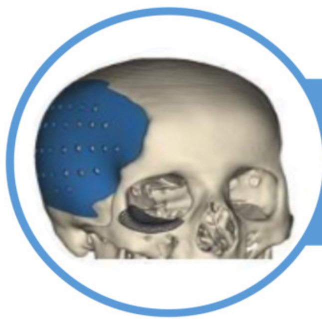

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Use of corticosteroids in dental surgical procedures

Anderson Jara Ferreira [1], Erick Andres Alpacas Zevallos [2], Camila Coelho Guimarães [3], Gustavo Ramiro Rojas Manrique [2], Jaime S. Gallegos Zanabria [2], Ilan Hudson Gomes de Santana [1], Fernando Kendi Horikawa [4], Élio Hitoshi Shinohara [4]

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REVIEW ARTICLES

ABSTRACT

Background: Corticosteroids are widely employed in Oral and Maxillofacial Surgery (OMS) to mitigate postoperative inflammatory complications such as edema, pain, and trismus. Despite their extensive use, considerable variability remains regarding optimal protocols concerning dosage, route, and timing of administration. **Objective:** This narrative review aimed to critically evaluate the available scientific evidence on the efficacy, safety, and administration protocols of corticosteroids in OMS procedures. **Methods:** A descriptive exploratory narrative review was conducted. A comprehensive literature search was performed from May to June 2025 across PubMed/MEDLINE, Scopus, and Embase databases, using MeSH and DeCS terms alongside relevant free-text keywords. Studies included randomized trials, systematic reviews, meta-analyses, clinical guidelines, and cohort studies published between 2000 and 2025 in English, Portuguese, or Spanish. Data extraction focused on corticosteroid types, doses, routes, timing, clinical outcomes, and adverse events. **Results:** Evidence consistently demonstrated the clinical efficacy of corticosteroids—especially dexamethasone—in reducing postoperative edema, trismus, and pain, notably in third molar extractions, orthognathic surgeries, and facial fracture repairs. Intramuscular administration of 4–8 mg dexamethasone approximately 30–60 minutes preoperatively yielded the most significant benefits. Other corticosteroids such as betamethasone and methylprednisolone showed similar efficacy but different pharmacokinetics. Adverse effects were generally minimal with single short-term doses, though caution remains essential in patients with comorbidities. A lack of standardized protocols persists, underlining the need for individualized treatment plans. **Conclusions:** Corticosteroid use in OMS, when guided by well-established protocols and individualized patient assessment, is effective and safe for controlling inflammatory complications. Nevertheless, further high-quality randomized multicenter trials are warranted to establish robust standardized clinical guidelines.

Keywords: Corticosteroids; Postoperative Complications; Pain Management; Edema

1 Federal University of Paraíba
2 Universidad Catolica de Santa María-Perú
3 Saint Leopoldo Mandic
4 Osasco Regional Hospital

Corresponding author: *Anderson Jara Ferreira* *author's email; anderson_jara@hotmail.com*

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INTRODUCTION

Oral and Maxillofacial Surgery (OMS) encompasses a diverse range of surgical procedures involving the hard and soft tissues of the craniofacial region, including complex extractions, osteotomies, removal of benign lesions, facial fractures, and orthognathic surgeries. Regardless of surgical complexity, postoperative tissue inflammatory response is an inevitable physiological phenomenon, characterized by edema, pain, trismus, and, in some cases, functional alterations that directly impact the patient's quality of life [1,2]. In this context, corticosteroids have been widely used as adjunct pharmacological agents aimed at controlling inflammation and reducing postoperative complications [3].

Synthetic corticosteroids, structural analogs of endogenous glucocorticoid hormones, act through complex and multifactorial mechanisms. Their primary mode of action involves the inhibition of phospholipase A2, a key enzyme in the release of arachidonic acid from membrane phospholipids [4]. This inhibition blocks the inflammatory cascade that would otherwise culminate in the production of prostaglandins, leukotrienes, and other pro-inflammatory mediators. Furthermore, corticosteroids modulate the expression of genes related to the immune response, decreasing leukocyte migration, capillary permeability, and the production of inflammatory cytokines such as IL-1, IL-6, and TNF-α [5,6].

