Eventuality of Dexamethasone Injected Intra-massetrically on Post Operative Sequel Following the Surgical Extraction of Impacted Mandibular Third Molars: A Prospective Study

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Abstract

Objective The objective of the study was to compare the efficacy of dexamethasone given intra-massetrically via intra buccal approach on postoperative sequelae after surgical extraction of impacted mandibular third molars.

Methodology Twenty patients, each of who required surgical extraction of a single impacted mandibular third molar under local anesthesia, were randomly set apart to one of the two groups of ten each. The experimental group received dexamethasone 8 mg injected to the masseter muscle intra buccally and the control group did not receive any steroid. Facial swelling and maximal inter-incisal distance were measured by an independent examiner pre-operatively, and at 4th h, on the day of surgery, 2 and 7 postoperative days. Pain was measured from the patient's response to a visual analogue scale.

Results Patients were of the age range 18–40 years. Dexamethasone group showed significant reduction in swelling and pain compared with the control group at all intervals. Dexamethasone injected into the masseter muscle via intra buccal approach resulted in significantly less trismus than control on day one postoperatively.

Conclusion Dexamethasone 8 mg given intra-massetrically through intra buccal approach is an effective way of minimizing swelling, trismus, and pain following surgical extraction of impacted mandibular third molars. It offers a simple, safe, painless, non-invasive and cost-effective treatment.

Keywords Intra-massetric · Dexamethasone · Impacted third molar

Introduction

Oral surgical procedures can lead to serious inflammatory reactions in the facial soft tissues. Though surgical extraction of impacted mandibular third molars is the most common surgical procedure in oral surgery, it usually produces pain, trismus and facial swelling in the postoperative period [1]. This fact has led to the extensive use of a variety of medications to control these postoperative complications. Corticosteroids are potent inhibitors of inflammation, and they have been widely used in different routes and regimens to lessen the inflammatory sequelae after third molar surgery [2]. Use of corticosteroids in dental practice began in the early 1950s, when Spies et al. and Strean and Horton administered hydrocortisone to prevent inflammation in oral surgery [1, 3].

Corticosteroids exert an important anti-inflammatory action, inhibiting vascular dilatation, reducing liquid transudation and edema formation, decreasing cell exudates, and reducing fibrin deposit around the inflamed area. The mechanisms responsible for these effects include inhibition of leukocyte chemotaxis to the inflammatory focus, inhibition of fibroblast function and endothelial cells, and suppression of the production or effects of numerous chemical inflammation mediators [4, 5]. Prolonged corticosteroid use can delay healing and increase patient susceptibility to infection. A single large dose or a short duration of therapy causes few adverse effects, such as those typically contemplated in oral surgery; the adverse effects are not clinically significant.

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The most commonly used forms of corticosteroids in dentoalveolar surgery include dexamethasone (oral), dexamethasone sodium phosphate (intravenous or intramuscular Decadron Phosphate, Decadrol, Dexone, Hexadrol Phosphate, and others), and dexamethasone acetate (intramuscular Decadron- LA and others); methylprednisolone (oral Medrol, Meprolone), methylprednisolone acetate (Depo-Medrol and others); and methylprednisolone sodium succinate (intravenous or intramuscular Solu-Medrol and others). Dexamethasone has a longer duration of action than methylprednisolone and is considered more potent [6].

Materials and Methods

Randomised prospective study included 20 patients, each of whom required removal of impacted mandibular third molar under local anaesthesia. The present study was approved by our local institutional review board. Inclusion criteria were, Partially impacted mandibular third molars with Pell and Gregory classification A, B, or C on the radiograph. Subjects were 18 years of age or older, had no Pericoronitis or infection at the time of operation. Exclusion criteria were, a history of immunocompromise, a history of allergy to the drug used, long-term use of any drug, pregnancy or lactation, those who used other drugs during the observation period and those who refused to take part in the study.

Operative Technique

The same surgeon operated on all patients using a standard technique, Anaesthesia was by a standard inferior alveolar nerve block and long buccal nerve block using a solution of 2 % lignocaine hydrochloride and adrenaline 1:80 000. Surgical access was by a Ward's incision, bone was removed around the tooth with a 702 straight fissure bur on a straight hand-piece under continuous irrigation with normal saline. The crown or roots were sectioned when necessary. After complete extraction of the tooth, the socket was inspected and irrigated copiously with normal saline and flap was sutured back with 2 interrupted 3-0 black silk sutures. A small gauze pack was then applied to the site and the usual postoperative instructions were given to the patients.

Patients were randomly divided into two groups of ten patients each. The treatment group received dexamethasone 8 mg into the masseter muscle via intra buccal approach. Injections were given preoperatively just before surgery. The control patients were given no corticosteroid. The trial was not blinded and patients were aware of whether they had had dexamethasone or not.

As well as dexamethasone, all patients were given Tab. Ciprofloxacin-TZ and Tab. Aceclofenac every 12 h orally for 5 days. Warm saline gargling was advised from the day after surgery for all patients.

Assessment and Follow Up

Measurements of facial swelling were made preoperatively and on the second and seventh postoperative days by an independent examiner. Facial swelling on the operated side was evaluated by 3 facial measurements: tragus- soft tissue pogonion, tragus to outer corner of the mouth and gonion-lateral canthus using a tape measure. The preoperative sum of the 3 values was taken as the baseline for that side.

Measurements of pain and trismus were made at 4th h post-op and on the following follow-up days. The trismus was evaluated with the maximum mouth opening on the 4th h post-operatively and on the following follow-up days, by measuring the inter-incisal distance using a scale. Postoperative pain was evaluated with a visual analogue scale (VAS), 10 mm long, that ranged from 0 = “no pain” to 10 = “the worse possible pain” 4 h postoperatively and on the days of follow up.

