



REVIEW ARTICLE

CORTICOSTEROIDS IN IMPACTED MANDIBULAR THIRD MOLAR SURGERY: A NARRATIVE REVIEW

Saiid Elshafey Mohamed Beshir^{1*}

¹ Department of Maxillofacial Surgery and Diagnostic Sciences college of dentistry Jazan University.Saudi Arabia.

*Corresponding Author: Saiid Elshafey Mohamed Beshir Department of Maxillofacial Surgery and Diagnostic Sciences college of dentistry Jazan University.Saudi Arabia. email: sabeshir@jazanu.edu.sa

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ABSTRACT

Aim:To systematically evaluate the clinical efficacy, optimal dosage, route, timing, and safety of corticosteroid administration in managing postoperative complications—pain, swelling, and trismus—following impacted mandibular third molar surgery.

Materials and Methods:PubMed, Scopus, Web of Science, and Google Scholar were searched using a pre-specified search strategy. Clinical studies, reviews, systematic reviews, case reports, and case series were included for data synthesis.Search keywords terms included: Corticosteroids, Mandibular Third Molar, Impacted Tooth, Dental Surgery, Postoperative Complications, Swelling, Pain Management, Trismus, Anti-inflammatory Drugs.

Results:A total of **315** titles were screened rigorously by two independent evaluators. After duplicate exclusion and removal of irrelevant titles, 87 articles were included for full-text analysis, out of which **35** qualified for final data synthesis.

Conclusion:Corticosteroids especially dexamethasone demonstrate significant effectiveness in reducing postoperative complications when administered via intravenous, intramuscular, or submucosal routes either preoperatively or intraoperatively. While oral administration is preferred by patients for its convenience, its efficacy is comparatively lower. Standardized clinical protocols and individualized patient assessment are essential to maximize therapeutic outcomes while minimizing potential adverse effects.

Keywords: Corticosteroids, Mandibular Third Molar, Impacted Tooth, Dental Surgery, Postoperative Complications, Swelling, Pain Management, Trismus, Anti-inflammatory Drugs

INTRODUCTION

The extraction of impacted mandibular third molars stands as a frequent procedure within oral and maxillofacial surgery while leading to major postoperative complications involving pain together with facial swelling and trismus.¹⁻⁴ The complications create adverse effects which harm patient life quality while extending recovery time and creating a continuous clinical problem.^{3,4} The exact severity of postoperative complications depends on surgical trauma extent while also considering how patients handle surgery and the selected techniques.⁵ Different pharmaceutical interventions such as analgesics alongside anti-inflammatory drugs and antibiotics and corticosteroids are used to manage the complications after surgery.⁶ The administration of corticosteroids continues to gain traction in medical practice because these medications provide strong

anti-inflammatory effects that control surgical trauma-induced inflammatory responses.^{7,8} Corticosteroids block the activity of phospholipase A2 enzyme to halt arachidonic acid synthesis which leads to decreased prostaglandin and leukotriene production for inhibition of inflammatory response signs like swelling and pain.^{9,10} Widespread acceptance of corticosteroids for third molar surgery has led to inconsistent clinical findings because researchers use diverse methods of drug delivery (oral, intravenous, intramuscular, submucosal) with different dosage schedules and timing protocols and corticosteroid types.^{11,12} The evaluation of present evidence needs to be extensive so healthcare professionals can identify the best practices for corticosteroid management in mandibular third molar procedures to achieve uniform treatment benefits and reduce side effects. The oral and maxillofacial surgery field has provided comprehensive research on four corticosteroids:

dexamethasone, methylprednisolone, betamethasone, and prednisone because of their effective treatment and beneficial safety characteristics.¹³ Medical practitioners use dexamethasone as their primary corticosteroid because it exhibits strong anti-inflammatory properties with an extended half-life and weak mineralocorticoid activity along with multiple administration options.¹⁴ Dexamethasone demonstrates proven effectiveness to decrease both postoperative edema and pain when given before or during surgery which makes it a preferred treatment method in third molar procedures.^{8,15}