Several randomized clinical trials and systematic reviews have investigated the therapeutic effects of corticosteroids in oral and maxillofacial surgeries, with special focus on third molar procedures, given the high frequency of this intervention within the specialty [7,8]. The administration of corticosteroids, particularly dexamethasone, has demonstrated significant reductions in facial edema, limitation of mouth opening (trismus), and postoperative pain, especially when administered via intramuscular or intravenous routes in the preoperative period [9].

However, despite the clear benefits, the use of corticosteroids in the surgical setting is not without risks. The potential for systemic adverse effects—such as hyperglycemia, increased blood pressure, adrenal suppression, delayed wound healing, and greater susceptibility to infections—especially in patients with pre-existing comorbidities like diabetes mellitus, immunosuppression, or coagulation disorders, has

been widely discussed in the literature [10]. Additionally, the lack of consensus regarding the ideal dose, timing of administration, and the most appropriate route for each clinical situation still represents a challenge for oral and maxillofacial surgeons [11].

Variations in administration protocols reflect the differing therapeutic philosophies among professionals in the field. While some authors advocate single-dose preoperative administration, others suggest multiple-dose regimens or extended use in the immediate postoperative period, based on surgery duration and the extent of tissue trauma. The choice of administration route also remains a point of debate. Although the intramuscular route is the most commonly employed due to its ease and relatively rapid absorption, there is evidence supporting the use of the intravenous route for higher short-term bioavailability, as well as the oral route in less complex procedures [12].

Beyond pharmacological considerations, the individualization of corticosteroid therapy must take into account patient-specific factors such as age, overall health status, presence of chronic diseases, history of adverse drug reactions, and concomitant use of other medications. In this regard, the development of personalized clinical protocols becomes essential to maximize therapeutic benefits and minimize associated risks [13].

Given the widespread use and the divergences found in the literature, a critical analysis of the efficacy, safety, and different administration protocols of corticosteroids within the scope of Oral and Maxillofacial Surgery is warranted. The present narrative review aims to synthesize and discuss the main available scientific evidence, providing support for a safer, more effective, and evidence-based clinical practice. Through an integrative approach, it seeks to address the underlying pharmacological mechanisms, the most commonly used protocols to date, expected clinical effects, potential adverse outcomes, and the latest recommendations found in international clinical guidelines.

METHODOLOGY

This is a narrative literature review, descriptive and exploratory in nature, aimed at critically analyzing the available scientific evidence regarding the use of corticosteroids in Oral and Maxillofacial Surgery procedures. The preparation of this work followed the methodological principles recommended for narrative reviews, prioritizing a qualitative synthesis of the information, with a focus on the historical

context, the evolution of therapeutic approaches, and an interpretative analysis of existing clinical controversies.

The literature search was conducted between May and June 2025 by two independent reviewers in the electronic databases PubMed/MEDLINE, Scopus, and Embase, which are considered highly relevant for biomedical and dental research. To build the search strategy, controlled descriptors were used according to the MeSH (Medical Subject Headings) and DeCS (Health Sciences Descriptors) vocabularies, including the following terms: Corticosteroids, Anti-Inflammatory Agents, Oral Surgery, Maxillofacial Surgery, Dexamethasone, Methylprednisolone, Postoperative Complications, Pain Management, Edema, Trismus, along with free-text terms such as *"steroid therapy in oral surgery," "corticosteroids and wisdom tooth removal,"* and *"perioperative management in maxillofacial surgery."*

The inclusion criteria encompassed randomized clinical trials, controlled trials, systematic reviews, meta-analyses, clinical practice guidelines, and cohort studies published between January 2000 and May 2025, restricted to publications in English, Portuguese, and Spanish. Studies were included if they specifically addressed the use of corticosteroids within the context of Oral and Maxillofacial Surgery, involving parameters such as clinical efficacy, administration protocols, routes of administration, adverse effects, and pharmacological safety considerations.

Studies were excluded if they did not directly address the proposed topic, presented inadequate methodological design, or were published as letters to the editor, isolated case reports, low-quality narrative reviews, unpublished dissertations or theses, or documents without access to the full text.

