

A Narrative Review Of Impact Of Perioperative Dexamethasone For Postoperative Pain

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Abstract

Background: Dexamethasone is frequently administered in the perioperative period to reduce postoperative nausea and vomiting. In contrast, the analgesic effects of dexamethasone are not well defined. The authors performed a meta-analysis to evaluate the dose dependent analgesic effects of perioperative dexamethasone

Objective: To determine the efficacy of perioperative single intravenous dose of dexamethasone for subjects posted for surgeries under general anaesthesia for postoperative pain

Methods: A total of 40 patients classified as ASA 1/2 undergoing surgeries under general anaesthesia were observed peri-operatively. Single dose of intravenous dexamethasone i.e 0.1 mg/ kg is given for 20 patients peri-operatively and other 20 patients received placebo. Post operatively patients were evaluated for hemodynamic changes along with VAS scores.

Results: Forty patients in which 20 pts receiving dexamethasone 0.1mg/kg were included and remaining 20 pts were given placebo. Patients receiving dexamethasone had lower pain scores at 2hr, 6hr, 12hr, 24 hr with mean VAS score 2.875 ± 0.275 and the patients receiving placebo had a higher pain scores at 2hr, 6hr, 12hr, 24hr with mean VAS score 4.1075 ± 1.317 . Dexamethasone-treated patients required less analgesia compared to the placebo group.

Conclusion: Dexamethasone at doses more than 0.1 mg/kg is an effective adjunct in multimodal strategies to reduce postoperative pain and opioid consumption after surgery. The preoperative administration of the drug produces less variation of effects on pain outcomes.

Keywords: ASA- American Society of Anaesthesiologists.

Date of Submission: 10-07-2025

Date of Acceptance: 20-07-2025

I. Introduction:

- Postoperative pain management is crucial for patient recovery and satisfaction.
- Non-opioid analgesics, including corticosteroids like dexamethasone, have garnered attention for their potential analgesic properties¹.
- Glucocorticoids have been used to reduce inflammation and tissue damage in a variety of conditions, including inflammatory bowel disease, rheumatoid arthritis, and some malignancies.
- Glucocorticoids have potent immunomodulatory effects, and are used in the treatment of acute allograft rejection.
- They also have antiemetic properties and dexamethasone is commonly used for the prevention of postoperative nausea and vomiting².
- Dexamethasone is a synthetic glucocorticosteroid
- Corticosteroids act by controlling the rate of protein synthesis; they react with cytoplasmic receptors to form a complex which directly influences the rate of RNA transcription. This directs the synthesis of lipocortins. Dexamethasone has approximately a seven-times higher anti-inflammatory potency than prednisolone and 30 times that of hydrocortisone³.
- The efficacy of glucocorticoids for reducing pain and inflammation after surgery has recently been explored.
- Early studies in patients undergoing dental procedures showed that glucocorticoids were effective in reducing postoperative pain and oedema⁴.
- The study was conducted to know the efficacy of dexamethasone on postoperative pain.

II. Methodology

Study Design and Population

This hospital based cross-sectional study was conducted from October 2023 -July 2024, in the Department of Anaesthesiology, Akash Institute of Medical Sciences, after obtaining approval from institutional ethics committee and patient informed consent in 40 patients undergoing surgeries under general anaesthesia.

Based on a similar study by Mohtadi et al ⁵, the sample size calculated was 40(20 in each group).

Inclusion Criteria

- American society of Anesthesiologists (ASA) grade 1 and 2.
- Age: 18 – 60 years of either sex.
- Patients posted for general anaesthesia.
- Duration of Surgery <=2hrs.

Exclusion Criteria

- Patients with known allergy to drug.
- Patient refusal .

Anesthetic and Surgical Technique

After pre-anaesthetic evaluation patients were shifted to pre-operative room and Intravenous cannula was inserted.

In operating room, patients were connected to standard ASA monitors.

