https://doi.org/10.62587/AFRJMS.3.2.2026.214-219 ISSN: 3006-7421

African Research Journal of Medical Sciences

Journal homepage: https://www.afrjms.com

Research Paper **Open Access**

Comparison of 4 mg and 8 mg dexamethasone as adjuvants to 0.5% ropivacaine in ultrasound-guided supraclavicular brachial plexus block

Rajdeep Kour[1], Neha Sharma[2] and Neha Sharma[1*]

[1]Associate Professor, Government Medical College & Hospital, Jammu, Jammu and Kashmir, India. E-mail: neha310sharma@gmail.com
[2]Associate Professor, Gian Sagar Medical College & Hospital, Rajpura, Punjab, India.

Article Info
Volume 3, Issue 2, July 2026
Received : 02 September 2026
Revised : 17 September 2026
Accepted : 30 September 2026
Published : 04 October 2026
doi: 10.62587/AFRJMS.3.2.2026.214-219

Abstract

Background: Various adjuvants have been tried with local anaesthetics in an attempt to prolong anaesthesia from peripheral nerve blocks. Most studies have used a dose of 8 mg dexamethasone to augment peripheral nerve block analgesia. A few studies have used doses of less than 8 mg dexamethasone and shown favourable outcomes. Hence, we attempted to compare the effects of 4 mg versus 8 mg dexamethasone as an adjuvant to 0.5% ropivacaine in producing the desired peripheral nerve blockade. The primary objectives were the onset and duration of sensory and motor block and the duration of analgesia. **Materials and methods:** Forty adult patients of ASA I and II, of both genders, aged 18–65 years, were scheduled for elective upper limb surgeries under ultrasound-guided supraclavicular brachial plexus block. Patients were randomised into two groups of 20 patients each (n = 20). Group I received 28 mL of 0.5% ropivacaine with 4 mg dexamethasone (1 mL) and 1 mL normal saline. Group II received 28 mL of 0.5% ropivacaine with 8 mg dexamethasone (2 mL). **Results:** The demographic data and surgical characteristics were similar in each group. Sensory and motor block onset time and duration were similar in both groups. The duration of analgesia was longer in Group II, but the difference was not statistically significant. **Conclusion:** Dexamethasone added to ropivacaine in supraclavicular brachial plexus block for upper limb surgery significantly shortens the onset time and prolongs the duration of both sensory and motor blocks without producing side effects.

Keywords: *Dexamethasone, Ropivacaine, Supraclavicular brachial plexus block, Postoperative analgesia*

© 2026 Rajdeep Kour, Neha Sharma and Neha Sharma. This is an open access article under the CC BY license (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

1. Introduction

Pain is one of the most dreaded fears of a patient undergoing any surgery. Pain can be intense, especially after orthopaedic surgery. Regional anaesthesia serves an important role in facilitating ambulatory anaesthesia and reducing immediate postoperative pain. In an effort to improve analgesia and facilitate mobilization, regional anaesthesia is often used either as an adjunct to general anaesthesia or as the primary anaesthetic. The supraclavicular block was introduced into clinical practice in Germany by Kulenkampff in 1911 (D'Souza and Johnson, 2023). Kulenkampff's recommendation was to advance the needle toward the first rib, in the direction of the spinous process of T2 or T3 (Kulenkampff, 1928).

Brachial plexus block consists of injecting local anaesthetic drugs into the fascial spaces surrounding the nerve plexus, thereby blocking the autonomic, sensory and motor fibres supplying the upper extremity. Among the various techniques, the supraclavicular approach is a preferred one, being simple and safe; it

* *Corresponding author: Neha Sharma, Associate Professor, Government Medical College & Hospital, Jammu, Jammu and Kashmir, India. E-mail: neha310sharma@gmail.com*

3006-7421/© 2026 Rajdeep Kour, Neha Sharma and Neha Sharma. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

preserves consciousness, avoids airway instrumentation, and provides rapid recovery and good postoperative analgesia.

Commercially available local anaesthetics have a limited duration of analgesia, so prolonging the duration of sensory and motor blockade of regional anaesthetic techniques is desirable. Various agents, such as epinephrine, tramadol, sodium bicarbonate, clonidine, dexamethasone, dexmedetomidine, buprenorphine and midazolam, have been added to enhance the effect of single-injection local anaesthetic peripheral nerve blockade, with varying results (Vieira *et al.*, 2010). Although 8 mg dexamethasone has been used in many studies, lower doses may also provide clinically useful prolongation of analgesia. Hence, we attempted to compare the effect of 4 mg versus 8 mg dexamethasone as an adjuvant to 0.5% ropivacaine in producing the desired peripheral nerve blockade (Kalashetty and Hasaraddi, 2019).

