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EFFICACY OF ROUTES OF ADMINISTRATION OF DEXAMETHASONE (INTRAVENOUS VERSUS INTRA MUCOSAL) IN REDUCING POSTOPERATIVE PAIN AND SWELLING FOLLOWING IMPACTED MANDIBULAR THIRD MOLAR SURGERY: A COMPARATIVE CLINICAL STUDY

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ABSTRACT

Aims and objectives: To see the effect of dexamethasone and see and compare the effects of submucosal vs intra- muscular (IM) administration of dexamethasone in reducing postoperative pain and swelling following impacted mandibular third molar surgery. **Materials and methods:** The study was done on 30 patients, who were put into three groups of 10 each. The two experimental groups were given dexamethasone 4 mg sub-mucosally or intramuscularly (preoperatively), and the control group did not receive any form of corticosteroid. Measurements of facial swelling and maximal interincisal distance were made preoperatively and on the 1st, 3rd, and 7th postoperative days. Pain was evaluated from patients' response to visual analog scale and recording the number of rescue analgesic tablets taken at the end of the 7th postoperative day. **Results:** Both dexamethasone groups showed a significant reduction in pain, swelling, and trismus as compared with the control group at all intervals. There was a statistically significant reduction in magnitude of swelling in the submucosal dexa- methasone group as compared with the IM dexamethasone group on the 1st postoperative day, but there was no significant difference among two experimental groups at other times and their effects were comparable for all variables. **Conclusion:** Dexamethasone 4 mg is an effective therapeutic strategy for reducing postoperative sequelae following surgical removal of impacted third molars and submucosal dexamethasone is an effective alternative to dexamethasone given systemically.

KEYWORDS

Corticosteroids, Submucosal dexona, intravenous dexona, Third molar surgery.

INTRODUCTION

Disimpaction of lower third molars is still the most common procedure done by oral and maxillofacial surgeons.[1] Third molars show a high incidence of impaction and are often associated with many conditions, such as pericoronitis, periodontal pocket in the distal aspect of the second molar, dental occurrence in third molar or second molar, resorption of second molar due to constant , and many types of cysts. The disimpaction of embedded third molars by surgical means involves trauma to soft and hard tissues and can result in significant postoperative complication or sequaele.[2]

The disimpaction of impacted tooth usually involves incision, flap reflection, and bone removal, which results in considerable postoperative pain , inflammation and reduced mouth opening (trismus).[3]

To reduce the postoperative sequaelea, there fore seems to be a good goal . Many studies have worked on the treatments to minimize postoperative complications by using antiseptic mouthwashes, good flap design, antibiotics, corticosteroid treatment, muscle relaxants, and physiotherapy exercise. Among them, the use of corticosteroids has gained more popularity.

Steroids that have extensively been used in dental surgery are dexamethasone and methylprednisolone. [2] It has no mineralocorticoid activity and the half-life is roughly 36 to 72 hours.[2]

Dexamethasone has a longer duration of action than methylprednisolone and is found to be more potent of the two.. The potency of dexamethasone is about 20 to 30 times that of natural corticosteroid.[5] It is also considered to have the least depressing effect on leukocyte chemotaxis. Dexamethasone has been extensively used in oral and maxillofacial surgeries because of its very potent nature and long half-life. It is a synthetic analog of prednisolone in which a methyl group has been added at the carbon 16 position and a fluorine atom at carbon 9 position. It has been known that the addition of fluorine at the carbon 9 position enhances the anti-inflammatory activity of dexamethasone. Dexamethasone is a white odorless compound, which is slightly soluble in water. It has a melting point of 240 to 260°C.

Various routes have been utilised; orally administered dexamethasone are rapidly and almost completely absorbed. However, in order to maintain adequate blood concentration throughout the immediate postoperative period, repeated dose is required. Intravenous (IV) administration results in instantaneous blood levels, but requires expertise and additional equipment.[6]

Intramuscular route has been the most commonly prescribed route in outpatient settings and gives good plasma concentration of the drug and prolonged anti- inflammatory action. The submucosal administrartion is better for third molar surgery, as the injection is given in close proximity to the operative field and local infiltration of dexamethasone injected submucosally around the site of surgery is expected to provide slow absorption and prolonged duration of action. This study was designed to compare the effect of preoperative administration of inj. dexamethasone given via the submucosal and IM routes, on the postoperative sequelae after removal of impacted lower third molars.

AIMS AND OBJECTIVES

Objectives of the study:

To evaluate the efficacy of dexamethasone in reducing postoperative sequelae following surgical extraction of impacted mandibular third molars.

To compare the effect of preoperative administration of inj. dexamethasone given via submucosal and IM routes, on the postoperative sequelae after removal of impacted lower third molars, which include – Pain

Dexamethasone is a member of the glucocorticoid class of corticosteroids. It is a synthetic corticosteroid, highly potent, and has anti-inflammatory and immunosup- pressant effects. Its potency is 25 times that of cortisol in terms of its glucocorticoid effect, while it has minimal mineralocorticoid activity.