Research continues to challenge the best practices for corticosteroid usage and when to administer them despite their broad established beneficial properties. Clinical efficacy of corticosteroids before surgery receives support from various studies but researchers disagree about the proper timing and appropriate dosing route.¹⁶ Dexamethasone utilized as a single pre-surgical dose demonstrates superior effectiveness for reducing postoperative complications than administering it after surgical procedures have begun.¹² Studies have shown similar outcomes for corticosteroid benefit when administered before operation and right after operation thus requiring established treatment guidelines founded on sound clinical proof.¹⁷

Patients receiving corticosteroids need close monitoring due to possible adverse effects which include delayed wound healing and higher infection risk and blood sugar changes in addition to digestive problems.¹⁸ The administration of short-term corticosteroids during third molar surgery has proven to be safe according to studies even though other researchers have certain reservations.¹⁹ Healthcare professionals should weigh advantages against dangers while providing personalized care to their patients through proper consent protocols and proven clinical practices.²⁰

The objective of this review is to systematically evaluate published studies regarding clinical outcomes of corticosteroid utilization and technical protocols along with dosage schedules and timing protocols and side effects in surgeries involving impacted mandibular third molars with evidence-based practices for medical practitioners.

MATERIAL AND METHODS

PubMed, Scopus, Web of Science, and Google Scholar were searched using a pre-specified search strategy. Clinical studies, reviews, systematic reviews, case reports, and case series were included for data synthesis.

The review was conducted according to the PRISMA guidelines (PRISMA flow chart is presented in figure1.)

A total of 315 titles were screened rigorously by two independent evaluators. After duplicate exclusion and removal of irrelevant titles, 87 articles were included for full-text analysis, out of which 35 qualified for final data synthesis.

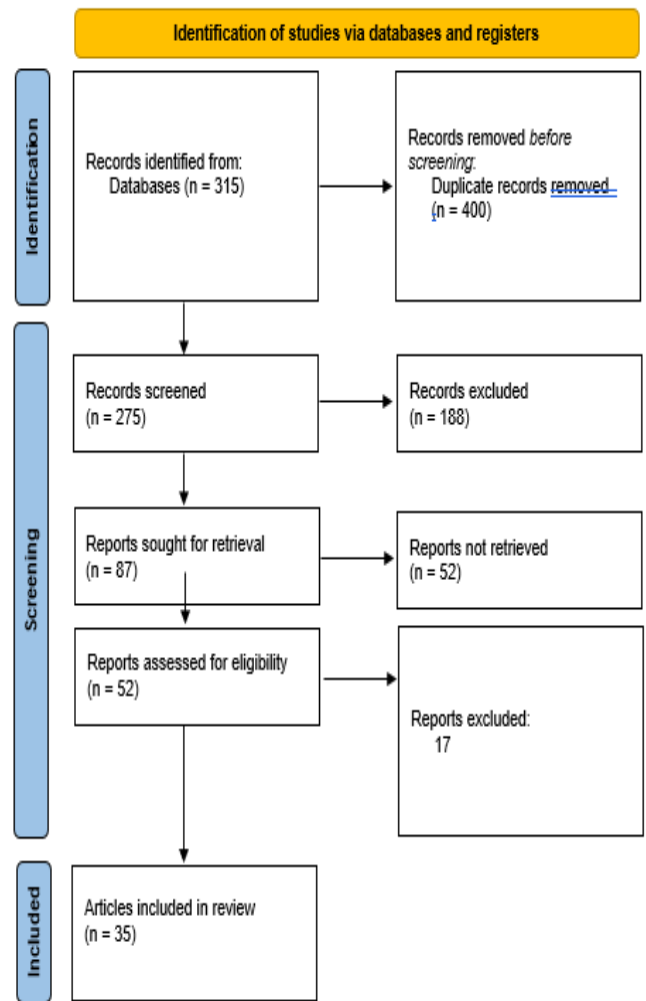


Figure 1. PRISMA flow chart

Patients who get surgical removal of buried mandibular third molars typically experience pain alongside swelling and trismus which strongly impacts their daily life quality. Intra-nasal corticosteroids have gained recognition as an effective treatment solution because they provide strong anti-inflammatory effects. A critical analysis evaluates the clinical impact and recommended dosages and administration routes for corticosteroids being used throughout impacted mandibular third molar surgery. The review also examines the timing of administration and safety considerations of these medications. Strong scientific findings from the analyzed research demonstrate that corticosteroids effectively decrease the complications following surgical procedures. Standardized clinical guidelines together with individual patient management approaches are necessary due to the existing protocol variations.