2. Aims and objectives

1. To evaluate the onset and duration of sensory and motor blockade.
2. To evaluate the duration of analgesia.

3. Materials and methods

After approval from the institutional ethics committee, the present study was conducted on 40 patients between 18 and 65 years of age, of both genders, who were scheduled for upper limb surgeries under supraclavicular block in the Department of Anaesthesiology and Critical Care, GMC Jammu. The study duration was 6 to 8 months. Forty cases posted for upper limb surgeries were selected randomly after taking informed written consent, and two groups of 20 patients of ASA I and ASA II each were designated as follows:

- **Group I:** 28 mL of 0.5% ropivacaine with 4 mg dexamethasone (1 mL) and 1 mL of normal saline.
- **Group II:** 28 mL of 0.5% ropivacaine with 8 mg dexamethasone (2 mL).

3.1. Inclusion criteria

- Patients aged between 18 and 65 years, of either sex, posted for elective upper limb surgeries.
- American Society of Anesthesiologists grade I and II patients.

3.2. Exclusion criteria

- Known hypersensitivity reaction to dexamethasone or local anaesthetic.
- Abnormal coagulation parameters or anticoagulation therapy.
- Local infection at the site of proposed puncture for supraclavicular block.
- History of peptic ulcer disease, diabetes mellitus, hepatic or renal failure, pregnancy, or peripheral neuropathy.
- Patient refusal.
- ASA grade 3 or more.

3.3. Pre-anaesthetic preparation

Patients were explained the procedure, and informed written consent was taken. Routine pre-anaesthetic evaluation was performed before surgery. All patients were kept fasting for 8 hours preoperatively and were given oral pantoprazole 40 mg and alprazolam 0.25 mg the night before surgery. A peripheral intravenous line was established with an 18G cannula.

3.4. Anaesthesia technique

On arrival in the operating room, baseline parameters of each patient were recorded: heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, baseline ECG and oxygen saturation, using standard monitoring equipment. After establishing intravenous access using an 18G IV cannula, an infusion of Ringer's lactate was started. Patients were premedicated with injection midazolam 0.05 mg/kg. The patient was positioned supine with the head turned to the opposite side. A linear ultrasound probe was placed in the supraclavicular fossa parallel to the middle third of the clavicle, in the sagittal plane, to

visualise the brachial plexus as a "bunch of grapes"-like cluster of 5 to 6 hypoechoic circles located lateral and superior to the subclavian artery at the lower cervical region. A 23-gauge, 1.5-inch needle was inserted using the in-plane technique. Upon visualising its path to the desired location, the local anaesthetic mixture was injected according to the allocated group. The total injectate volume was 30 mL in each group and was administered after negative aspiration around the brachial plexus.

The onset time of sensory and motor blockade was noted. **Sensory block** was assessed by the pin-prick method with a 23-gauge needle and compared with the same stimulation on the opposite hand. The time to complete sensory blockade was recorded. **Motor block** was assessed by the **Bromage three-point score**: 0 = normal motor function with full flexion and extension of the elbow, wrist and fingers; 1 = decreased motor strength with ability to move the fingers and/or wrist only; 2 = complete motor blockade with inability to move the fingers. The time to complete motor block was recorded. Sensory and motor block were assessed at 5, 10, 20, 30 and 120 min, then every 30 min for the next 3 hours, and subsequently every 60 min until the end of the study observations. The duration of analgesia was defined as the time between the end of local anaesthetic administration and the first rescue analgesic administration.

4. Results

The demographic data and surgical characteristics were similar in each group (Table 1). Differences in mean arterial pressure and mean heart rate between Groups I and II at 0, 5, 10, 15, 30, 45, 60, 90, 120 and 150 minutes were statistically insignificant ($p > 0.05$).

Table 1: Demographic and surgical characteristics

Parameter	Group I: 4 mg (n = 20)	Group II: 8 mg (n = 20)	Reported *p* value
Age (years), mean ± SD	36.85 ± 9.20	35.40 ± 8.84	>0.05
Weight (kg), mean ± SD	59.30 ± 7.86	57.90 ± 8.80	>0.05
Sex (male/female)	11/9	15/5	>0.05
Duration of surgery (min), mean ± SD	113.20 ± 16.70	114.66 ± 16.30	>0.05

The onset and duration of sensory and motor block and the duration of analgesia are shown in Table 2.