Dexamethasone phosphate (as sodium) is a white or slightly yellow, very hygroscopic, crystalline powder. It is an odorless compound Dexamethasone phosphate (as sodium) is Soluble in water (ratio 1:2), slightly soluble in alcohol, insoluble in chloroform and ether, and very slightly soluble in dioxan.[4]

Dexona in an injectable form is a clear and colorless solution, free from visible particulate matter. Each milliliter of solution contains dexamethasone sodium phosphate equivalent to 4 mg of dexamethasone phosphate. The 8 mg/2 mL vial for- mulation contains sodium citrate, disodium edetate, and sodium sulfite anhydrous. No preservatives are present.

Pharmacology

Dexamethasone is known to have anti-inflammatory and immunosuppressive actions. Glucocorticoids prevent the development of the inflammatory response. They also inhibit capillary dilation and phagocytosis and appear to prevent the hypersensitivity response anti-inflammatory and immunosuppressive actions. Glucocorticoids prevent the development of the inflammatory response.

Dexamethasone is a long-acting synthetic adrenocortico- steroid with glucocorticoid activity. It has no mineralocor- ticoid activity, the half-

life is around 36 to 72 hours, and the drug is 25 times more potent than hydrocortisone. It is also considered to have the least adverse effect on leukocyte chemotaxis.[1]

The principal metabolic actions of dexamethasone are on carbohydrate, protein, and calcium metabolism. Dexamethasone also influences the mobilization, oxida- tion, synthesis, and storage of fats. Dexamethasone causes inhibition of endogenous corticotropin secretion by suppressing the release of adrenocorticotropic hormone from the pituitary.

Pharmacokinetics

Dexamethasone phosphate (as sodium) is rapidly absorbed following administration by oral, IM, or IV routes.

MATERIALS AND METHODS

The present study was undertaken in the Department of Oral and Maxillofacial Surgery, GDC SRINAGAR in the year 2018 to 2020 and skims dental unit . This study included both male and female patients, who were referred to the Department of Oral and Maxillofacial Surgery for removal of impacted mandibular third molars.

- **Inclusion Criteria**
- Patients aged 18 to 50 years
- Patients with impacted mandibular third molars indicated for surgical extractio

Exclusion Criteria

- Patients with systemic disorders
- Pregnant and lactating females Study sample included 30 patients who underwent surgical extraction of impacted mandibular third molars. The patients were divided into three groups of 10each
- Group I (submucosal dexamethasone group): Patients received 4 mg (1 mL) dexamethasone via submucosal route (around the tooth to be extracted) half an hour prior to the procedure
- Group II (IM dexamethasone group): Patients received 4 mg (1 mL) dexamethasone via IM route (dorsogluteal site) half an hour prior to the procedure.
- Group III (control group): Patients in this group did not receive any form of corticosteroid.

Preoperatively, facial measurements and interincisal opening were recorded, and this was taken as baseline. The evaluations were made subsequently on 1st, 3rd, and 7th postoperative days and compared with baseline.

Evaluation of Pain

Pain was evaluated using standard visual analog scale (VAS) on 1st, 3rd, and 7th postoperative days and also taking into account the number of rescue analgesic tablets taken at the end of 7th postoperative day.

Evaluation of Facial Swelling

Facial swelling on the operated side was evaluated by two facial measurements

- Tragus–midline (Tr-Md) and Gonion–lateral canthus (Go-Lc) This was done using a flexible measuring tape. The preoperative sum of two values was taken as the baseline for that side. Facial measurements were made subsequently on 1st, 3rd, and 7th postoperative days and compared with the baseline.
- Evaluation of Trismus Maximal mouth opening was recorded preoperatively, which was taken as baseline. Mouth opening values were recorded subsequently on 1st, 3rd, and 7th postoperative days and compared with the baseline for evaluation of trismus.
- Postoperative Instructions Regular postextraction instructions were given. All patients were given amoxicillin 500 mg thrice daily for 5 days, and tramadol 50 mg orally as required as rescue analgesia. Chlorhexidine mouth wash was to be used twice daily starting 1 day after operation for 5 days.

RESULTS

There were 54 men and 36 women in the age range of 19 to 45 years. Following completion of clinical study on the patients, the measurements and data taken from all patients were tabulated for statistical studies. The results of our study are described in brief as follows:

In all groups, the mean postoperative pain score was highest at postoperative day 1 and gradually reduced

Mean and standard deviation of pain on 1st postoperative day treatment-wise over the following 7 days .The mean postoperative pain was lower in the submucosal dexamethasone group at all time points when compared with the control group. The IM dexamethasone group showed significant difference in mean postoperative pain values on 1st and 3rd postoperative day as compared with the control group; however, there was no significant difference between the two groups on the 7th postoperative day. The accumulated number of rescue analgesic tablets also differed significantly between the dexamethasone groups and control group. However, there was no significant difference in mean postoperative pain score and the total number of rescue analgesic tablets in either dexamethasone group at any interval.

