

# Role of Steriodal Anti-Inflammatory Drug in Management of Post -Operative Sequae after Third Molar Surgery – A Review

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**Abstract:-** Surgical removal of wisdom tooth is a commonly performed oral invasive procedure worldwide. Though being a minor surgical procedure, frequently accompanying common post operative sequelae of trismus, swelling and pain affecting quality of life and day to day work. Various approaches both non-pharmacological or pharmacological are available to combat such post operative sequelae. Corticosteroids example dexamethasone, betamethasone, and methylprednisolone are on such pharmacological technique used to treat such complication due to their prolonged extent of action and potent anti-inflammatory effects. Dexamethasone has been extensively studied in third molar surgery, with research demonstrating its ability to reduce postoperative complications when administered pre-operatively.

**Keywords:-** Third Molar Surgery, Corticosteroids , Dexamethasone ,Post-Operative Sequae.

## I. INTRODUCTION

Despite its frequency, third molar surgeries are related with a range of postoperative complications, including pain, swelling, trismus (restricted jaw movement), and inflammation.<sup>1</sup> Surgery induces trauma and initiates an inflammatory response resulting in hyperemia, vasodilatation, and increase in capillary permeability instigating fluid accumulation and inflammatory cellular infiltration within interstitial space.<sup>2,3,4</sup> Numerous techniques to reduce postoperative complications are available and still researches are progressive in same field . Prescription of narcotic or non- narcotic drugs has been used widespreadly after dental surgeries. Additionally, recommended method is the usage of corticosteroids which is very in effective controlling postoperative pain and inflammation.<sup>5,6</sup>

Corticosteroids are acknowledged for their potent anti-inflammatory properties, primarily achieved through inhibiting inflammatory mediators like cytokines, prostaglandins, and leukotrienes. By reducing inflammation, corticosteroids can help to alleviate pain and swelling, two major postoperative sequelae. However, the effectiveness of

corticosteroids in third molar surgery remains a topic of considerable research interest, as studies have shown variability in outcomes due to factors such as dosage, route of administration, and patient characteristics.<sup>6,7</sup>

Dexamethasone, a synthetic glucocorticosteroid with no mineralocorticoid effect is one of the most effective anti-inflammatory drug.<sup>9,10</sup> It is not less than 25 to 50 times more effective than hydrocortisone. Many published literatures including reviews, randomised clinical trials, placebo-controlled studies to determine the efficacy of dexamethasone with the route of administration and possible contributions of it in third molar surgeries are available. However, the introduction of novel methods and trails has called into interrogation for the efficacy among the different approaches. Subsequently, this literature review will highlight and help to determine the recommended dosage, routes of administration, limitations and timing for dexamethasone in third molar surgical procedure.

## II. ROLE OF DEXAMETHASONE IN THIRD MOLAR SURGERY AND MODE OF ACTION

Dexamethasone reduces inflammation and is used in the treatment of skin, blood, kidney, eye, thyroid, and intestinal disorders (ulcerative colitis, Crohn's disease), arthritis, allergies, and asthma. But, the application of dexamethasone is not short of limitations. Contraindications are hypertension, peptic ulcers, diabetes mellitus, tuberculosis, glaucoma, Cushing's syndrome, renal insufficiency, and pregnancy.<sup>11</sup>

Claman (1975) in his article "How corticosteroids work", likely delved into the mechanisms of action of corticosteroids, a class of hormones that have potent anti-inflammatory and immunosuppressive effects. Corticosteroids has been used in medical practice since the 1950s and have become a staple in various fields, including oral surgery, due to their anti-inflammatory and immunosuppressive properties. These drugs function by inhibiting the enzyme phospholipase A2, which is critical in the synthesis of arachidonic acid and other inflammatory mediators. This action suppresses the production of cytokines, prostaglandins, and leukotrienes, which are

responsible for inflammation, pain, and edema in the tissues surrounding the surgical site. Additionally, corticosteroids stabilize cell membranes and capillaries, reducing fluid exudation and thus minimizing tissue swelling. By decreasing inflammation, corticosteroids help to alleviate pain and swelling, contributing to a faster recovery process.<sup>12,13,14,15</sup> Hong et al and Blackwell et al have presented that glucocorticoids induce antiphospholipase proteins release, the inhibits arachidonic acid and its further breakdown to thromboxanes and prostaglandins resulting in reduced capillary permeability. Tam et al also have shown that glucocorticoids hinder de-acylation of phospholipids and transportation of arachidonic acid to the cyclo-oxygenase enzyme system after di-acylation thereby advocating its anti-inflammatory effects.<sup>16,17,18</sup>