The selection process was carried out in two stages: initially through screening of titles and abstracts, followed by full-text reading of articles deemed potentially relevant. During the detailed review, data extracted included information on the types of corticosteroids used, administered doses, routes of administration, timing of application (pre-, intra-, or postoperative), study design, sample population, evaluated outcomes (edema, pain, trismus, adverse events), and the main conclusions reported by the authors.

RESULTS AND DISCUSSION

The analysis of the scientific literature revealed a substantial number of publications over the past two decades addressing the use of corticosteroids in the context of Oral and Maxillofacial Surgery (OMS). The evaluated studies are predominantly focused on three major thematic axes: clinical efficacy in controlling postoperative complications, pharmacological safety, and the variability of administration protocols, including dose, route, and timing of application, as summarized in Table 1.

Table 1 – Methodological characteristics and main findings of studies on the use of corticosteroids in Oral and Maxillofacial Surgery

Year	**Author(s)**	**Short Title**	**Objectives**	**Results**	**Conclusions**
2020	Shoohanizad et al.	Pre- vs postoperative dexamethasone in third molars	Compare pre- vs postoperative dexamethasone in extractions	Pre-op led to less edema and trismus	Preoperative administration preferable for symptom control
2020	Sreesha et al.	Submucosal vs intravenous in third molars	Compare submucosal vs intravenous dexamethasone	Both effective, slight advantage for IV	Choice depends on clinical case and logistics
2021	Erdil et al.	Elastic bandage vs dexamethasone or dexketoprofen	Evaluate bandage, dexamethasone, and dexketoprofen after third molars	All reduced symptoms, dexamethasone superior	Dexamethasone indicated; bandage as adjunct
2024	Praneetha et al.	Dexamethasone vs methylprednisolone via intramasseteric injection	Compare dexamethasone and methylprednisolone intramasseterically	Dexamethasone showed better outcomes	Most effective option in this protocol

2020	Agrawal et al.	Intralesional vs intravenous in third molars	Compare intralesional vs intravenous dexamethasone	Intralesional as effective as intravenous	Both safe and effective; prefer less invasive
2024	Gupta et al.	Safety and efficacy in cesarean sections	Analyze safety and efficacy of steroids in obstetric surgery	Steroids safe and effective in inflammatory prevention	Confirms safety in specific protocols
2021	Lee & Moon	Review on epidural steroids	Review safety of epidural steroids	Low incidence of serious adverse events with careful use	Judicious use maintains good safety profile
2024	Kalita et al.	Dexamethasone in third molars	Test efficacy in reducing edema, trismus, and pain	Significant reduction of symptoms	Dexamethasone standard in third molar surgeries

Source: Data from the present study (2025)

Regarding clinical efficacy, corticosteroids have demonstrated consistent results in reducing postoperative inflammatory parameters, particularly in procedures associated with greater tissue morbidity, such as the removal of impacted third molars, orthognathic surgeries, and interventions for facial fracture repair [14,15,16]. Preoperative administration of a single dose of dexamethasone, ranging from 4 mg to 8 mg via intramuscular or intravenous routes, resulted in a significant reduction in facial edema and limitation of mouth opening in the immediate postoperative period. These findings reinforce the superiority of corticosteroids over placebo for controlling edema and trismus [17,18].

In addition to dexamethasone, other corticosteroids such as betamethasone and methylprednisolone have also been investigated, showing similar clinical efficacy, although with distinct pharmacokinetic profiles. Comparative studies indicate that dexamethasone, due to its higher anti-inflammatory potency and lower

mineralocorticoid activity, remains the drug of choice in most clinical protocols in Oral and Maxillofacial Surgery. However, the choice of corticosteroid should consider individual patient characteristics, the type of surgery, and the most appropriate route of administration [19,20].

Concerning routes of administration, the literature highlights the intramuscular route as the most frequently employed, primarily due to its practicality and rapid systemic absorption. Nevertheless, the intravenous route has gained prominence in larger procedures, such as orthognathic surgeries, for its capacity to provide immediate bioavailability and precise dose control. On the other hand, the oral route has been considered a viable alternative in less complex outpatient procedures, although with slightly lower efficacy compared to parenteral routes [21,22,23].

