(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 5, Issue 3, Page No: 1148-1154
May-June 2022

IJMSCR

Effect Of Dexamethasone As An Additive To Local Anaesthetics For Ultrasound Guided Supraclavicular Block For Upper Limb Surgeries.

[1]Nasir Jeelani Wani, [2]Mufti Mehmood, [3]Asma Hassan Mufti,
[1]Consultant, [2.3]Senior Resident,
[1]Department of Anaesthesia and Critical Care, [2]Department of Orthopedics,
[3]Department of Obstetrics and Gynecology,
Government Medical College Srinagar, India

***Corresponding Author:**
Asma Hassan Mufti
Senior Resident Department of Obstetrics and Gynecology, Government Medical College Srinagar, India

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Objective; Use of adjuvants in local anaesthetics is one of the methods for prolonging analgesia after surgery. Dexamethasone is readily available drug with a good safety profile. The present study was designed to study effect of dexamethasone as an adjuvant to local anaesthetic drugs when used for ultrasound guided supraclavicular block for upper limb orthopedic surgery.

Methodology This prospective, randomized double blind study was conducted at a tertiary care hospital. Institutional ethics committee approval was taken. 80 patients over period of eight months were enrolled in this study after obtaining written informed consent. In Group A drugs used were, 0.5% Ropivacaine 20ml + 0.1% Lignocaine 10ml + Dexamethasone 4mg (1ml); in Group B patients were given 0.5% Ropivacaine 20ml + 0.1% Lignocaine 10ml + Normal Saline 1ml.

Ultrasound guided supraclavicular block was performed by 23 G Quincke needle. Patients were observed for onset of sensory and motor blockade, time taken to complete surgical anaesthesia and duration of blockade. Pain scores were observed for 24 hours in postoperative period. Need for rescue analgesia was also recorded.

Results and Conclusion Use of dexamethasone as an adjuvant resulted in quick onset of motor blockade. Time to achieve complete blockade for surgery was significantly faster in dexamethasone group, also duration of nerve blockade was significantly longer by almost 2 hours. Postoperative pain scores were significantly lower with lesser rescue analgesia requirement when dexamethasone was used as an adjuvant.

This study demonstrates effectiveness of dexamethasone as adjuvant. No significant complications were noted. Therefore, its use is advocated and should be promoted for routine addition to local anaesthetics in peripheral nerve blocks.

Keywords: dexamethasone, supraclavicular block, postoperative analgesia

Introduction

Brachial plexus blocks have evolved as an alternative to General Anaesthesia for upper limb surgeries. For upper limb surgeries, nerves of brachial plexus can be blocked at various levels, depending on type of surgery. These techniques are classified by the level at which the needle or catheter is inserted for injecting local anaesthetic - interscalene block, supraclavicular block, infraclavicular and axillary block.

Supraclavicular brachial plexus block was described by Kulenkampff.[1] It provides effective anaesthesia and analgesia for upper limb surgery. Trunks and divisions of brachial plexus are in close proximity while crossing the first rib.[2] The landmark-based approach is not used frequently as there is risk of

inadvertent pneumothorax.[2] Ultrasound guided approach for supraclavicular block was first described by Kapral et al.[3] Use of ultrasound has increased the success rate and has also increased the safety margin.[4] Limiting factors for this approach is increased cost and expertise needed.[4]

Orthopedic surgeries are associated with severe pain. Effective management of postoperative pain improves patient satisfaction and hastens recovery. Use of peripheral nerve blocks has improved patient outcome and satisfaction, besides providing anaesthesia for surgery they provide postoperative analgesia. Catheters based techniques can be used to provide prolonged analgesia after surgery, however they present with challenge of catheter displacement and have potential for increased infection risk.[5] Other method to prolong analgesia is by adding adjuvants to local anesthetics. Several different additives are being used including epinephrine, opioids[6], clonidine[7], dexmedetomidine[8] among others. However, they are associated with side effects like sedation, bradycardia, sedation or respiratory depression.[6,7,8] Dexamethasone has also been studied as an adjuvant with varied results. It is cheap, easily available drug with a good safety profile.