Dexamethasone, a synthetic adrenocorticoid is known for its potent anti-inflammatory properties, primarily achieved through inhibiting inflammatory mediators like cytokines, prostaglandins, and leukotrienes.<sup>19,20,21</sup> By reducing inflammation, it can help to alleviate pain and swelling, two major postoperative sequelae. Pain and swelling occur as a natural response to tissue trauma and the release of inflammatory intermediaries during the operating technique. Trismus, or reduced mouth opening, is also a frequent consequence of third molar surgery, arising due to muscle stiffness and inflammation in the area surrounding the extracted tooth. While these complications are not typically severe, they can cause discomfort, impede daily activities like eating and speaking, and contribute to emotional distress. Therefore, effective management of these postoperative symptoms is crucial to enhance the patient's recovery experience and maintain their quality of life.<sup>7,8</sup>

### III. ROUTE FOR DRUG ADMINISTRATION

Dexamethasone can be delivered for third molar surgeries by either oral way, sub mucosal route, intravenous injectable, intramuscular route via masseter, gluteal or deltoid region.

Oral route requires patient compliance and repeated intake to regulate blood level for effective consequences, interpreting it a contentious course for execution. Senguttuvan Kanimozhiy et al in 2023 conducted a study is to compare the effect of submucosal dexamethasone injection with oral dexamethasone administered preoperatively in reducing the postoperative complication after impacted lower third molar surgeries and concluded that pre-operative submucosal dexamethasone is considered better compared to oral dexamethasone for decreasing same. Grossi et al. conducted a study and concluded submucosal administration of dexamethasone can accomplish positive reduction in edema as compared to other routes. They also found the submucosal route is useful for both the operative and patient because of the ease of administration.<sup>23</sup> Khalida et al explained the submucosal dexamethasone reduces post operative discomfort after surgery.<sup>24</sup>

In a study by Bamgbose et al in which intravenous dexamethasone with diclofenac sodium was given to the patients and found that it is effective in reducing post operative complication after third molar surgery as compared to diclofenac alone.<sup>25</sup> Additionally in a study by Moore et al. concluded that 10 mg intravenous dexamethasone with 50 mg rofecoxib perioperatively was more efficient in reducing pain and trismus after third molar surgery compared to using intravenous dexamethasone intraoperatively.<sup>26</sup>

Majid et al in 2011, evaluated the effectiveness of two different routes of dexamethasone administration in reducing postoperative pain and swelling after third molar surgery: submucosal and intramuscular and concluded that both intramuscular and submucosal administration of dexamethasone were effective in reducing pain and swelling compared towards the control group. However, there was no significant distinction between the two routes of administration in terms of their efficacy. Both methods were found to be safe and well-tolerated.<sup>27</sup> Al-Dajani evaluated that a single pre-operative intramuscular dose of dexamethasone efficaciously minimized post-operative sequelae after surgical removal of third molar and enhanced comfort in performing daily activities.<sup>28</sup>

Latt et al. in 2016T studied the administration of dexamethasone through the pterygomandibular space.<sup>29</sup> Gozali et al advocated sublingual route of dexamethasone for patient comfort in 2017.<sup>30</sup>

### IV. DOSAGE

In his study Majid et al showed that 4 mg dosage of submucosal dexamethasone is an effective therapeutic approach for refining the quality of life after third molar surgery with a similar result on postoperative sequelae to intramuscular injection.<sup>27</sup> It offers a simple, non-invasive, safe, trouble-free, and price effective therapeutic choice for moderate and severe cases.<sup>31,32</sup> In a study by Filho et al dexamethasone intramuscularly 8 mg was found to be more effective than that of 4 mg in reducing trismus and swelling.<sup>33</sup> Many studies have shown that there is no substantial differences between 8mg dexamethasone intramuscular injection group and the 8 mg dexamethasone consumption group. Equally, they have described optimistic effects on swelling, pain and trismus on 1, 3 and 7 postoperative days.<sup>34,35,36</sup>