With respect to timing of administration, data indicate that preoperative administration, performed approximately 30 to 60 minutes before the surgical incision, provides better outcomes in preventing edema and reducing the inflammatory peak [24,25]. The physiological rationale for this approach lies in the need to allow the drug to reach adequate plasma levels before the onset of the tissue inflammatory response. However, fractionated dosing schemes, including additional doses in the immediate postoperative period, have also been described in some protocols, with positive results, albeit with a theoretically higher risk of side effects [26].

From the perspective of pharmacological safety, the analysis of studies revealed that the use of corticosteroids in single doses and for short durations is associated with a favorable safety profile, with a low incidence of significant adverse events [27]. Among the most commonly reported reactions are episodes of transient hyperglycemia, especially in patients with a history of diabetes mellitus, and slight increases in blood pressure. More severe events, such as opportunistic infections, suppression of the hypothalamic-pituitary-adrenal axis, and scarring alterations, were rarely reported, generally linked to prolonged therapeutic regimens or high cumulative doses [28,29].

Nevertheless, the literature emphasizes the need for caution when prescribing corticosteroids to patients with specific clinical conditions, including immunosuppression, a history of peptic ulcer, uncontrolled systemic hypertension, renal insufficiency, and unregulated endocrine diseases. Thus, individualized risk-benefit assessment remains a fundamental principle in therapeutic decision-making [30,31,32].

Another relevant aspect identified in the analyzed studies is the absence of a universal consensus on the ideal administration protocol. The diversity of doses, routes, and timing of administration reported in publications demonstrates a lack of standardization in clinical practices. This heterogeneity stands out as one of the main obstacles to the development of clinical guidelines based on high-quality evidence. Despite this, some recommendations can be outlined from the current literature: for most medium-complexity surgeries, the administration of 4 to 8 mg of dexamethasone intramuscularly, one hour before the procedure, has shown consistent efficacy with low rates of complications [33].

Finally, it is noteworthy that the methodological gaps still present in the available studies, including the small sample sizes of many trials, the lack of adequate blinding, and the absence of long-term assessments, limit the generalizability of the findings. The conduction of new randomized, multicenter clinical trials with greater methodological rigor is essential for building a robust scientific consensus to support the development of standardized clinical protocols. Overall, critical analysis of the literature indicates that when administered judiciously, corticosteroids represent an effective and safe therapeutic resource for controlling inflammatory complications in Oral and Maxillofacial Surgery, offering significant clinical benefits and contributing to improved postoperative patient experience.

CONCLUSION

The use of corticosteroids in Oral and Maxillofacial Surgery, when guided by appropriate protocols and careful clinical assessment, proves to be an effective strategy for controlling inflammatory complications such as postoperative edema, pain, and trismus. Although dexamethasone remains the most extensively studied and utilized drug, gaps still exist regarding the optimal protocol in terms of dosage, route, and timing of administration. Thus, individualization of therapy and strict adherence to contraindications remain essential to maximize benefits and minimize the risks associated with the use of these agents.

REFERENCES

1- Sugragan C, Sirintawat N, Kiattavornchareon S, Khoo LK, Kc K, Wongsirichat N. Do corticosteroids reduce postoperative pain following third molar intervention? J Dent Anesth Pain Med. 2020 Oct;20(5):281-291.

2- Milic T, Raidoo P, Gebauer D. Antibiotic prophylaxis in oral and maxillofacial surgery: a systematic review. Br J Oral Maxillofac Surg. 2021 Jul;59(6):633-642.

3- Dammling C, Abramowicz S, Kinard B. Current Concepts in Prophylactic Antibiotics in Oral and Maxillofacial Surgery. Oral Maxillofac Surg Clin North Am. 2022 Feb;34(1):157-167.

4- Farooqui AA, Farooqui T. Phospholipids, Sphingolipids, and Cholesterol-Derived Lipid Mediators and Their Role in Neurological Disorders. Int J Mol Sci. 2024 Oct 3;25(19):10672.

5- Ripon MAR, Bhowmik DR, Amin MT, Hossain MS. Role of arachidonic cascade in COVID-19 infection: A review. Prostaglandins Other Lipid Mediat. 2021 Jun;154:106539.