Mandibular third molar extractions when impacted function as one of the most common procedures in oral surgery and generate complications like pain alongside facial swelling and trismus which degrade recovery after surgery.^{1,2} The postoperative complications impact patient quality of life strongly so various medications have been introduced to reduce these complications.³ The clinical applications of corticosteroids became widespread because these medications demonstrate both strong anti-inflammatory effects and immunosuppressive actions.^{4,5} The pharmacological effects entail a reduction of phospholipase A2 activity together with the subsequently lower levels of pain-causing prostaglandins and leukotrienes.⁶

Research has demonstrated corticosteroids' effectiveness but differences exist in the selection of optimal corticosteroid as well as dosage and administration route and timing.⁷

This examination evaluates existing studies about corticosteroids and recommends suitable protocols to reduce postoperative effects of impacted mandibular third molar surgery.

Clinical Efficacy of Corticosteroids

Clinical studies have extensively evaluated the oral surgery performance of dexamethasone together with methylprednisolone betamethasone and prednisone.⁸ Current research supports dexamethasone as the most effective corticosteroid since it achieves strong anti-inflammatory reactions and demonstrated a longer biological half-life while having low mineralocorticoid potential along with simple administration via different delivery routes.⁹ Dexamethasone reduces all three postoperative side effects including swelling and pain and trismus than placebo.¹⁰ Dexamethasone provided superior results for treating postoperative inflammation over hydrocortisone and methylprednisolone.¹¹

Routes of Administration

Administration of corticosteroids can occur through different routes such as oral, intravenous, intramuscular as well as submucosal delivery with their own unique advantages and drawbacks.¹² Postoperative symptom management improves through IV and IM drug administration which ensures quick systemic absorption along with enhanced bioavailability.¹³ Since oral corticosteroids undergo first-pass metabolism this makes their potency weaker but they remain advantageous because their administration is easy and patients have better compliance while avoiding injection complications.¹⁴ Submucosal injections deliver their anti-inflammatory drugs directly to the local area where they reduce edema and trismus while causing low systemic absorption.¹⁵ The route selection depends on surgical complexity together with patient-specific needs and

requires clinical expertise.¹⁶

Timing and Dosage

Postoperative results depend heavily on the method when corticosteroids are given in addition to how much is administered. Preoperative corticosteroid administration demonstrates better effectiveness than postoperative treatment because it stops inflammatory mediators before surgery.¹⁷ Dexamethasone become more effective for controlling pain and swelling before surgery instead of after surgery.¹⁸ Postoperative administration of drugs at the moment of surgery leads to equal clinical advantages as reported by previous studies.¹⁹ Recent studies have revealed that dexamethasone doses between 4 to 8 mg effectively treat patients with minimal side effects thus making them optimal for routine clinical use.²⁰

Safety and Adverse Effects

Although corticosteroids show good safety when used temporarily certain side effects such as delayed wound healing and elevated infection risk and gastrointestinal symptoms and brief hyperglycemia require attention.²¹ Properly administered short-term corticosteroid treatment in third molar surgery produces minimal severe side effects.²² Medical practitioners need to thoroughly review both the patient's medical records and their systemic health alongside evaluating treatment potential risks prior to giving corticosteroid prescriptions.²³ Healthcare providers must practice patient-specific care through consent procedures and continuous postoperative checks to protect patients from complications.²⁴