Patients in the control group consistently had lower maximal interincisal opening on the 1st and 3rd postoperative days as compared with the dexamethasone treated groups. However, there was no significant difference among the dexamethasone- treated groups for the above parameter. The interincisal mouth opening values reached baseline in all the three groups by the 7th postoperative day.

Analysis of variance technique was used to test the mean difference between three treatment groups, namely, submucosal dexamethasone, IM dexamethasone, and control group. To see which of the treatment groups are significantly different, the least significant difference technique was used by taking two treatments at a time.

DISCUSSION

The removal of impacted third molar by surgical means can lead to considerable amount of pain, inflammation and impaired function. The factors that lead to postoperative pain and swelling are complex, but many of the these factors correlate to the process of inflammation. Careful attention to surgical procedure will minimize the sequelae of inflammation, but will not prevent them.[7] Postoperative swelling is a biological response characterized by increased vascular permeability, increased movement of leukocytes into the inflamed area, and the release of chemical mediators of inflammation. By controlling the extent of the inflammatory process, using pharmacologic measures, postoperative complications, such as pain, swelling, and trismus, can be minimized.[7,8]

The most commonly used forms of corticosteroids in dentoalveolar surgery include dexamethasone (oral), dexamethasone sodium phosphate (IV or IM), dexa- methasone acetate (IM), methylprednisolone (oral), and methylprednisolone sodium succinate (IV/IM).[7] The corticosteroid selected should have good biological activity and minimal mineralocorticoid effects. It is also considered to have the least adverse effect on leukocyte chemotaxis.[1] Dexamethasone also has a longer duration of action than methylprednisolone, thereby considered more potent.[2,3]

Dexamethasone is available in oral, parenteral, and topical formulations, and is largely used in oral surgery due to its high efficacy and long half-life. In our study, we aimed to evaluate the effectiveness of dexamethasone given via two different routes (submucosal and IM) on postoperative sequelae after impacted third molar surgery.

Consistent with published data , third molar surgery in the control group was associated with significant postoperative sequelae.[1,9] The postoperative sequelae including pain and trismus reached its peak on 1st daypost operatively and facial swelling was the highest on 3rd day postoperatively. They gradually reduced to reach near baseline (preoperative) values by the 7th postoperative day

Unlike previous studies that reported only a limited effect on trismus and pain, our patients showed significantly less trismus and pain at all times of evaluation in the submucosal group as compared with controls, which may have been the result of higher concentration of drug at the site of injury.

Although there is an agreement about their effects on swelling, the role of corticosteroids in the prevention of postoperative pain is controversial. Recently, Waldron et al[14] in a meta-analysis reported that patients treated with dexamethasone experienced comparatively lesser postoperative pain, required less opioids in postoperative period, had longer time to first analgesic dose, and needed less rescue analgesia. They concluded that perioperative single dose dexamethasone was associated with small, but statistically significant analgesic benefits.

In the present study, a comparison was drawn between two different mode and route of administration of dexamethasone. Both dexamethasone groups were associated with a significant reduction in

pain, swelling, and trismus; submucosal dexamethasone had a significant effect on facial swelling on 1st postoperative day as compared with IM dexamethasone, but the effect in two groups were comparable overall for all variables.

Overall, the comparable results obtained show that submucosal dexamethasone is an effective alternative to systemically administered dexamethasone. The expertise of the surgeon and the discomfort caused to the patient are factors that may limit the use of IM route. Submucosal dexamethasone, on the contrary, is simple, less invasive, and painless. It is well suited for third molar surgery and provides a low-cost solution for the typical discomfort associated with extraction of impacted third molars.

CONCLUSION

In this study, inj. dexamethasone sodium phosphate was used as an adjunct to reduce postoperative pain and swelling following surgical removal of impacted third molars.

It indicates a definite reduction in pain, swelling, and trismus after third molar surgery in patients treated with dexamethasone as compared with the control group. These findings signify and highlight the use of dexamethasone certainly as a valid method in reducing postoperative sequelae in patients undergoing third molar surgery.

This study provides a basis for preoperative route of administration of dexamethasone in a subtherapeutic dose of 4 mg to reduce the intensity of postsurgical sequelae, such as pain, swelling, and trismus.

This study also compares two routes of administra- tion of dexamethasone; the comparable results obtained show that submucosal dexamethasone is an effective alternative to dexamethasone given systemically. It offers a simple, painless, less invasive, and cost-effective solution for typical discomfort associated with surgical extraction of third molars.

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