Patient was preoxygenated , premedicated and induced and intubated with endotracheal tube .

The dose of dexamethasone is 0.1 mg/kg body weight of the patient given at the time of induction of anesthesia in one group(group A)

The other group received placebo at the same time (group B).

Patients are maintained on positive pressure ventilation ,on Oxygen:Air:Isoflurane. After the procedure patient is extubated and shifted to post operative recovery room

- Postoperative pain was studied according to VAS in both groups.
- Visual analogue scale used to measure postoperative pain at intervals of 2hr,6hr,12hr,24hr after the surgery

Outcome Measures

The following parameters were observed peri-operatively at frequent intervals for 24 hours:

- a) Vital signs monitoring(HR, SBP, DBP, MAP, ECG, SpO₂).
- b) Onset, level and duration of sensory and motor blockade.
- c) Time of requirement of first analgesic after operation(time to VAS-4) and total number of rescue analgesia required in postoperative 24hrs.
- d) Complications.

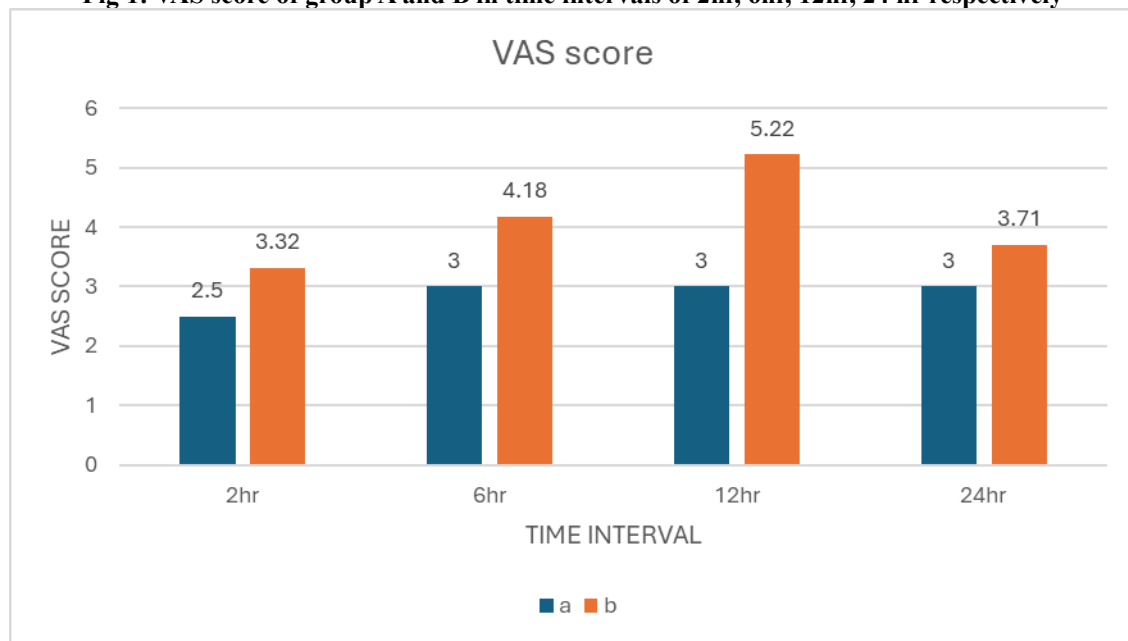
III. Results

1. VAS score of group A and B in time intervals of 2hr, 6hr, 12hr, 24 hr respectively is shown in table 1 and figure 1

Table 1 : VAS score of group A and B in time intervals of 2hr, 6hr, 12hr, 24 hr respectively.