Patient Selection and Contraindications

A proper selection of patients becomes priorities for corticosteroid treatment in mandibular third molar surgery. Medical professionals need to evaluate each patient's health background due to corticosteroid effects on conditions such as diabetes mellitus, hypertension, peptic ulcers, immunosuppression and known allergies.²⁵ Diabetic patients treated with short-term corticosteroids experience temporary hyperglycemia therefore patients must receive detailed monitoring and diabetic management needs adjustment.²⁶ Medically vulnerable people with active infections or compromised immune systems should receive corticosteroids carefully because their use could worsen infection risks while delaying healing processes.²⁷

Combination with Other Pharmacological Agents

Research indicates that the simultaneous use of corticosteroids with NSAIDs and analgesics improves control of symptoms after third molar extractions.²⁸ When NSAIDs are combined with corticosteroids the drugs amplify their pain-reducing effects alongside their anti-inflammatory action to boost postoperative comfort and life quality.²⁹ Medical providers must consider both advantages and enhanced gastrointestinal risk factors and bleeding susceptibility before prescribing these medication combinations to patients with gastric or bleeding conditions.³⁰

Impact on Quality of Life and Patient Satisfaction

Patient Quality of Life together with Satisfaction Rates receive direct effects from surgical care.

Patient satisfaction together with adherence levels directly depend on postoperative outcomes which determine the overall quality of life. Research studies have proved that patients who receive corticosteroids show better reported outcomes because these drugs minimize pain alongside swelling and functional limitation which allows patients to resume their regular activities faster.^{31,32} Research indicates that better postoperative comfort leads to increased patient satisfaction together with higher acceptance of surgical treatment thus showing strong clinical and psychological significance of quality postoperative care.³³

Limitations of Current Evidence and Recommendations for Research

A substantial amount of research establishes corticosteroid effectiveness during third molar surgeries but great differences between research methods and corticosteroid dosing and administration routes and outcome measures prevent broad generalization of study findings.³⁴ Additional well-designed randomized controlled trials together with established outcome criteria and complete safety checks will help advance clinical guidelines. Research on individualized treatment methods should connect specific therapeutic protocols to patient risk factors and surgical intricacy to achieve maximum therapeutic results and safety standards.³⁵ (Table 1).

Table 1. Summary of the papers included

S.No	First Author	Year	Key Findings
1	Singh	2023	Preemptive dexamethasone better than methylprednisolone
2	Priyanga	2022	Sublingual dexamethasone effective for swelling and trismus
3	Alcântara	2014	Preemptive corticosteroids reduce pain and swelling
4	Martins-de-Barros	2021	Dexamethasone superior to ketorolac
5	Zandi	2008	Steroids more effective than rubber drains
6	Firoozi	2022	Kinesio taping can reduce sequelae
7	Nehme	2021	Piezosurgery + IM dexamethasone lowers pain
8	Parhizkar	2022	Corticosteroids improve patient outcomes
9	Costa	2023	Blood concentrates affect inflammation signs
10	Laureano Filho	2008	Higher dose dexamethasone reduces edema
11	Lima	2017	Oral dexamethasone better than diclofenac
12	Chen	2017	Submucosal dexamethasone reduces discomfort
13	Gholami	2021	IM methylprednisolone relieves swelling, pain
14	O'Hare	2019	Submucosal dexamethasone shows efficacy
15	Shoohanizad	2020	Pre-op dexamethasone more effective than post-op
16	Lacerda-Santos	2023	Photobiomodulation reduces trismus and edema
17	Ngeow	2016	Corticosteroids remain useful in third molar surgery
18	Feslihan	2019	Photobiomodulation may replace steroids
19	Mijailovic	2023	Dexamethasone better than etoricoxib
20	Gonçalves	2022	Tramadol injection shows limited benefit
22	Koray	2014	HA spray can improve symptoms post-surgery