Table 2: Comparison of block characteristics

Parameter	Group I: 4 mg (n = 20)	Group II: 8 mg (n = 20)	Reported *p* value
Onset of sensory block (min), mean ± SD	17.50 ± 4.20	17.00 ± 4.20	>0.05
Onset of motor block (min), mean ± SD	18.01 ± 4.03	18.08 ± 4.03	>0.05
Duration of sensory block (h), mean ± SD	12.30 ± 0.40	12.80 ± 0.40	>0.05
Duration of motor block (h), mean ± SD	10.00 ± 0.30	10.00 ± 0.35	>0.05
Duration of analgesia (h), mean ± SD	18.30 ± 2.21	18.79 ± 2.31	>0.05

The reported mean sensory block onset times were 17.5 ± 4.2 minutes in Group I and 17.0 ± 4.2 minutes in Group II. Motor block onset times were 18.01 ± 4.03 and 18.08 ± 4.03 minutes, respectively. Mean sensory block duration was 12.3 ± 0.40 hours in Group I and 12.8 ± 0.40 hours in Group II. Mean motor block duration was 10.0 ± 0.30 and 10.0 ± 0.35 hours, respectively. Mean duration of analgesia was 18.30 ± 2.21 hours in Group I and 18.79 ± 2.31 hours in Group II.

Sensory and motor block onset time was similar in both groups. The duration of analgesia was longer in Group II, but the difference was statistically insignificant ($p > 0.05$).

Table 3: Intraoperative analgesia quality and adverse events

Outcome	Group I: 4 mg (n = 20)	Group II: 8 mg (n = 20)	Reported *p* value
Mild intraoperative pain/discomfort, n (%)	2 (10%)	1 (5%)	>0.05
Poor quality of analgesia, n (%)	0 (0%)	0 (0%)	>0.05
Nausea/vomiting, n (%)	0 (0%)	0 (0%)	>0.05
Hypertension, n (%)	0 (0%)	0 (0%)	>0.05
Hypoxia, n (%)	0 (0%)	0 (0%)	>0.05

The intraoperative quality of analgesia was excellent and the same in both groups (Table 3). Two patients (10%) in Group I and one patient (5%) in Group II complained of mild pain and discomfort, but no additional analgesic was required, and the difference was statistically insignificant ($p > 0.05$). None of the patients in either group had poor quality of analgesia. From 6 hours, patients in both groups showed a significantly lower VAS score >4. No side effects such as nausea, vomiting, hypertension or hypoxia were reported in either group.

5. Discussion

During the present study, the brachial plexus was successfully blocked under ultrasound guidance, and anatomical variation of important structures, individual nerves and accurate needle placement could be visualised at the brachial plexus site before infiltration of the study drug solutions. The study compared two doses of dexamethasone, 4 mg and 8 mg, as adjuvants to 0.5% ropivacaine for ultrasound-guided supraclavicular brachial plexus block in patients undergoing elective upper-limb surgery. Sex, age and ASA grades were similar in both groups. The mean duration of surgery was 113.20 (SD 16.70) minutes in Group I and 114.66 (SD 16.30) minutes in Group II; the t-test was insignificant ($p = 0.85$). The onset and duration of both sensory and motor block were similar in both groups, with no statistically significant difference; these findings are more or less in agreement with previous studies. The duration of analgesia was also longer and similar in both groups (Krishna *et al.*, 2017; Srinivas *et al.*, 2019).

In this study, we demonstrated that in patients undergoing supraclavicular brachial plexus block, dexamethasone added to ropivacaine shortens sensory and motor block onset time and extends block duration. Brachial plexus block is an easy and relatively safe procedure for upper limb surgeries. Ropivacaine provided better operating conditions, but the duration of analgesia is rarely maintained for more than 4–6 hours; addition of a steroid to the local anaesthetic effectively and significantly prolonged the duration of analgesia, as well as producing an earlier onset of action (Golwala *et al.*, 2009). Steroids are very potent anti-inflammatory and immunosuppressive agents, and perineural injection of steroid is reported to influence postoperative analgesia. Epidural steroids have been used for the treatment of back pain and sciatica (Benzon, 1999).

Various steroids have been used for this purpose, but dexamethasone, a synthetic glucocorticoid, is preferred because of its highly potent anti-inflammatory property, about 25–30 times as potent as hydrocortisone, without any mineralocorticoid activity; it was thus found to be safer and devoid of potential side effects. Preoperative administration of dexamethasone by the oral and intravenous routes has been shown to reduce overall pain scores and analgesic requirements in the postoperative period without any adverse effect in various oral and general surgical procedures (Elhakim *et al.*, 2003). Dexamethasone is also known to reduce postoperative nausea and vomiting. The possible mechanism of its analgesic and antiemetic effects is the anti-inflammatory property of dexamethasone (Bisgaard *et al.*, 2003). Moreover, despite the concern surrounding the "off-label" use of perineural adjuvants, the safety profile of

dexamethasone is promising (Liu *et al.*, 1998). None of our patients complained of neurotoxicity or any other side effect attributed to dexamethasone (Neal *et al.*, 2009).