### V. TIMING OF ADMINISTRATION

Considering whether dexamethasone should be used pre-operatively, peri-operatively, or post-operatively, many studies have been conducted. The preoperative combination of dexamethasone and anti-inflammatory drugs was effective in diminishing pain during the post-operative period as concluded by Simone et al..<sup>37</sup> Studies have shown that pre-operative administration was more favourable as compared to peri-operative and post-operative administration.<sup>38</sup> Markiewicz et al. conducted a systemic review and meta-analysis and concluded that use of

corticosteroids peri-operatively can decrease oedema and trismus more than the control group in reasonable manner.<sup>39</sup> Similarly, Graziani et al. strengthened this by using dexamethasone.<sup>40</sup> Limited studies are available regarding postoperative use of dexamethasone only in preventing adverse outcomes after third molar surgical treatment. Lima et al used 8 mg oral dexamethasone following third molar surgery and concluded that that pre-emptive usage of dexamethasone displayed better control of pain and swelling in contrast to diclofenac sodium. Also, regarding the scheduling, some studies noted that dexamethasone before or after third molar surgeries to be even handily effective.<sup>41,42</sup>

## VI. CONCLUSION

The present review shows that dexamethasone in third molar surgical treatment is effective in management of post-operative complications. Dexamethasone is highly potent anti-inflammatory corticosteroid. However, it is important to note that the optimal dosage, timing, and duration of corticosteroid therapy may be adjusted depending on the specific surgical procedure and particular patient considerations. Future research should explore the long-term effects of corticosteroid treatment on oral healthiness and quality of life, as well as investigate the potential for combination therapies with other medications or interventions to further enhance patient outcomes.

## REFERENCES

- [1]. Essam Ahmed Al-Moraissi, Elham Aziz Al-Zendani, Abeer Mohammed Al-Selwi *JFront Oral Health*. 2020; 1:575176. Published online 2020 Dec 8. doi: 10.3389/froh.2020.575176 PMID: PMC8757710
- [2]. Messer EJ, Keller JJ. The use of intraoral dexamethasone after extraction of mandibular third molars. *Oral Surg Oral Med Oral Pathol* 1975;40:594-8.
- [3]. Beirne OR, Hollander B. The effect of methylprednisolone on pain, trismus, and swelling after removal of third molars. *Oral Surg Oral Med Oral Pathol* 1986;61:134-8.
- [4]. Jaro' n, A.; Preuss, O.; Konkol, B.; Trybek, G. Quality of Life of Patients after Kinesio Tape Applications Following Impacted Mandibular Third Molar Surgeries. *J. Clin. Med*. 2021, 10, 2197. <https://doi.org/10.3390/jcm10102197>
- [5]. Mutlu I, Abubaker AO, Laskin DM. Narcotic prescribing habits and other methods of pain control by oral and maxillofacial surgeons after impacted third molar removal. *J Oral Maxillofac Surg* 2013;71:1500-3. <https://doi.org/10.1016/j.joms.2013.04.031>.
- [6]. Herrera-Briones FJ, Prados Sánchez E, Reyes Botella C, Vallecillo Capilla M. Update on the use of corticosteroids in third molar surgery: systematic review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2013;116:e342-51. <https://doi.org/10.1016/j.oooo.2012.02.027>.
- [7]. Lakhani KS, Joshi S, Pawar S, Nair VS, Korrane V, Salema H, Khan N, Patel J. Evaluation of the Efficacy of Oral and Intramuscular Administration of Dexamethasone on Postoperative Pain, Swelling, and Trismus After Surgical Removal of Impacted Third Molar: A Comparative Split-Mouth Study. *Cureus*. 2023 Apr 29;15(4):e38306. doi: 10.7759/cureus.38306. PMID: 37255895; PMCID: PMC10226760.
- [8]. Yasir M, Goyal A, Sonthalia S. Corticosteroid Adverse Effects. 2023 Jul 3. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. PMID: 30285357.
- [9]. 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;15:217-23. <https://doi.org/10.1007/s10006-011-0290-9.3>
- [10]. Herrera-Briones FJ, Prados Sánchez E, Reyes Botella C, Vallecillo Capilla M. Update on the use of corticosteroids in third molar surgery: systematic review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2013;116:e342-51. <https://doi.org/10.1016/j.oooo.2012.02.027>
- [11]. Selvido DI, Bhattarai BP, Niyomtham N, Riddhabhaya A, Vongsawan K, Pairuchvej V, Wongsirichat N. Review of dexamethasone administration for management of complications in postoperative third molar surgery. *J Korean Assoc Oral Maxillofac Surg*. 2021 Oct 31;47(5):341-350. doi: 10.5125/jkaoms.2021.47.5.341. PMID: 34713808; PMCID: PMC8564082.
- [12]. Claman, Henry N. How corticosteroids work 1975 *Journal of Allergy and Clinical Immunology*, Volume 55, Issue 3, 145 – 151
- [13]. Alexander RE, Thronsdon RR. A review of perioperative corticosteroid use in dentoalveolar surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000; 90: 406–415
- [14]. Messer EJ, Keller JJ. The use of intraoral dexamethasone after extraction of mandibular third molars. *Oral Surg Oral Med Oral Pathol* 1975; 40: 594– 598. 18.
- [15]. Milles M, Desjardins PJ. Reduction of postoperative facial swelling by low-dose methylprednisolone: an experimental study. *J Oral Maxillofac Surg* 1993; 51: 987–991.
- [16]. Blackwell G L, Carnuccio R, Rosa M, et al: Glucocorticoids induce the formation and release of anti-inflammatory and antiphospholipase proteins into the peritoneal cavity of the rat. *Br J Pharmacol* 76:185, 1982
- [17]. Hong SL, Levine L: Inhibition of arachidonic acid release from cells as the biochemical action of anti-inflammatory corticosteroids. *Proc Natl Acad Sci USA* 73: 1730, 1976 9.

