



EFFICACY OF DEXAMETHASONE ADDED AS AN ADJUVANT TO ROPIVACAINE(0.5%) VERSUS ROPIVACAINE (0.5%) IN BRACHIAL PLEXUS BLOCK

Anaesthesiology

Dr. Om Prakash Saini

3rd year PG resident, Anaesthesia Department, Jhalawar Medical College, Jhalawar (raj.)

Dr. Sandeep Kumawat

3rd year PG resident, Anaesthesia Department, Jhalawar Medical College, Jhalawar (raj.)

Dr S. P. Chittora

MD, FICA, Senior Professor & Head, Department Of Anaesthesiology, Jhalawar Medical College & Associated Hospital, Jhalawar (rajasthan)

ABSTRACT

Introduction: Brachial plexus block is a reliable regional anaesthetic technique for upper limb surgery. Adjuvants to local anesthetics for brachial plexus block may enhance the quality and duration of sensory, motor blockade and analgesia. We used dexamethasone 8 mg along with 0.5% ropivacaine for supraclavicular brachial plexus block.

Aims & Objectives :

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

Methods and materials: 60 ASA grade I and II patients, 21-60 years old, scheduled for upper limb surgeries under supraclavicular brachial plexus block, were included in this prospective study. The patients were randomly assigned to two groups, Group R which received inj.ropivacaine 0.5% 30ml + 2ml normal saline and Group RD which received inj.ropivacaine 0.5% 30 ml+ inj dexamethasone 2 ml (8 mg). Onset and recovery time of sensory and motor block, quality of block and duration of analgesia were studied in both groups.

Results: The two groups were comparable in demographic data. Group RD showed early onset of sensory and motor block ($P < 0.05$). Duration of sensory and motor block was also prolonged in group RD ($P < 0.05$). Mean time for analgesia requirement in postoperative period was significant longer in group B ($P < 0.05$).

Conclusion: Brachial plexus block via supraclavicular approach provide postoperative analgesia of short duration even when a long acting local anesthetic is used without adjuvant . Adjuvant like dexamethasone 8mg to 0.5% ropivacaine for supraclavicular brachial plexus block provides faster onset and prolonged duration of sensory and motor blockade.

KEYWORDS

Dexamethasone, Ropivacaine, Brachial Plexus Block, Supraclavicular Block, Post operative Analgesia.

INTRODUCTION:

Regional anaesthesia techniques provide important advantages including excellent pain control, reduced side effect and shortened stay in the post anaesthesia care unit⁽¹⁾. Brachial plexus block is often used either as an adjuvant to general anesthesia (GA) or as a sole anesthesia modality. Brachial plexus blockade for ambulatory upper-limb surgery can significantly reduce pain and nausea, allowing for faster discharge from hospital when compared with GA. Supraclavicular brachial plexus block is safe, time efficient, cost effective technique that provide satisfactory surgical condition like complete motor and sensory block.⁽²⁾

Brachial plexus block is a reliable regional anaesthetic technique for upper limb surgery. Local anesthetics alone does not provide analgesia for more than 4-8 hours. Prolonging the duration of sensory and motor blockade of regional anaesthetic techniques is often desirable to provide intra operative anesthesia and analgesia in the post operative period without any systemic side effects. Adjuvants to local anesthetics for brachial plexus block may enhance the quality and duration of sensory, motor blockade and analgesia. Hence, various adjuvant such as opioids, clonidine, neostigmine, dexamethasone, midazolam, were added to local anaesthetic in brachial plexus block to achieve quick dense and prolonged block but result are either inconclusive or associated with side effects.⁽³⁾ Dexamethasone being an age old, easily available over the counter, cheap, and safe drug having significant analgesic properties attracts attention. Many studies have shown that dexamethasone as an adjuvant to local anesthetics prolongs motor and sensory blockade in SCBP block.⁽⁴⁾

AIMS & OBJECTIVES:

This study tested the hypothesis that adding dexamethasone significantly prolongs the duration of ropivacaine. So we studied

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

MATERIAL AND METHOD:

The Study was conducted in 60 adult patients of age 21-60 years in department of Anaesthesiology, orthopaedic operation theatre at Jhalawar Medical College and associated Hospital, Jhalawar with due

permission from institutional Ethics committee with informed consent. A prospective, randomized, controlled, clinical study was conducted on 60 ASA I or II patients posted for elective and emergency undergoing upper limb surgeries under supra clavicular brachial plexus block.

