Review Article

A review of perioperative corticosteroid use in oral and maxillofacial surgery

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ABSTRACT

Aim: Oral and maxillofacial surgeons are often recommended to use corticosteroids during and after third molar extraction and other dentoalveolar surgical procedures to reduce postsurgical edema, but recommendations are rarely accompanied by the guidance regarding the type of steroid, dosage, or duration of administration. **Materials and Methods:** A systematic search of the literature was made. The primary predictor variable was CS administration, and the outcome variables were edema, pain, and infection. A meta-analysis was performed. The risk of other side effects was evaluated through a simple review. **Results:** Recent data suggest that perioperative corticosteroid regimens should be administered in higher doses and for longer durations than recommended in the past and should be started before surgery for optimum benefit. **Conclusions:** Based on literature review, interim recommendations for the use of corticosteroids are proposed, including dosages and regimens that appear rational for oral, intramuscular, or intravenous corticosteroid administration before and after extractions and other dentoalveolar surgery. These largely empiric recommendations might require adjustment when evidence-based data become available in future studies. There is a great need for well-designed clinical research to further evaluate protocols for corticosteroid use.

KEY WORDS: Corticosteroids, Oral, Pre-operative, Surgery, Use

INTRODUCTION

Use of corticosteroids plays an important role in the treatment of diseases, disorder and also during the oral and surgical treatment of the maxillofacial area and other related structures due to the local expression of systemic problems. Group of corticosteroids with glucocorticoid activity such as betamethasone, dexamethasone, triamcinolone, and prednisolone is being used extensively in controlling pain, allergy, inflammation, and also alter immune conditions. Temporomandibular disorders (TMDs) are clinical problems involving temporomandibular joints (TMJs), the masticatory muscles or both. It is a common musculoskeletal disorder causing orofacial pain. The most common signs and symptoms of TMDs are pain, altered mandibular movements, and the elicitation of joint noise.[1]

Access this article online

Website: jprsolutions.info | ISSN: 0975-7619

Treatment of TMDs varies based on their etiology. Based on the severity of the disorder, surgical or a combination of treatment such as splint application, thermal application, and physiotherapy treatment is recommended. Various corticosteroids are used in the treatment of TMDs, which have dramatic effects in controlling hypomobility, pain, and inflammation, especially associated with TMJ problems. For a short-term treatment (tapering dose for 5–7 days), oral corticosteroids are being used mainly for acute TMJ discomforts. Long-term use of corticosteroids may result in acute adrenal crisis, hypertension, and electrolyte anomalies, even diabetes even formation of osteoporosis that includes TMJ also. It is also reported that intra-articular injections of corticosteroids (like triamcinolone acetonide) cause damage to fibrous layer, cartilage, and bone of TMJ.[2]

Drug	Alternative name	Usual dose
Hydrocortisone	Hydrocortone	20–240 mg/day
Prednisone	Deltasone, Orasone	50–60 mg/day
Dexamethasone	Decadron	0.75–9.0 mg/day
Betamethasone	Celestone	0.6–7.2 mg/day

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Received on: 22-08-2018; Revised on: 13-09-2018; Accepted on: 17-01-2019

EDEMA

Two reviews concerning orthognathic surgery supported the administration of CSs when edema or vascular problems were to be expected. A trial by Munro *et al.* did not show any significant decrease in edema but is among the trials in which the highest doses and the longest duration of treatment were used. The researchers stated that the lack of effect was due to hormonal differences because all patients were children. This seems plausible but was not possible to clarify by the literature reviewed in the present study. Another problem in this study could be the grading of clinical edema on a simple scale from, which is not as accurate as the objective measurement method used in the other studies, examples being computed tomographic scans, C-reactive protein values, and laser scans. A trial by Weber and Griffin published in 1994 showed significantly decreased edema with one single pre-operative dose of dexamethasone and doses administered before and after surgery and on the 1st post-operative day. This trial concluded that, if minimum dose and duration are preferred, administration of methylprednisolone 85 mg (intravenously) preoperatively seems to decrease edema significantly, but more clinical trials are needed to support this conclusion. No meta-analysis could be performed in orthognathic surgery and decreased edema with CSs; further clinical trials are needed.[3]

NEUROREGENERATION

A trial by Al-Bishri *et al.*, which was based on the patients' own evaluation of neurosensory dysfunction, was not included because of the purely subjective evaluation method. Bracken *et al.* advocated the use of 24-h methylprednisolone (initially 30 mg/kg before the operation and thereafter a methylprednisolone infusion of 5.4 mg/kg/h) if started sooner than 3 h after trauma and of 48-h methylprednisolone (2.5-mg/kg bolus infusion of tirilazad mesylate every 6 h) if longer than 3 h after trauma, and both regimens had significant neuroregeneration effects. Seo *et al.* administered a fixed CS dose (prednisolone 30 mg for 7 days, 15 mg for 4 days, and 5 mg for 3 days) during 14 days of treatment with different times for onset of treatment (1 week, 3 weeks, or 6 weeks after trauma) and found significant neuroregeneration in patients when treatment onset was later than the 1st week after trauma. A study by Galloway *et al.* showed that an initial neuroregeneration effect was not statistically significant. Combined, these studies show that there might be a neuroregeneration effect of CSs, but no meta-analysis could be performed, and further clinical studies are needed.[4]