6- Vasquez AM, Mouchlis VD, Dennis EA. Review of four major distinct types of human phospholipase A2. Adv Biol Regul. 2018 Jan;67:212-218.

7- Shoohanizad E, Parvin M. Comparison of the Effects of Dexamethasone Administration on Postoperative Sequelae Before and After "Third Molar" Extraction Surgeries. Endocr Metab Immune Disord Drug Targets. 2020;20(3):356-364.

8- Sreesha S, Ummar M, Sooraj S, Aslam S, Roshni A, Jabir K. Postoperative pain, edema and trismus following third molar surgery - A comparitive study between submucosal and intravenous dexamethasone. J Family Med Prim Care. 2020 May 31;9(5):2454-2459.

9- Erdil A, Akbulut N, Altan A, Demirsoy MS. Comparison of the effect of therapeutic elastic bandage, submucosal dexamethasone, or dexketoprofen trometamol on inflammatory symptoms and quality of life following third molar surgery: a randomized clinical trial. Clin Oral Investig. 2021 Apr;25(4):1849-1857.

10- Haan BJ, Blackmon SN, Cobb AM, Cohen HE, DeVier MT, Perez MM, Winslow SF. Corticosteroids in critically ill patients: A narrative review. Pharmacotherapy. 2024 Jul;44(7):581-602.

11- Polderman JA, Farhang-Razi V, Van Dieren S, Kranke P, DeVries JH, Hollmann MW, Preckel B, Hermanides J. Adverse side effects of dexamethasone in surgical patients. Cochrane Database Syst Rev. 2018 Aug 28;8(8):CD011940.

12- Praneetha S, Shenoy V, Christopher P, Gopi G, Manonmani B. Pre-emptive Single Dose of Intramasseteric Administration of Dexamethasone Versus Methylprednisolone

in Surgical Extraction of Impacted Mandibular Third Molars: Prospective Split-Mouth, Randomised Triple Blinded Clinical Study. J Maxillofac Oral Surg. 2024 Apr;23(2):424-429.

13- Karłowicz-Bodalska K, Sauer N, Jonderko L, Wiela-Hojeńska A. Over the Counter Pain Medications Used by Adults: A Need for Pharmacist Intervention. Int J Environ Res Public Health. 2023 Mar 3;20(5):4505.

14- Kalita S, Goyal R, Kumar H, Yadav D, Talreja L, Jaiswal P. Efficacy of Dexamethasone in Reducing Postoperative Symptoms of the Surgical Extraction of Impacted Third Molars. Cureus. 2024 Oct 21;16(10):e72035.

15- Naik VG, Shankar MNR, Agarwal R, Rai KK, Karande A, Humne A. Submucosal Infiltration versus Intravenous Administration of Dexamethasone in Decreasing Post-operative Inflammatory Sequelae after Third Molar Surgery - A Comparative Study. Ann Maxillofac Surg. 2024 Jul-Dec;14(2):141-146.

16- Sreesha S, Ummar M, Sooraj S, Aslam S, Roshni A, Jabir K. Postoperative pain, edema and trismus following third molar surgery - A comparitive study between submucosal and intravenous dexamethasone. J Family Med Prim Care. 2020 May 31;9(5):2454-2459.

17- Praneetha S, Shenoy V, Christopher P, Gopi G, Manonmani B. Pre-emptive Single Dose of Intramasseteric Administration of Dexamethasone Versus Methylprednisolone in Surgical Extraction of Impacted Mandibular Third Molars: Prospective Split-Mouth, Randomised Triple Blinded Clinical Study. J Maxillofac Oral Surg. 2024 Apr;23(2):424-429.

18- Agrawal A, Chandel S, Singh N, Tiwari AK, Singh AK, Singh G. The efficacy of intralesional dexamethasone versus intravenous dexamethasone in surgery for impacted third molars: A randomized controlled trial. Natl J Maxillofac Surg. 2020 Jan-Jun;11(1):94-97

19- Canellas JVDS, Ritto FG, Tiwana P. Comparative efficacy and safety of different corticosteroids to reduce inflammatory complications after mandibular third molar surgery: a systematic review and network meta-analysis. Br J Oral Maxillofac Surg. 2022 Oct;60(8):1035-1043.