Median pain score	Group A	Group B	P value	T	SD(groupA/group B)
VAS at 2 hr	2.5	3.32	0.054	1.943	1.455/1.490
VAS at 6 hr	3	4.18	0.000	3.565	1.509/1.371
VAS at 12 hr	3	5.22	0.000	6.107	1.979/1.386
VAS at 24 hr	3	3.71	0.001	3.311	2.119/1.480

Fig 1: VAS score of group A and B in time intervals of 2hr, 6hr, 12hr, 24 hr respectively



The above graph shows the VAS scores of the group A and group B in the time intervals between 2hr, 6hr, 12hr, 24hr postoperatively its seen that group A has less VAS scores compared to group B concluding dexamethasone effectiveness

2. Side-effects and Quality of anaesthesia

None of the participants had any side-effects; None required supplementation of anaesthesia and all had excellent quality of anaesthesia.

IV. Discussion

- In this patients treated with dexamethasone experienced less postoperative pain, had longer time to first analgesic dose, needed less rescue analgesia, and had shorter hospital stays⁶.
- Patients treated with dexamethasone had significantly higher blood glucose levels during the first postoperative day.
- The onset of dexamethasone is thought to be 1–2 h allowing time to diffuse across the cell membrane and alter gene transcription.
- Administration of steroids 60 min or more before surgical trauma may be important in minimizing pain and inflammation⁷.
- Similarly, dexamethasone is a more effective antiemetic when given before induction of anaesthesia than at the end of surgery.
- In a study conducted by Mohtadi et al⁵, the role of dexamethasone in reducing postoperative pain was studied. The dose of dexamethasone is the same in both studies 0.1 mg/kg body weight of the patient given at the time of induction of anesthesia in one group. In contrast, the other group received placebo at the same time. Postoperative pain was studied according to VAS in both groups. The pain score at 2, 6, 12, and 24 h after surgery was determined to be significantly less in the dexamethasone group ($p=0.003$). These results validate the results of our study in which the mean pain score was also significantly less in the dexamethasone group of patients
- In a study conducted by Lim et al⁸, the role of dexamethasone in reducing postoperative pain and its timing of administration were studied. There were three groups of patients in that study. Group N received a placebo, group S1 received an injection of 8 mg dexamethasone 1 h before surgery, and group S2 received the same dose of dexamethasone during laparoscopic cholecystectomy. There was statistically significant reduced pain in both S1 and S2 groups compared to group N (control group). However, there was no significant difference in pain scores between these two groups (S1 and S2). The results of this study also validate the results of our study that IV dexamethasone significantly reduces postoperative pain after laparoscopic cholecystectomy, and the timing of its administration does not affect its analgesic effects.
- There are a few limitations to our study.
- This study was conducted in a single center, and the sample size was small.

- Further, we have administered rescue analgesia at a VAS of 6 or more, whereas most literature indicates that rescue analgesia should be administered at VAS greater or equal to 4.
- It is likely to affect the total analgesia consumed.
- The management of postoperative pain is a critical component of surgical recovery, influencing patient satisfaction, length of hospital stay, and overall outcomes.
- Opioids have traditionally been the mainstay of postoperative analgesia; however, their side effects, including nausea, constipation, and potential for dependence, have prompted the search for alternative analgesic strategies.
- Dexamethasone, a corticosteroid known for its anti-inflammatory properties, has emerged as a viable option for enhancing postoperative pain control.
- Dexamethasone's acts by inhibiting the release of inflammatory mediators, such as prostaglandins and cytokines, thereby reducing the inflammatory response associated with tissue injury and surgery. Its effects on the central nervous system may enhance pain threshold and decrease the need for opioids.

V. Limitations

- The study's first limitation is its small sample size of 40 patients. Although based on previous studies & statistical power calculations, this sample size may not capture the full variability & potential complications of the interventions.
- Limitations of subjects who did not fulfilling the inclusion criteria

VI. Conclusion

Perioperative dexamethasone at a dose of 0.1 mg/kg appears to provide significant benefits in managing postoperative pain and reducing opioid consumption compared to placebo. While the results are promising, further large-scale studies are needed to confirm these findings and to better understand the long-term implications of corticosteroid use in the perioperative setting.

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