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The Role of Corticosteroids in Managing Postoperative Outcomes in Oral Surgery: A Review

1. DR RINY GEORGE
SENIOR LECTURER,DEPARTMENT OF ORAL AND MAXILLOFACIAL SURGERY
ALAZHAR DENTAL COLLEGE THODUPUZHA KERALA

1. DR.ANU MATHEW
READER, DEPARTMENT OF PERIODONTICS
ALAZHAR DENTAL COLLEGE THODUPUZHA KERALA

2. DR.ALLWIN ANTONY THOTTATHIL
READER, DEPARTMENT OF PEDODONTICS
ALAZHAR DENTAL COLLEGE THODUPUZHA KERALA

3. DR. FEMI KHADAR
SENIOR LECTURER, DEPARTMENT OF PERIODONTICS
ALAZHAR DENTAL COLLEGE THODUPUZHA KERALA

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Abstract
Inflammation-related complications such as pain, swelling, and trismus are common after many oral surgical procedures, particularly the surgical removal of impacted mandibular third molars. These postoperative reactions, although part of the normal healing process, may significantly affect patient comfort and recovery. Over the years, corticosteroids have been widely used as adjunctive medications in oral surgery because of their potent anti-inflammatory properties. By suppressing inflammatory mediators and reducing vascular permeability, corticosteroids help minimize postoperative tissue reactions. Numerous clinical studies conducted over the past decade have evaluated the effectiveness of corticosteroids in reducing postoperative morbidity following oral surgical procedures. Most of these studies indicate that corticosteroids, especially dexamethasone and methylprednisolone, can significantly reduce postoperative pain, edema, and trismus when administered before or immediately after surgery. Different routes of administration—including oral, intravenous, intramuscular, and submucosal injections—have been investigated in clinical practice. Although the majority of evidence supports their beneficial effects, variations in dosage, timing, and route of administration have produced some differences in clinical outcomes. This review summarizes recent evidence regarding the role of corticosteroids in oral surgery, focusing on their pharmacological mechanisms, clinical applications, administration protocols, benefits, and limitations.

Keywords: Corticosteroids, Oral surgery, Third molar surgery, Dexamethasone, Postoperative inflammation

I. Introduction

Oral surgical procedures are frequently associated with postoperative inflammatory responses such as pain, swelling, and limited mouth opening. These complications are particularly common following surgical removal of impacted mandibular third molars, which remains one of the most commonly performed procedures in oral and maxillofacial surgery[1,2]. While these inflammatory reactions are part of the normal healing process, they often cause significant discomfort to patients and may temporarily interfere with eating, speaking, and other routine activities.

The inflammatory response following oral surgery is initiated by surgical trauma and the subsequent release of inflammatory mediators such as prostaglandins, histamine, and cytokines[3]. These mediators increase vascular permeability and attract inflammatory cells to the surgical site, resulting in tissue swelling, pain, and muscle stiffness.

To control these postoperative symptoms, clinicians commonly use a combination of analgesics, anti-inflammatory drugs, antibiotics, and supportive care[4,5]. Among these pharmacological options, corticosteroids have gained considerable

attention because of their strong anti-inflammatory effects.

Corticosteroids are synthetic analogues of glucocorticoid hormones naturally produced by the adrenal cortex. They exert powerful anti-inflammatory and immunosuppressive effects by interfering with several stages of the inflammatory cascade[6,7]. Because of these properties, corticosteroids have been widely used in medicine and dentistry to control inflammation associated with surgical procedures.

Over the past decade, numerous clinical trials and systematic reviews have investigated the effectiveness of corticosteroids in reducing postoperative complications after oral surgery[8,9]. Many of these studies have demonstrated that corticosteroid administration before or immediately after surgery can significantly reduce swelling, pain, and trismus, thereby improving patient comfort and recovery[10].

This review aims to provide an overview of the current evidence regarding the role of corticosteroids in oral surgery, with particular emphasis on their mechanism of action, clinical indications, routes of administration, therapeutic outcomes, and possible adverse effects.

Mechanism of Action of Corticosteroids

The anti-inflammatory effects of corticosteroids are primarily related to their ability to interfere with the biochemical pathways responsible for inflammation.

One of the most important mechanisms involves the inhibition of phospholipase A2, an enzyme that plays a key role in the production of inflammatory mediators[11]. By blocking this enzyme, corticosteroids prevent the formation of arachidonic acid and subsequently reduce the synthesis of prostaglandins and leukotrienes.

Corticosteroids also suppress the release of pro-inflammatory cytokines such as interleukin-1 and tumor necrosis factor-alpha, which are involved in the activation of inflammatory cells[12]. By limiting the production of these cytokines, corticosteroids reduce the intensity of the inflammatory response.