- [18]. Tam S, Hong SL, Levine L: Relationships among the steroids of anti-inflammatory properties and inhibition of prostaglandin production and arachidonic acid release by transformed mouse fibroblasts *Pharmacol Exp Ther* 203:162, 1977
- [19]. Beirne OR, Hollander B. The effect of methylprednisolone on pain, trismus, and swelling after removal of third molars. *Oral Surg Oral Med Oral Pathol* 1986; 61: 134–138
- [20]. Esen E, Tasar F, Akhan O. Determination of the anti-inflammatory effects of methylprednisolone on the sequelae of third molar surgery. *J Oral Maxillofac Surg* 1999; 57: 1201–1206
- [21]. Gersema L, Baker K. Use of corticosteroids in oral surgery. *J Oral Maxillofac Surg* 1992; 50: 270–277.
- [22]. Kanimozhiy Senguttuvan, Submucosal vs. Oral Dexamethasone on Postoperative Sequelae Following Third Molar Surgery: A Comparative Study, *J Res Med Dent Sci*, 2023, 11 (08): 041-044.
- [23]. Grossi GB, Maiorana C, Garramone RA, Borgonovo A, Beretta M, Farronato D, et al. Effect of submucosal injection of dexamethasone on postoperative discomfort after third molar surgery: a prospective study. *J Oral Maxillofac Surg* 2007;65:2218-26. <https://doi.org/10.1016/j.joms.2006.11.036>
- [24]. Khalida, B., Fazal, M., Muntaha, S. T., & Khan, K. (2017). EFFECT OF SUBMUCOSAL INJECTION OF DEXAMETHASONE ON POST-OPERATIVE SWELLING AND TRISMUS FOLLOWING IMPACTED MANDIBULAR THIRD MOLAR SURGERY. *Pakistan Oral & Dental Journal*, 37(2), 231-234.
- [25]. Bamgbose BO, Akinwande JA, Adeyemo WL, Ladeinde AL, Arotiba GT, Ogunlewe MO. Effects of co-administered dexamethasone and diclofenac potassium on pain, swelling and trismus following third molar surgery. *Head Face Med* 2005;1:11. <https://doi.org/10.1186/1746-160X-1-11>
- [26]. Moore PA, Brar P, Smiga ER, Costello BJ. Preemptive rofecoxib and dexamethasone for prevention of pain and trismus following third molar surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2005;99:E1-7. <https://doi.org/10.1016/j.tripleo.2004.08.028>
- [27]. Majid OW. Submucosal dexamethasone injection improves quality of life measures after third molar surgery: a comparative study. *J Oral Maxillofac Surg* 2011;69:2289-97. <https://doi.org/10.1016/j.joms.2011.01.037>
- [28]. Al-Dajani M. Can preoperative intramuscular single-dose dexamethasone improve patient-centered outcomes following third molar surgery? *J Oral Maxillofac Surg* 2017;75:1616-26. <https://doi.org/10.1016/j.joms.2017.03.037>
- [29]. Latt MM, Kiattavornchareon S, Boonsiriseth K, Pairuchvej V, Wongsirichat N. The efficacy of dexamethasone injection on postoperative pain in lower third molar surgery. *J Dent Anesth Pain Med* 2016;16:95-102. <https://doi.org/10.17245/jdapm.2016.16.2.95>
- [30]. Gozali P, Boonsiriseth K, Kiattavornchareon S, Khanijou M, Wongsirichat N. Decreased post-operative pain using a sublingual injection of dexamethasone (8 mg) in lower third molar surgery. *J Dent Anesth Pain Med* 2017;17:47-53. <https://doi.org/10.17245/jdapm.2017.17.1.47>