The present study was designed to study effect of dexamethasone as an adjuvant to local anaesthetic drugs, for ultrasound guided supraclavicular block for upper limb orthopedic surgery. Primary aim of study was effect of dexamethasone on prolongation of postoperative analgesia and requirement of rescue analgesia, its effect on onset of blockade and time required for achievement of surgical anaesthesia.

Materials and Methods

This prospective, randomized double blind study was conducted at a tertiary care hospital, Government Medical College Srinagar, India for a period of eight months from January 2021 to August 2021.

After obtaining approval from the ethical committee of the Institute, an informed written consent was obtained from all the patients undergoing the study. 80 patients of either sex aged 20-60 years, belonging to ASA physical status I or II undergoing elective surgery of upper limb including hand, forearm or elbow were recruited for this study. Exclusion criteria for the study was any contraindication for peripheral nerve block, including coagulopathy, neurological disorder, any severe systemic disease, localized or systemic infection or allergy to the study drug.

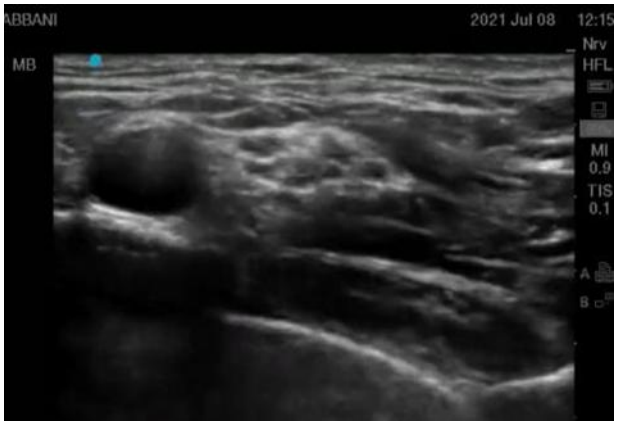
Pre anaesthesia assessment was done day before surgery. Before the procedure patients received Midazolam 1 mg intravenous as premedication. Standard anaesthesia monitoring was done (ECG, Blood Pressure, Pulse Oximetry). Drug solution was prepared by an anaesthetist not involved in the performance of the block. Patients were randomly allocated into two groups by computer generated random numbers with 40 patients in each group. **Group A** - Patients were given 0.5% Ropivacaine 20ml + 0.1% Lignocaine 10ml + Dexamethasone 4mg (1ml); **Group B** - Patients were given 0.5% Ropivacaine 20ml + 0.1% Lignocaine 10ml + Normal Saline 1ml.

UAAP ultrasound guided supraclavicular block was performed by 23 G Quincke needle under USG guidance (Figure1 & Figure 2).

Figure 1: Using linear probe for imaging under all aseptic precautions.

Volume 5, Issue 3; May-June 2022; Page No 1148-1154

Figure 2: Supraclavicular block sonoanatomy

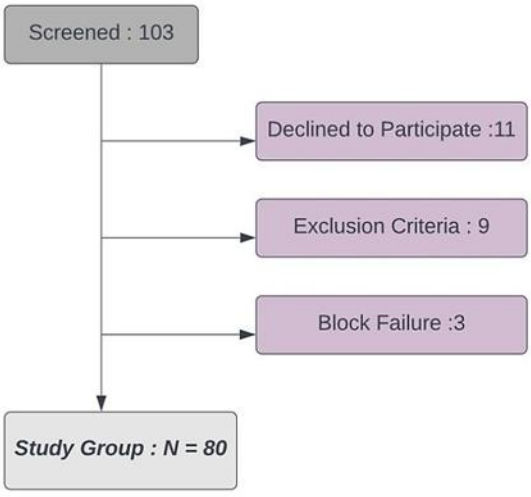


Onset of sensory block was assessed by the time between drug injection and complete loss of pin-prick sensation in C4-C5 dermatome. Onset of Motor block was defined as reduction of muscle power to grade 3 or less and was noted. Time taken for attainment of surgical anaesthesia was also recorded. If surgical anaesthesia was not achieved in a patient even after 30 min from the anaesthetic injection, the case was considered as failed block and the surgery was then performed under general anaesthesia. Requirement of any analgesics intraoperatively was to be noted.