23	Lima TC	2018	Dexamethasone+NSAID+codeine effective
24	Barbalho	2017	Dexamethasone+nimesulide improves comfort
25	Almadhoon	2022	Route and dose influence dexamethasone outcome
26	Almeida	2019	Steroids superior to placebo
27	La Rosa	2024	Etoricoxib effective both pre/post-op
28	Antunes	2011	IV vs IM dexamethasone efficacy similar
29	Falci	2017	Preemptive dexamethasone reduces sequelae
30	Chugh	2018	Submucosal vs IM corticosteroids effective
31	De Marco	2021	Flap design influences pain/swelling
32	Caymaz	2019	PRF variants improve healing outcomes
33	Azab	2022	Secondary closure reduces complications
34	Brignardello	2012	Adjuvant laser therapy moderately effective
35	UStün	2003	Methylprednisolone dosage impacts results

Future Directions

The future of research needs to develop standardized procedures for prescribing corticosteroids during impacted mandibular third molar surgeries including steroid selection and dosing amounts along with administration methods and application times. To validate current evidence researchers need to execute new large-scale randomized controlled trials together with additional meta-analyses that generate specific treatment recommendations.

CONCLUSION

A successful application of corticosteroids minimizes adverse effects which occur after impacted mandibular third molar surgery. Professional recommendations favor dexamethasone as the most appropriate corticosteroid because of its effectiveness and safety parameters but specific optimization of dosage schedule combined with delivery method is essential. Following standardized guidelines alongside improved patient selection process along with evidence-based protocols delivery will result in better therapeutic outcomes and patient satisfaction.

DECLARATIONS

The author declares no conflicts of interest and confirms that this review is based on previously published studies and does not involve any new studies with human participants or animals performed by the author.

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None

REFERENCES

1. Singh A, Pentapati KC, Kodali MVRM, Smriti K, Patil V, Chowdhary GL, et al. Efficacy of Preemptive Dexamethasone versus Methylprednisolone in the Management of Postoperative Discomfort and Pain after Mandibular Third Molar Surgery: A Systematic Review and Meta-Analysis. *ScientificWorldJournal*. 2023;2023:7412026.
2. Priyanga R, Balamurugan R, Rajan PS. Comparison of dexamethasone administration through sublingual and intramuscular routes for evaluation of pain, swelling, and trismus after impacted mandibular third molar surgery—a prospective randomized controlled study. *Oral Maxillofac Surg*. 2022;26(1):155-9.
3. Alcântara CE, Falci SG, Oliveira-Ferreira F, Santos CR, Pinheiro ML. Pre-emptive effect of dexamethasone and methylprednisolone on pain, swelling, and trismus after third molar surgery: a split-mouth randomized triple-blind clinical trial. *Int J Oral Maxillofac Surg*. 2014;43(1):93-8.
4. Martins-de-Barros AV, Barros AM, Siqueira AK, Lucena EE, Sette de Souza PH, Araújo FA. Is Dexamethasone superior to Ketorolac in reducing pain, swelling and trismus following mandibular third molar removal? A split mouth triple-blind