CONTRAINDICATIONS OF STEROIDS

Topical corticosteroids are contraindicated in the treatment of primary bacterial infections and patients with hypersensitivity.[5]

Side Effects

Side effects are dependent on the type and dosage of the drug, length of treatment. It includes weight gain, impaired growth, adrenal insufficiency, increased susceptibility to infection, myopathy, osteoporosis, osteonecrosis, cataract, glaucoma, fractures, hypertension, insomnia, diabetes, and peptic ulcer. Topical treatments cause adverse effects such as skin atrophy, hypo-pigmentation contact dermatitis, oral thrush, subcutaneous fat wasting, and cushingoid effect from systemic absorption. Inhaled corticosteroids cause side effects including oropharyngeal candidiasis, dysphonia, reflex cough, bronchospasm, and pharyngitis.[6]

RESULTS

In oral and maxillofacial surgery, most clinical trials showed a significant decrease in edema after CS, and local injection of methylprednisolone ≥25 mg was expected to result in a significant decrease in edema. Regarding the analgesic effect, several clinical trials showed a decrease in pain after CS. Further, CS administration resulted in a slightly higher risk of infection; CS could be administered with no increased risk of infection. In oral and maxillofacial surgery, methylprednisolone risk of infection intravenously seemed sufficient to produce a significant decrease in edema, and several trials pointed toward a neuroregeneration effect, but no statistical analysis could be performed. Regarding the risk of other side effects, in oral surgery, a minimal risk of chronic adrenal suppression was seen; in orthognathic surgery, an elevated risk of avascular osteonecrosis, steroid-induced psychosis, and adrenal suppression was seen. There were no reports of decreased healing.[7]

DISCUSSION

In surgical extraction, most trials showed a significant decrease in edema after CS administration using different doses, routes, and duration of treatment indicates that CS administration decreases the risk of post-operative edema significantly. In oral and maxillofacial surgery, the threshold dose value of methylprednisolone is expected to be 0–25 mg, above which any single dose of methylprednisolone administered will result in a significant decrease in edema. This indicates that if a minimum dose is preferable, a pre-operative injection into the masseter muscle of methylprednisolone ≥25 mg (or an equivalent anti-inflammatory dose of

another CS) is effective in decreasing edema.[8]

In oral and maxillofacial surgeries, fewer trials are available, but these show a significant decrease of edema when CSs are administered at different doses and durations of treatment. It seems possible that one intravenous dose of methylprednisolone ≥85 mg (or an equivalent anti-inflammatory dose of another CS) administered preoperatively results in a significant decrease in edema, but more research is needed to verify this. Insufficient data on the edema-decreasing effect of CS after oral and maxillofacial surgery did not allow a meta-analysis. No trials reported an increased need for analgesic treatment postoperatively after CS administration. This shows that the CS administration does not suppress the β-endorphin level and thereby increase the patient's perception of pain.[9]

Several trials reported significantly decreased edema and analgesia, indicating a strong correlation between edema and pain decreases. However, Pedersen, Skjelbred and Løkken, Buyukkurt *et al.*, and Milles *et al.* found a significant decrease in edema but no significant decrease in pain connected to the low dose and/or post-operative administration timing. Neupert *et al.* found no significant decrease in edema but a significant decrease in pain. Human trials on CS and neuroregeneration indicated that CS promotes neuroregeneration. However, there is no accepted conclusion on what should be the administered dose or the onset and duration of treatment to support the conclusions presented. Avascular osteonecrosis seems to occur more frequently with high dosages. Doses of dexamethasone >16 mg/day 21 and methylprednisolone ≤1,830 mg within 30 h are expected to increase the risk. Therefore, it seems that there is a minimally increased risk when administering high-dose CS over a short period. Other predisposing factors such as smoking, alcohol consumption, and hard physical labor are also thought to increase the risk.

Regarding increased infection rates, in oral surgery, most trials reported infection rates at an increased risk. Hence, there is no significantly increased risk of infection and the use of prophylactic antibiotics should not be administered, unless other indications are present. The fear of CSs causing decreased healing has shown to be less plausible because none of the available trials reported any signs of this. With regard to the meta-analysis, edema is believed to be greater in the mandible, and the comparison of studies including only mandibular or maxillary and mandibular M3 surgical extractions could be viewed as a potential bias. However, because maxillary and mandibular extractions were done bilaterally and in a double-blind manner (including the upper and lower jaws on the same side during the same operation), this was considered to be of lesser importance. Whether these findings can be extrapolated to other surgical fields, such as apicoectomy, implant dentistry, treatment of odontogenic pathologic conditions, and traumatic fractures are difficult to conclude from this review. It seems plausible that if an inflammatory reaction is present and thus edema and pain are expected, the administration of a CS preoperatively would be expected to decrease edema and pain, thereby causing fewer post-operative complications.[10]

CONCLUSIONS

The purpose of this review was to clarify whether CS administration does indeed significantly decrease edema and pain. Furthermore, we wanted to identify the minimum effective dose of CS in relation to onset, duration, and route of administration. In addition, we evaluated whether CS administration did, in fact, introduce an increased risk of side effects.

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Source of support: Nil; Conflict of interest: None Declared