Post-operatively an observer unaware of patient groups assessed pain score (Visual Analogue Scale – VAS; 0= No pain, 1-3= Mild pain, 4-6= Moderate pain, 7-10= Severe pain.) every 4 hourly till 24 hours. Requirement of rescue analgesia doses in first 24 hours recorded. Rescue analgesia if required was given by injection paracetamol 15mg/kg when VAS is >4.

Statical Analysis : The recorded data was compiled and analyzed using SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean ± SD and categorical variables were summarized as frequencies and percentages. Student's independent t-test was employed for comparing continuous variables. Chi-square test or Fisher's exact test, whichever appropriate, was applied for comparing categorical variables. A P-value of less than 0.05 was considered statistically significant.

Figure 3: Patient enrollment flowchart



Results

The demographic data of the patients included in the study is recorded in Table 1.

Volume 5, Issue 3; May-June 2022; Page No 1148-1154

Table 1: Demographic data			
	Group A	**Group B**	**P Value**
Age (years)	39.1 ± 12.17	41.5 ± 11.61	0.401
Sex (male/female)	33/7	30/10	0.471
Weight (kg)	58 ± 7.33	61 ± 9.92	0.440

Mean age in Group A patients in our study was 39.1 years where as mean age in Group B patients was 41.5 years. Group A had 82.5% male patients while as Group B had 75% male patients. The mean weight in Group A was 58 kg while as mean weight in group B is 61 kg. Difference in demographic data between the two groups is insignificant, so the two study groups are comparable.

Table 2: Onset of Motor and Sensory block in two groups			
	Group A	**Group B**	**P-value**
Onset of motor block (Minutes)	11.3 ± 1.56	15.4 ± 1.73	<0.001*
Onset of sensory block (Minutes)	10.6 ± 1.75	11.1 ± 1.64	0.155

Mean onset of motor block in Group A was 11.3 minutes while as it was 15.4 minutes in Group B, while as mean onset of sensory block in Group A was 10.6 minutes while as it was 11.1 minutes in Group B.

Table 3: Time to achieve complete block in two groups		
Time to achieve complete block (minutes)	**Mean**	**P-value**
Group A	20.6 ± 4.21	<0.001*
Group B	26.1 ± 2.58	

Mean time (minutes) to achieve complete block in Group A was 20.6 and in Group B it was 26.1 minutes.

Table 4: Duration of Motor and Sensory block in two groups			
	Group A	**Group B**	**P-value**
Duration of motor block (hours)	9.1 ± 1.64	7.2 ± 1.55	<0.001*
Duration of sensory block (hours)	9.7 ± 1.71	7.8 ± 1.44	<0.001*

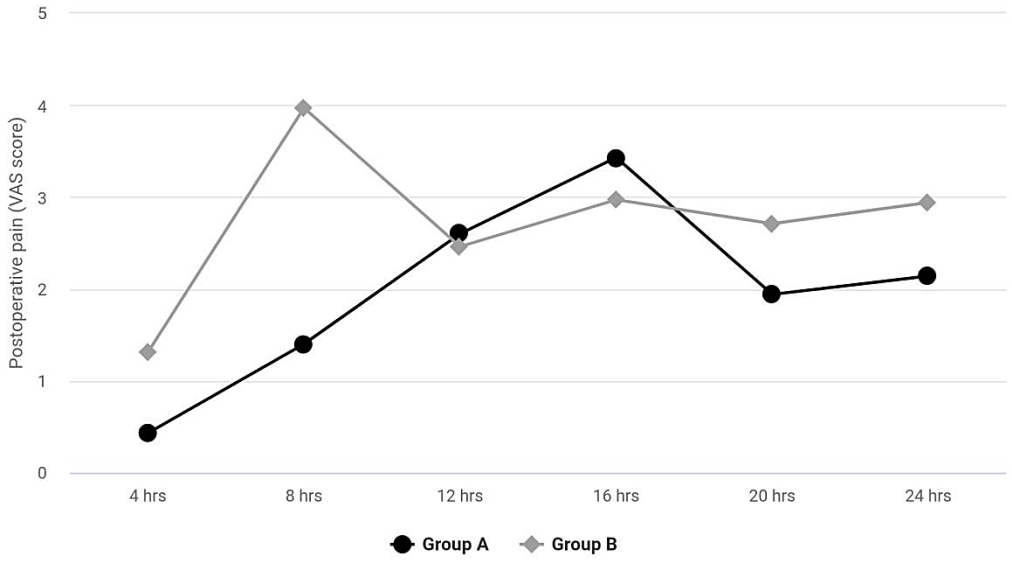
Mean duration (hours) of motor block in Group A was 9.1 and in Group B it was 7.2 hours whereas the mean time (hours) of sensory block in Group A was 9.7 and in Group B it was 7.8 hours.