- randomized clinical trial. *Med Oral Patol Oral Cir Bucal*. 2021;26(2):e141-50.
5. Zandi M. Comparison of corticosteroids and rubber drain for reduction of sequelae after third molar surgery. *Oral Maxillofac Surg*. 2008;12(1):29-33.
 6. Firoozi P, Souza MRF, de Souza GM, Fernandes IA, Galvão EL, Falci SGM. Does kinesio taping reduce pain, swelling, and trismus after mandibular third molar surgery? A systematic review and meta-analysis. *Oral Maxillofac Surg*. 2022;26(4):535-53.
 7. Nehme W, Fares Y, Abou-Abbas L. Piezo-surgery technique and intramuscular dexamethasone injection to reduce postoperative pain after impacted mandibular third molar surgery: a randomized clinical trial. *BMC Oral Health*. 2021;21(1):393.
 8. Parhizkar P, Schmidlin PR, Bornstein MM, Fakheran O. Can adjunctive corticosteroid therapy improve patient-centered outcomes following third molar surgery? A systematic review. *Med Oral Patol Oral Cir Bucal*. 2022;27(5):e410-8.
 9. Costa MDMA, Paranhos LR, de Almeida VL, Oliveira LM, Vieira WA, Dechichi P. Do blood concentrates influence inflammatory signs and symptoms after mandibular third molar surgery? A systematic review and network meta-analysis of randomized clinical trials. *Clin Oral Investig*. 2023;27(12):7045-78.
 10. Laureano Filho JR, Maurette PE, Allais M, Cotinho M, Fernandes C. Clinical comparative study of the effectiveness of two dosages of Dexamethasone to control postoperative swelling, trismus and pain after the surgical extraction of mandibular impacted third molars. *Med Oral Patol Oral Cir Bucal*. 2008;13(2):E129-32.
 11. Lima CAA, Favarini VT, Torres AM, da Silva RA, Sato FRL. Oral dexamethasone decreases postoperative pain, swelling, and trismus more than diclofenac following third molar removal: a randomized controlled clinical trial. *Oral Maxillofac Surg*. 2017;21(3):321-6.
 12. Chen Q, Chen J, Hu B, Feng G, Song J. Submucosal injection of dexamethasone reduces postoperative discomfort after third-molar extraction: A systematic review and meta-analysis. *J Am Dent Assoc*. 2017;148(2):81-91.
 13. Gholami M, Anbiaee N, Bakhshi Moqaddam Firouz Abad S, Asadi M. What Are the Effects of Methylprednisolone Injection Into the Masseter and Gluteal Muscle on Pain, Edema and Trismus After Impacted Lower Third Molar Surgery? A Randomized Clinical Trial. *J Oral Maxillofac Surg*. 2021;79(9):1829-36.
 14. O'Hare PE, Wilson BJ, Loga MG, Ariyawardana A. Effect of submucosal dexamethasone injections in the prevention of postoperative pain, trismus, and oedema associated with mandibular third molar surgery: a systematic review and meta-analysis. *Int J Oral Maxillofac Surg*. 2019;48(11):1456-69.
 15. 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):356-64.
 16. Lacerda-Santos JT, Granja GL, Firmino RT, Dias RF, de Melo DP, Granville-Garcia AF, et al. Use of Photobiomodulation to Reduce Postoperative Pain, Edema, and Trismus After Third Molar Surgery: A Systematic Review and Meta-Analysis. *J Oral Maxillofac Surg*. 2023;81(9):1135-45.
 17. Ngeow WC, Lim D. Do Corticosteroids Still Have a Role in the Management of Third Molar Surgery? *Adv Ther*. 2016;33(7):1105-39.
 18. Feslihan E, Eroğlu CN. Can Photobiomodulation Therapy Be an Alternative to Methylprednisolone in Reducing Pain, Swelling, and Trismus After Removal of Impacted Third Molars? *Photobiomodul Photomed Laser Surg*. 2019;37(11):700-5.
 19. Mijailovic I, Janjic B, Milicic B, Todorovic A, Ilic B, Misic T, et al. Comparison of preemptive etoricoxib and dexamethasone in third molar surgery - a randomized controlled clinical trial of patient-reported and clinical outcomes. *Clin Oral Investig*. 2023;27(9):5263-73.
 20. Gonçalves KK, Santos MS, Barbirato DD, Silva CC, Barros AV, Araújo ES, et al. Is the injection of tramadol effective at control of pain after impacted mandibular third molar extractions? A systematic review and meta-analysis. *Med Oral Patol Oral Cir Bucal*. 2022;27(6):e560-8.
 21. Lim D, Ngeow WC. A Comparative Study on the Efficacy of Submucosal Injection of Dexamethasone Versus Methylprednisolone in Reducing Postoperative Sequelae After Third