20- Gupta N, Yaliwal RG, Mudanur S, Kori S. Comparative Study of the Safety and Efficacy of Intramuscular Dexamethasone, Betamethasone Phosphate, and Standard Management Protocol in Early-Term Scheduled Caesarean Delivery. Cureus. 2024 Sep 19;16(9):e69720.

21- Fairbairn L, Schuberth A, Deacon L, Gilkes H, Montgomery V, Bennett MI, Mulvey MR. A systematic review of subcutaneous versus intramuscular or intravenous routes of opioid administration on pain outcomes in cancer and post-surgical clinical populations

- challenging current assumptions in palliative care practice. Br J Pain. 2023 Apr;17(2):152-165.

22- Ning ZH, Long S, Zhou YY, Peng ZY, Sun YN, Chen SW, Su LM, Zhao YH. Effect of exposure routes on the relationships of lethal toxicity to rats from oral, intravenous, intraperitoneal and intramuscular routes. Regul Toxicol Pharmacol. 2015 Nov;73(2):613-9.

23- Le T, Aguilar B, Mangal JL, Acharya AP. Oral drug delivery for immunoengineering. Bioeng Transl Med. 2021 Aug 10;7(1):e10243.

24- Mohamed SA, Abdel-Ghaffar HS, Hassan NA, El Sherif FA, Shouman SA, Omran MM, Hassan SB, Allam AAAE, Sayed DG. Pharmacokinetics and Pharmacodynamics of 3 Doses of Oral-Mucosal Dexmedetomidine Gel for Sedative Premedication in Women Undergoing Modified Radical Mastectomy for Breast Cancer. Anesth Analg. 2021 Feb 1;132(2):456-464.

25- Canseco JA, Karamian BA, DiMaria SL, Patel PD, Donnally CJ 3rd, Plusch K, Singh A, Nachwalter R, Lee JK, Kurd MF, Anderson DG, Rihn JA, Hilibrand AS, Kepler CK, Vaccaro AR, Schroeder GD. Timing of Preoperative Surgical Antibiotic Prophylaxis After Primary One-Level to Three-Level Lumbar Fusion. World Neurosurg. 2021 Sep;153:e349-e358.

26- Movahed MR. The Movahed protocol and algorithm for preventing intubation in patients with acute or sympathetic crashing acute pulmonary edema (SCAPE) without cardiogenic shock by repeated administration of buccal nitroglycerin ointments. Am J Cardiovasc Dis. 2024 Dec 15;14(6):368-374.

27- Lee MS, Moon HS. Safety of epidural steroids: a review. Anesth Pain Med (Seoul). 2021 Jan;16(1):16-27.

28- Bensch GW. Safety of intranasal corticosteroids. Ann Allergy Asthma Immunol. 2016 Dec;117(6):601-605.

29- Zöllner EW. Asthma treatment in children: A guide to screening for and management of hypothalamic-pituitary-adrenal axis suppression. S Afr Med J. 2019 Apr 29;109(5):306-309.

30- Rice JB, White AG, Scarpati LM, Wan G, Nelson WW. Long-term Systemic Corticosteroid Exposure: A Systematic Literature Review. Clin Ther. 2017 Nov;39(11):2216-2229.

31- Yu SH, Drucker AM, Lebwohl M, Silverberg JI. A systematic review of the safety and efficacy of systemic corticosteroids in atopic dermatitis. J Am Acad Dermatol. 2018 Apr;78(4):733-740.e11.

32- Lax SJ, Harvey J, Axon E, Howells L, Santer M, Ridd MJ, Lawton S, Langan S, Roberts A, Ahmed A, Muller I, Ming LC, Panda S, Chernyshov P, Carter B, Williams HC, Thomas

KS, Chalmers JR. Estratégias para o uso de corticosteroides tópicos em crianças e adultos com eczema. Cochrane Database Syst Rev. 11 de março de 2022;3(3):CD013356.

33- Kalita S, Goyal R, Kumar H, Yadav D, Talreja L, Jaiswal P. Efficacy of Dexamethasone in Reducing Postoperative Symptoms of the Surgical Extraction of Impacted Third Molars. Cureus. 2024 Oct 21;16(10):e72035.