Table 5: Postoperative pain (VAS score), Comparison between two groups at various intervals of time			
VAS	**Group A**	**Group B**	**P-value**
	Mean	**Mean**	
4 Hrs	0.43 ±0.50	1.31 ±0.72	<0.001*
8 Hrs	1.40 ±0.88	3.97 ±1.04	<0.001*

Volume 5, Issue 3; May-June 2022; Page No 1148-1154

12 Hrs	2.60 ±1.24	2.46 ±1.88	0.709
16 Hrs	3.43 ±1.75	2.97 ±1.64	0.263
20 Hrs	1.94 ±1.43	2.71 ±1.36	0.024*
24 Hrs	2.14 ±1.88	2.94 ±1.91	0.082

Figure 4 Postoperative pain (VAS score) at various intervals of time - Line chart



Mean postoperative VAS score of Group A and Group B at 4 hours was 0.43 and 1.31, at 8 hours it was 1.40 and 3.97 in Group A and B. At 12 hours mean VAS score of Group RT was 2.60 and that of Group RF was 2.46. Mean postoperative VAS score at 16 hours was 3.43 and 2.97 in Group A and B, at 20 hours mean postoperative VAS score was 1.94 and 2.71 in two study groups. At 24 hours mean VAS score was 2.14 in Group A and 2.94 in Group B.

Table 6: Requirement of rescue analgesic doses in two groups

	Group A		**Group B**		**P-value**
	No.	**%age**	**No.**	**%age**	
1 Dose	12	30.0	5	12.5	<0.001*
2 Doses	18	45.0	3	7.5	
3 Doses	3	7.5	20	50.0	

Rescue analgesia of two doses was needed in 18 patients in Group A, while as 3 doses were needed in 20 (50%) patients in Group B.

No significant postoperative complication related to supraclavicular block and drugs used were noted.

Discussion

Use of ultrasound has popularized use of peripheral nerve blocks due better safety profile and postoperative benefits, including reduced pain, early mobility and the avoidance of risk and side effects of general anaesthesia.[9]

This prospective randomized study demonstrates effectiveness of dexamethasone as additive to local anaesthetics. Dexamethasone is a potent long-acting glucocorticoid, and has been shown to prolong regional anaesthesia and analgesia. Several mechanisms have been proposed including steroid

Volume 5, Issue 3; May-June 2022; Page No 1148-1154

induced vasoconstriction which reduces local anaesthesia absorption. Steroids also increase activity of inhibitory potassium channels on nociceptive C-fiber and inhibit release of various inflammatory mediators. All these mechanisms are proposed to prolong analgesia.[10,11] Studies have been done demonstrating effect of dexamethasone as adjuvant to local anaesthetics for brachial plexus blocks and they differed in regards to onset and duration of sensory and motor blockade.[12]

In our study the demographic difference between the two groups is insignificant and hence two groups are comparable. We observed that there is significant difference in motor blockade between the two groups, motor block being faster in group where dexamethasone was used as an adjuvant. The difference between onset of sensory block was insignificant. Time to achieve complete blockade for surgery was significantly faster in dexamethasone group. The duration of sensory and motor blockade was significantly longer in dexamethasone group by almost 2 hours.

There was significant difference in postoperative pain scores (VAS) between two groups at 4hr, 8hr and 20hr interval. Also, the pain scores were lower in dexamethasone group.