- Molar Surgery. *J Oral Maxillofac Surg.* 2017;75(11):2278-86.
22. Koray M, Ofluoglu D, Onal EA, Ozgul M, Ersev H, Yaltirik M, et al. Efficacy of hyaluronic acid spray on swelling, pain, and trismus after surgical extraction of impacted mandibular third molars. *Int J Oral Maxillofac Surg.* 2014;43(11):1399-403.
 23. Lima TC, Bagordakis E, Falci SGM, Dos Santos CRR, Pinheiro MLP. Pre-Emptive Effect of Dexamethasone and Diclofenac Sodium Associated With Codeine on Pain, Swelling, and Trismus After Third Molar Surgery: A Split-Mouth, Randomized, Triple-Blind, Controlled Clinical Trial. *J Oral Maxillofac Surg.* 2018;76(1):60-6.
 24. Barbalho JC, Vasconcellos RJ, de Moraes HH, Santos LA, Almeida RA, Rêbello HL, et al. Effects of co-administered dexamethasone and nimesulide on pain, swelling, and trismus following third molar surgery: a randomized, triple-blind, controlled clinical trial. *Int J Oral Maxillofac Surg.* 2017;46(2):236-42.
 25. Almadhoon HW, Hamdallah A, Abu Eida M, Al-Kafarna M, Atallah DA, AbuIriban RW, et al. Efficacy of different dexamethasone routes and doses in reducing the postoperative sequelae of impacted mandibular third-molar extraction: A network meta-analysis of randomized clinical trials. *J Am Dent Assoc.* 2022;153(12):1154-1170.e60.
 26. Almeida RAC, Lemos CAA, de Moraes SLD, Pellizzer EP, Vasconcelos BC. Efficacy of corticosteroids versus placebo in impacted third molar surgery: systematic review and meta-analysis of randomized controlled trials. *Int J Oral Maxillofac Surg.* 2019;48(1):118-31.
 27. La Rosa GRM, Consoli M, Abiad RS, Toscano A, Pedullà E. Comparing pre- and postoperative etoricoxib administration versus only postoperative on third molar extraction sequelae and oral health quality of life: a prospective quasi-experimental study. *Clin Oral Investig.* 2024;28(4):218.
 28. Antunes AA, Avelar RL, Martins Neto EC, Frota R, Dias E. Effect of two routes of administration of dexamethasone on pain, edema, and trismus in impacted lower third molar surgery. *Oral Maxillofac Surg.* 2011;15(4):217-23.
 29. Falci SGM, Lima TC, Martins CC, Santos CRRD, Pinheiro MLP. Preemptive Effect of Dexamethasone in Third-Molar Surgery: A Meta-Analysis. *Anesth Prog.* 2017;64(3):136-43.
 30. Chugh A, Singh S, Mittal Y, Chugh V. Submucosal injection of dexamethasone and methylprednisolone for the control of postoperative sequelae after third molar surgery: randomized controlled trial. *Int J Oral Maxillofac Surg.* 2018;47(2):228-33.
 31. De Marco G, Lanza A, Cristache CM, Capcha EB, Espinoza KI, Rullo R, et al. The influence of flap design on patients' experiencing pain, swelling, and trismus after mandibular third molar surgery: a scoping systematic review. *J Appl Oral Sci.* 2021;29:e20200932.
 32. Caymaz MG, Uyanik LO. Comparison of the effect of advanced platelet-rich fibrin and leukocyte- and platelet-rich fibrin on outcomes after removal of impacted mandibular third molar: A randomized split-mouth study. *Niger J Clin Pract.* 2019;22(4):546-52.
 33. Azab M, Ibrahim S, Li A, Khosravirad A, Carrasco-Labra A, Zeng L, et al. Efficacy of secondary vs primary closure techniques for the prevention of postoperative complications after impacted mandibular third molar extractions: A systematic review update and meta-analysis. *J Am Dent Assoc.* 2022;153(10):943-956.e48.
 34. Brignardello-Petersen R, Carrasco-Labra A, Araya I, Yanine N, Beyene J, Shah PS. Is adjuvant laser therapy effective for preventing pain, swelling, and trismus after surgical removal of impacted mandibular third molars? A systematic review and meta-analysis. *J Oral Maxillofac Surg.* 2012;70(8):1789-801.
 35. UStün Y, Erdogan O, Esen E, Karsli ED. Comparison of the effects of 2 doses of methylprednisolone on pain, swelling, and trismus after third molar surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2003;96(5):535-9.