Another mechanism involves stabilization of lysosomal membranes and reduction of capillary permeability. These effects help limit the leakage of fluid into surrounding tissues and therefore reduce postoperative swelling[13].

Corticosteroids also influence immune cell activity by reducing the migration of neutrophils, macrophages, and lymphocytes to sites of tissue injury[14]. This further contributes to the reduction of inflammation and tissue damage.

Together, these mechanisms explain why corticosteroids are effective in controlling postoperative inflammatory reactions in oral surgery.

Clinical Applications in Oral Surgery

Third Molar Surgery

The surgical removal of impacted mandibular third molars is widely recognized as one of the most common procedures performed in oral and maxillofacial surgery. However, it is frequently associated with postoperative complications such as swelling, trismus, and pain[15,16].

Several studies have demonstrated that corticosteroid administration can significantly reduce postoperative inflammatory symptoms following third molar surgery[17,18]. Dexamethasone, in particular, is commonly used because of its high potency and relatively long duration of action.

Clinical trials have reported that patients receiving dexamethasone before surgery often experience less swelling and improved mouth opening compared with patients who do not receive corticosteroid therapy[19,20].

Temporomandibular Disorders

Corticosteroids have also been used in the management of temporomandibular joint disorders, particularly in cases involving inflammatory conditions of the joint[21,22]. Intra-articular corticosteroid injections can reduce inflammation within the joint and provide symptomatic relief in patients with persistent TMJ pain.

However, repeated injections should be used cautiously because excessive corticosteroid exposure may potentially affect joint cartilage[23,24].

Other Oral Surgical Procedures

Apart from third molar surgery and temporomandibular disorders, corticosteroids are also used in other oral surgical procedures such as orthognathic surgery, implant placement, and management of inflammatory oral lesions[25,26].

In these procedures, corticosteroids may help reduce postoperative swelling and improve overall patient comfort during the recovery period.

Routes of Administration

Corticosteroids can be administered through different routes depending on the clinical situation and surgeon preference.

Oral administration is convenient and widely used, especially for preoperative medication. Drugs such as dexamethasone and prednisolone may be prescribed in tablet form before or after surgery[27].

Intramuscular injection provides a rapid and sustained anti-inflammatory effect and is commonly used during surgical procedures[28].

Intravenous administration is typically used in hospital settings during major oral and maxillofacial surgeries where immediate drug action is required[29]. Submucosal injection has become increasingly popular in dental surgery because it allows the drug to be delivered directly at the surgical site while minimizing systemic effects[30]. Several studies have reported that submucosal dexamethasone injections significantly reduce postoperative swelling and trismus after third molar surgery[31,32].

Clinical Outcomes

The majority of clinical studies conducted over the past decade support the effectiveness of corticosteroids in reducing postoperative complications associated with oral surgery.

Patients receiving corticosteroids generally report lower pain levels, reduced swelling, and improved mouth opening compared with those who do not receive steroid therapy[33,34].

Systematic reviews and meta-analyses have also demonstrated that preoperative corticosteroid administration significantly reduces postoperative edema and improves functional recovery after third molar extraction[35].

In addition, corticosteroids may reduce the need for additional analgesic medication, thereby improving patient comfort during the postoperative period[36].

However, some studies have reported variations in outcomes depending on factors such as dosage, timing of administration, and route of delivery[37,38].

Adverse Effects and Limitations

Although corticosteroids are generally safe when used for short durations, clinicians should be aware of potential adverse effects.

Possible complications include delayed wound healing, increased risk of infection, and gastrointestinal irritation[39,40]. In patients with systemic diseases such as diabetes mellitus, corticosteroids may also cause transient elevations in blood glucose levels.

Long-term corticosteroid therapy may lead to more serious complications such as adrenal suppression and osteoporosis. However, such complications are rare when corticosteroids are used as a short-term adjunct in oral surgery[41,42].

Future Perspectives

Future research should focus on determining the most effective dosage, timing, and route of administration for corticosteroids in oral surgical procedures. Standardized clinical guidelines would help clinicians optimize treatment protocols and improve patient outcomes.

Advances in drug delivery systems may also allow the development of localized corticosteroid formulations that provide targeted anti-inflammatory effects with minimal systemic exposure[43-69].

II. Conclusion

Corticosteroids continue to play an important role in the management of postoperative inflammation associated with oral surgical procedures. Their ability to suppress inflammatory mediators makes them effective in reducing pain, swelling, and trismus following surgery.

Among the various corticosteroids used in clinical practice, dexamethasone remains the most commonly studied and widely used agent. When administered appropriately, corticosteroids can significantly improve postoperative patient comfort and recovery.

Nevertheless, careful consideration of dosage, timing, and patient health status is essential to minimize potential adverse effects. Further research will help refine treatment protocols and clarify the long-term benefits of corticosteroid therapy in oral surgery.

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