Results

Statistical Methods

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean $\pm$ SD (Min–Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumptions on data is made, Assumptions: (1) dependent variables should be normally distributed, (2) samples drawn from the population should be random, cases of the samples should be independent.

Analysis of variance (ANOVA) has been used to find the significance of study parameters between three or more groups of patients, Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (inter group analysis) on metric parameters.

Patients were of the age range of 18–40 years. There were no significant differences amongst the groups. No cases of alveolar osteitis or wound infection were reported at follow up. No side effects of drugs were mentioned or noted. There was a significant increase in swelling on the second day ($p < 0.050$), in the control group (Fig. 1). There was significant difference in the magnitude of swelling in either dexamethasone group at any interval compared with the control group.

Fig. 1 Graph for swelling

Fig. 2 Graph for trismus

Fig. 3 Graph for pain

Measurements of trismus differed significantly between the dexamethasone group and the control group on 2nd post operative ($p < 0.001$) and on 7th post-operative day

($p < 0.0019$) (Fig. 2). Pain was significantly less in Intramuscular group on the 7th post operative day (<0.001) (Fig. 3). There was no difference in the number of rescue analgesic tablets taken at each interval. No patient took pain killers after day 5.

Discussion

Perioperative use of corticosteroids is a pharmacological approach often used for reduction of oedema, trismus and pain after removal of impacted mandibular third molars [6–11]. Markiewicz et al. in a meta-analysis, concluded that giving corticosteroids perioperatively was of mild to moderate value in reducing postoperative inflammatory signs and symptoms. Specifically, when converted to Essen et al. scale, patients given corticosteroids had significantly less postoperative swelling and trismus than controls.

The selected corticosteroid should have scant mineralocorticoid effects and great biological activity. Dexamethasone meets these requirements since it has no mineralocorticoid activity, the half-life is approximately 36–54 h, and the drug is 10-fold more potent than hydrocortisone [7, 8].

Corticosteroids are said to be absolutely contraindicated for use in patients with active or incompletely treated tuberculosis, active viral or fungal infections (especially ocular herpes), active acne vulgaris, primary glaucoma, or patients with a history of acute psychoses or psychotic tendencies [6, 8]. While these contraindications refer to chronic corticosteroid use [15], it is felt that such drugs should be avoided in patients with these problems.

Though various routes of administration have been used, the effectiveness of the oral route of administration is dependent on patient compliance, and repeated dosing is required to maintain adequate blood levels during the postoperative period. Success of oral glucocorticosteroids in reducing the postoperative sequelae after third molar surgery is questionable [18]. The intramuscular route affords good plasma drug concentrations and prolonged anti-inflammatory action with a single pre- or postoperative dose [3, 8]. The expertise of the dental professional, the patient discomfort caused, and the need for specific material for administering the drug are factors that may limit use of this route. Vegas et al. [3] injected methylprednisolone into the masseter muscle and reported a decrease in pain, swelling and trismus, similarly Messer and Keller [12] injected dexamethasone into the masseter, as in the present study and reported reduced pain, swelling and trismus. The technique is convenient for the oral surgeon, since injection is carried out in proximity to the surgical area, for the patient too, as it is injected in a region that is still anaesthetized.

Though the intravenous route affords excellent and immediate plasma drug levels, some experience is required for administration. Ustün et al. [9] recommend preoperative administration via the intravenous route, because it offers immediate therapeutic blood drug concentrations before actual surgical trauma. Studies that employ the intravenous route suggest that while a single preoperative dose offers almost immediate benefit in terms of pain, swelling and trismus, supplemental dosing is usually needed via either the oral or intramuscular route, in order to ensure optimum clinical efficacy [13]. However, a very unusual side effect which has been documented to affect patients immediately after administration of intravenous dexamethasone is perineal pruritis. It has female predilection, lasts 30–45 s, and has been shown to occur with dosages between 6 and 8 mg [14].

Micó-Llorens et al. [1] documented a statistically significant reduction 6 h after surgery, but not at the subsequent controls. Baxendale et al. [16], using dexamethasone, reported a statistically significant reduction in pain 4 h, after surgery but not at the subsequent controls. Bystedt and Nordenram [17] reported improvements in pain in the immediate postoperative period.

In the present study we found that dexamethasone injected to masseter was associated with a significant reduction in swelling on days 1 and 2 postoperatively compared with controls, which agrees with the previous studies. Along with that we found that the postoperative trismus was less compared with the controls. These results add more strength to the concept that dexamethasone injected locally near the site of surgery in a therapeutic dose is a valuable way to reduce oedema in these patients [18]. An interesting finding was the significant reduction of trismus on day 2, which may have been the result of the higher concentration of dexamethasone achieved at the site of surgery. Our patients reported significantly less pain at all evaluation times in the dexamethasone group compared with controls.

Conclusion

Overall, the comparable results obtained show that dexamethasone injected to masseter is an effective alternative to dexamethasone given systemically. Intra massetric dexamethasone, on the other hand, is quite simple, less invasive, painless, convenient for the surgeon and the patient, and offers a low-cost solution for the typical discomfort associated with the extraction of impacted lower third molars. Preoperative injection offers the advantage of concentrating the drug near the surgical area with less systemic absorption.

In conclusion, the results of this study show that the intra-operative injection of 8 mg of dexamethasone via the intrabuccal approach into the masseter muscle significantly reduces swelling, trismus and postoperative pain. This technique therefore offers a low-cost solution for the typical patient discomfort associated with the surgical extraction of impacted lower third molars.

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