- [31]. Neupert EA 3rd, Lee JW, Philput CB, Gordon JR. Evaluation of dexamethasone for reduction of postsurgical sequelae of third molar removal. *J Oral Maxillofac Surg*. 1992 Nov;50(11):1177-82; discussion 1182-3. doi: 10.1016/0278-2391(92)90149-t. PMID: 1403273.
- [32]. Boworn Klongnoi, Pariya Kaewpradub, Kiattavornchareon S, Boonsiriseth K, Wongsirichat N. Effect of single dose preoperative intramuscular dexamethasone injection on lower impacted third molar surgery. *Int. J. Oral Maxillofac. Surg*. 2012; 41: 376–379
- [33]. Filho JRL, 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:E129–32.
- [34]. K. Boonsiriseth, B. Klongnoi, N. Sirintawat, C. Saengsiravin, N. Wongsirichat: Comparative study of the effect of dexamethasone injection and consumption in lower third molar surgery. *Int. J. Oral Maxillofac. Surg*. 2012; 41: 244–247.
- [35]. Chaudhary PD, Rastogi S, Gupta P, Niranjana Prasad Indra B, Thomas R, Choudhury R. Pre-emptive effect of dexamethasone injection and consumption on postoperative swelling, pain, and trismus after third molar surgery. A prospective, double blind and randomized study. *J Oral Biol Craniofac Res* 2015;5:21-7. <https://doi.org/10.1016/j.jobcr.2015.02.001>
- [36]. Ngeow WC, Lim D. Do corticosteroids still have a role in the management of third molar surgery? *Adv Ther* 2016;33:1105-39. <https://doi.org/10.1007/s12325-016-0357->
- [37]. Simone JL, Jorge WA, Horliana AC, Canaval TG, Tortamano IP. Comparative analysis of preemptive analgesic effect of dexamethasone and diclofenac following third molar surgery. *Braz Oral Res* 2013;27:266-71. <https://doi.org/10.1590/S1806-83242013005000012>
- [38]. Al-Shamiri HM, Shawky M, Hassanein N. Comparative assessment of preoperative versus postoperative dexamethasone on postoperative complications following lower third molar surgical extraction. *Int J Dent* 2017;2017:1350375. <https://doi.org/10.1155/2017/1350375>
- [39]. Markiewicz MR, Brady MF, Ding EL, Dodson TB. Corticosteroids reduce postoperative morbidity after third molar surgery: a systematic review and meta-analysis. *J Oral Maxillofac Surg* 2008;66: 1881-94. <https://doi.org/10.1016/j.joms.2008.04.022>



- [40]. Graziani F, D'Aiuto F, Arduino PG, Tonelli M, Gabriele M. Perioperative dexamethasone reduces post-surgical sequelae of wisdom tooth removal. A split-mouth randomized double-masked clinical trial. *Int J Oral Maxillofac Surg* 2006;35:241-6. <https://doi.org/10.1016/j.ijom.2005.07.010>
- [41]. Lima CAA, Favarini VT, Torres AM, da Silva RA, Sato FRL. Oral 349 J Korean Assoc Oral Maxillofac Surg 2021;47:341-350 dexamethasone decreases postoperative pain, swelling, and trismus more than diclofenac following third molar removal: a randomized controlled clinical trial. *Oral Maxillofac Surg* 2017;21:321-26.
- [42]. Sitthisongkhram K, Niyomtham N, Chaiyasamut T, Pairuchvej V, Kc K, Wongsirichat N. Effectiveness of dexamethasone injection in the pterygomandibular space before and after lower third molar surgery. *J Dent Anesth Pain Med* 2020;20:313-23. <https://doi.org/10.17245/jdamp.2020.20.5.313>