6. Conclusion

In the present comparative study, the administration of dexamethasone in different doses (4 mg vs 8 mg) as an adjuvant to ropivacaine in supraclavicular brachial plexus block significantly prolonged the duration of postoperative analgesia and of sensory and motor blocks in patients undergoing upper limb surgeries, which lasted much longer than that produced by local anaesthetic alone. Similar results were obtained in both groups with different doses of dexamethasone, suggesting that the lower dose of steroid may be preferable. However, further pharmacological, neuromuscular and genetic studies of different doses of steroids are needed. These findings do not establish equivalence or non-inferiority of the two doses, but they indicate that a clear additional benefit of 8 mg over 4 mg was not demonstrated in this small sample. Further adequately powered studies with clearly defined outcomes and robust methodology are needed.

Declarations

Conflict of interest: The authors declare no conflict of interest.

References

Benzon, H.T. (1999). Epidural steroids. In: Raj PP (Ed.), Pain Medicine: A Comprehensive Review, pp. 259-263. *Mosby, London*.

Bisgaard, T., Klarskov, B. *et al.* (2003). Pre-operative dexamethasone improves surgical outcome after laparoscopic cholecystectomy: A randomized double-blind placebo-controlled trial. *Annals of Surgery*, 238: 651-660.

Castillo, J., Curley, J., Hotz, J., Uezono, M., Tigner, J., Chasin, M. *et al.* (1996). Glucocorticoids prolong rat sciatic nerve blockade in vivo from bupivacaine microspheres. *Anesthesiology*, 85: 1157-1166.

D'Souza, R.S. and Johnson, R.L. (2023). Supraclavicular block. *StatPearls [Internet], StatPearls Publishing, Treasure Island (FL)*. https://www.ncbi.nlm.nih.gov/books/NBK519056/

Drager, C., Benziger, D., Gao, F. and Berde, C.B. (1998). Prolonged intercostal nerve blockade in sheep using controlled-release of bupivacaine and dexamethasone from polymer microspheres. *Anesthesiology*, 89: 969-974.

Elhakim, M., Ali, N.M. *et al.* (2003). Dexamethasone reduces postoperative vomiting and pain after paediatric tonsillectomy. *Canadian Journal of Anaesthesia*, 50: 392-397.

Golwala, M.P., Swadia, V.N., Dhimar, A.A. and Sridhar, N.V. (2009). Pain relief by dexamethasone as an adjuvant to local anaesthetics in supraclavicular brachial plexus block. *Journal of Anaesthesiology Clinical Pharmacology*, 25(3): 285-288.

Kalashetty, M.B. and Hasaraddi, G.S. (2019). Efficacy of ropivacaine alone and ropivacaine with dexamethasone in supraclavicular brachial plexus block: A comparative study in north Karnataka population. *MedPulse International Journal of Anesthesiology*, 11(3): 274-277.

Krishna, S.S., Chandra, G.P. and Chaithanya, C.K. (2017). Comparative study of ropivacaine alone versus ropivacaine with dexamethasone in supraclavicular brachial plexus block. *International Surgery Journal*, 4(12): 3879-3883. https://doi.org/10.18203/2349-2902.isj20175100

Kulenkampff, D. (1928). Brachial plexus anaesthesia: Its indication, technique, and dangers. *Annals of Surgery*, 87(6): 883-891.

Liu, K., Hsu, C.C. and Chia, Y.Y. (1998). Effect of dexamethasone on postoperative pain and emesis. *British Journal of Anaesthesia*, 80: 85-86.

Neal, J.M., Rathmell, J.P. and Rowlingson, J.C. (2009). Publishing studies that involve "off-label" use of drugs: Formalizing Regional Anesthesia and Pain Medicine's policy. *Regional Anesthesia and Pain Medicine*, 34(5): 391-392. https://doi.org/10.1097/AAP.0b013e3181b87066

Srinivas, K., Karthika, K. and Murthy, K.S. (2019). Effect of dexamethasone as adjuvant to ropivacaine in ultrasound guided supraclavicular brachial plexus block. *Indian Journal of Anesthesia and Analgesia*, 6(2): 443-448. https://doi.org/10.21088/ijaa.2349.8471.6219.12

Vieira, P.A., Pulai, I., Tsao, G.C., Manikantan, P., Keller, B. and Connelly, N.R. (2010). Dexamethasone with bupivacaine increases duration of analgesia in ultrasound-guided interscalene brachial plexus blockade. *European Journal of Anaesthesiology*, 27: 285-288.

Cite this article as: Rajdeep Kour, Neha Sharma and Neha Sharma (2026). Comparison of 4 mg and 8 mg dexamethasone as adjuvants to 0.5% ropivacaine in ultrasound-guided supraclavicular brachial plexus block. *African Research Journal of Medical Sciences*, 3(2): 214-219. doi: 10.62587/AFRJMS.3.2.2026.214-219.