Rescue analgesia of two doses was needed in 18 (45%) patients in Group A, while as 3 doses were needed in 20 (50%) patients in Group B. Hence the requirement of rescue analgesia was lesser in dexamethasone group. These results were comparable to other studies done using dexamethasone as adjuvant.[13,14]

Limitations: One of the limitations of this study is the small sample size of only 80 patients. Due to ongoing COVID 19 pandemic, not many patients could be included in the study. A multicentric study with a large sample size is required and will give a better picture. Also, the optimal dosage of dexamethasone to be used as an adjuvant remains uncertain. Future dose-finding studies are required to elucidate optimal dose of dexamethasone. Reported rates of complications both pneumothorax, hemidiaphragmatic paresis or intravascular injection refer to clinically symptomatic cases. The possibility of asymptomatic cases cannot be excluded.

Conclusion

Supraclavicular block for upper extremity surgery resulted in good postoperative analgesia in both the groups of our study. However, when dexamethasone was used as an adjuvant, it resulted in faster onset and longer duration of blockade. It also resulted in decreased requirement of rescue analgesia in first 24 hours. No significant complications were noted. Therefore, its use is advocated and should be promoted for routine addition to local anaesthetics in peripheral nerve blocks.

Authorship - Nasir Jeelani Wani performed this study in operation theater and contributed in drafting the manuscript. Mufti Mehmood was involved with recording observations. Asma Hassan Mufti was involved with statical analysis and designing of this study.

Decleration

The authors certify that informed written consent has been obtained from all the participants of the study.

References

1. Kulenkampff D. Brachial plexus anaesthesia: its indications, technique, and dangers. Ann Surg 1928;87:883–891.
2. Vermeylen K, Engelen S, Sermeus L, Soetens F, Van de Velde M. Supraclavicular brachial plexus blocks: review and current practice. Acta Anaesthesiol Belg 2012;63:15–21.
3. Kapral S, Krafft P, Eibenberger K, et al. Ultrasound-guided supraclavicular approach for regional anesthesia of the brachial plexus. Anesth Analg 1994;78:507–513.
4. Chan VW, Perlas A, Rawson R, Odukoya O. Ultrasound-guided supraclavicular brachial plexus block. Anesth Analg 2003;97:1514-7.
5. Ilfeld BM. Continuous peripheral nerve blocks: a review of the published evidence. Anesth Analg. 2011; 113(4):904–25. doi: 10.1213/ANE.0b013e3182285e01 PMID: 21821511
6. Karakaya D, Büyükgöz F, Bariş S, Güldoğuş F, Tür A. Addition of fentanyl to bupivacaine prolongs anesthesia and analgesia in axillary brachial plexus block. Reg Anesth Pain Med 2001;26:434-8.

Volume 5, Issue 3; May-June 2022; Page No 1148-1154

7. Duma A, Urbanek B, Sitzwohl C, Kreiger A, Zimpfer M, Kapral S, et al. Clonidine as an adjuvant to local anaesthetic axillary brachial plexus block: A randomized, controlled study. Br J Anaesth 2005;94:112-6.
8. Noss C, MacKenzie L, Kostash M. Dexamethasone – A promising adjuvant in brachial plexus anaesthesia? A systematic review. J Anesth Clin Res 2014;5:421.
9. Offierski C. Peripheral nerve blocks for distal extremity surgery. Clin Plast Surg. 2013;40(4):551-555.
10. Marks R, Barlow JW, Funder JW. Steroid-induced vasoconstriction: Glucocorticoid antagonist studies. J Clin Endocrinol Metab 1982;54:1075-7.
11. Seidenari S, Di Nardo A, Mantovani L, Giannetti A. Parallel intraindividual evaluation of the vasoconstrictory action and the anti-allergic activity of topical corticosteroids. Exp Dermatol 1997;6:75-80.
12. Mamdouh LE, Ghada HA, Sherief ZI, Eldin AA, Tarek EA. Effect of addition of dexamethasone to low volumes of local anaesthetics for ultrasound-guided supraclavicular brachial plexus block. Menoufia Med J 2015;28:928-34.
13. Nigam R, Murthy M, Kosam D, Kujur AR. Efficacy of dexamethasone as an adjuvant to bupivacaine in supraclavicular brachial plexus block. J Evol Med Dent Sci 2015;4:1115763.
14. Biradar PA, Kaimar P, Gopalakrishna K. Effect of dexamethasone added to lidocaine in supraclavicular brachial plexus block: A prospective, randomised, double-blind study. Indian J Anaesth 2013;57:180-4

Volume 5, Issue 3; May-June 2022; Page No 1148-1154