosal injection of 1 ml placebo 15 min after surgery. The placebo used was 0.9% sodium chloride solution. One lower wisdom tooth removal was performed for each patient (Fig. 1).

DXM-dexamethasone

Before entering the study, all patients were provided with details of the study subject and the aims of the research. All patients completed a written consent form. Neither the patient nor the oral surgeon was informed of the group assignment at any time during the entire study process. Allocation concealment was ensured through the use of 90 identical non-transparent sequentially numbered envelopes, each of which contained a group number that had been assigned previously using a random number generator. Identical unmarked syringes containing either 1 ml (4 mg/ml) of dexamethasone or 1 ml of placebo were administered; the appearance of the dexamethasone and placebo was the same. All of the syringes were prepared by the same non-operating surgeon before surgery using codes determining the sequencing of administration.

Fifteen minutes after the application of lingual, inferior alveolar nerve block, and buccal infiltrative anaesthesia with a total of 3.6 ml of 4% articaine hydrochloride and epinephrine (1:200,000), each patient received a submucosal injection (lower buccal vestibule near the surgical site) of 1 ml dexamethasone or 1 ml placebo based on their randomly assigned group. A further 15 min after the application of dexamethasone or placebo, a triangular incision was performed and a mucoperiosteal flap was elevated on the buccal side. The bone covering the impacted tooth was removed with the use of a hand-piece and round bur under copious water irrigation. The tooth was then extracted by coronal or coronal and root sectioning (the difficulty of the extraction was evaluated as level III or IV according to a modified version of the Parant scale[17]). After extraction of the impacted tooth, the surgical wound was rinsed with sterile saline solution. Once proper haemostasis was assured, the wound was closed with 4–0 nylon sutures. All operations were performed using a standardized technique. The duration of surgery was recorded in minutes, from the time of the initial incision

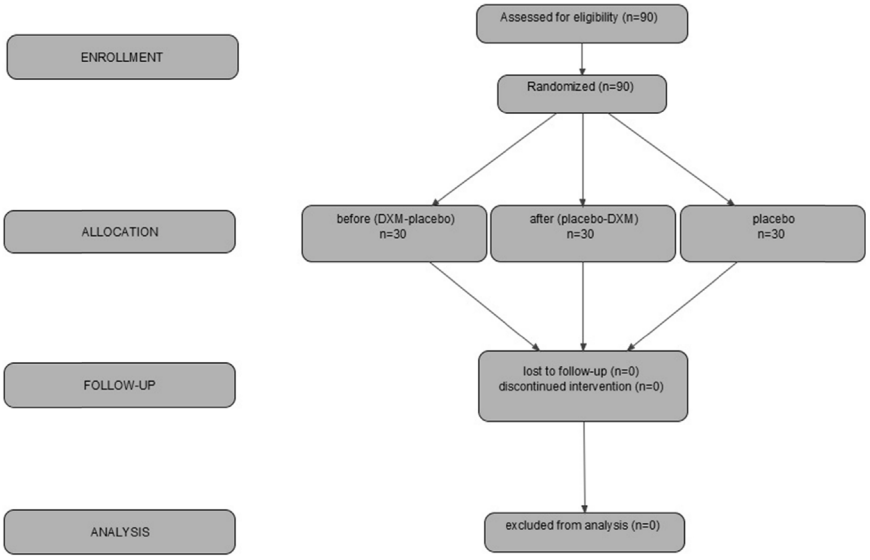

Fig. 1. CONSORT flow chart of patient participation in the study.