Patients were randomly divided into 2 groups. Group R (n=25) were administered 30 ml of 0.5% Ropivacaine and 2 ml of normal saline; Group RD (n=25) were given 30 ml of 0.5% Ropivacaine and 8 mg (2 ml) Dexamethasone.

Inclusion criteria:

1. ASA class I and II,
2. Age = 21 to 60 years,
3. SBP = 100-139 mm of Hg,
4. DBP = 60-89 mm of Hg.

Exclusion criteria:

1. ASA class III and IV,
2. Infection at the site of injection,
3. Presence of co-morbidities,
4. Presence of coagulopathies,
5. Hypersensitivity to any of the drugs used in this study.

Sensory block was assessed by a **3 point scale:** 0 - normal sensation (feeling of pain), 1 - loss of sensation of pinprick (analgesia), 2 - loss of sensation of touch (anesthesia).

Onset of time and duration of sensory block were recorded. Onset time defined as the time interval between the end of LA administration and loss of sensation of pinprick (score 1). Duration of sensory block is defined as the time interval between loss of sensation of pinprick (onset time) and recovery of touch sensation.

Motor block was assessed by **Modified Bromage scale:** Grade 0- Normal motor function with full flexion and extension of elbow, wrist and finger, Grade 1- Decreased motor strength with ability to move finger only, Grade 2- Complete motor block with inability to move fingers

Onset and duration of motor blockade were recorded. Motor blockade onset time defined as the time interval between the end of LA administration and decreased motor strength (MBS score 1). Duration of motor block defined as the time interval from the onset (MBS score 1) to the recovery of complete motor function (MBS score 0).

Pain will be assessed using a standard **visual analogue scale (VAS)**.

Visual Analogue Scale (VAS)

1-----1-----1-----1-----1-----1-----1-----1-----1-----1

0 1 2 3 4 5 6 7 8 9 10

No pain mild moderate pain worst possible pain

Procedure:

After pre anaesthetic check up, patients posted for surgery were kept overnight fasting after midnight. Patient's written informed consent and PAC checked. All patients were premedicated with 150mg ranitidine and 8mg ondansetron orally on the morning of surgery. Before the procedure, visual analogue scale (VAS) on 0-10 cm was explained to the patient for the assessment of pain where 0 denotes no pain and 10 denotes worst pain. Intravenous access obtained on opposite upper limb. Baseline vital parameter documented. Patient was given i.v. midazolam 1mg and fentanyl 0.5µg/kg prior to block.

Position of patient –On operation table, patient was given position for brachial plexus block via supraclavicular approach. Supine position with head resting on ring, ipsilateral arm abducted, shoulder depressed and roller pack placed in between scapula and head turned slightly to contralateral side. Under all aseptic precaution, local site was prepared. Subclavian artery palpated 1 to 1.5 cm. above midclavicular point and push medially by thumb. An insulated needle (23G, 5 cm) was directed posteriorly, caudally and toward the axilla. Once the desirable evoked motor response was obtained at 0.4 mA by peripheral nerve stimulator, the needle was stabilized and total volume of drug mixture was injected. If there was no adequate response, the needle was moved anteriorly or posteriorly along the first rib to elicit a response. Following the injection, the area was massaged to help the solution to dissipate along the plexus.

Intraoperative heart rate, systolic, diastolic and mean arterial pressures and the VAS scores noted every 5 min during the first 15 min, then every 15 min throughout the surgery and hourly thereafter till complete recovery of the block. Time for the first request of postoperative analgesic when VAS >3 (duration of analgesia) was noted and rescue analgesic intramuscular tramadol, 50 mg was given.

Statistical analysis: The demographic and clinical data of 60 patients were analyzed by univariate analysis, quantitative data by student's t test. P value of <0.05 would be considered statistically significant.

OBSERVATION AND RESULT:

After study of 60 cases, observation and result are summarised in tabulated form and described below

Table-1 Demographic data

PARAMETER	GROUP R	GROUP RD	P VALUE
SEX(M/F)	24/6	25/5	P= 1
AGE(YEARS)	32.4±9.8	32.84±9.35	P= 0.859
WEIGHT (KG)	60±6.8	59.12±5.63	P= 0.671
MEAN DURATION OF SURGERY	96.8±21.93	87.2±21.88	P= 0.095

No significant difference in male and female ratio, weight, age and mean duration of surgery between both group (p>0.05)

Table 2 Quality of Block and analgesia

MEAN TIME(MINUTES)	GROUP R	GROUP RD	P VAUE
ONSET OF SENSORY BLOCK	13.2±1.02	11.96±1.04	0.0001 (p<0.001)
ONSET OF MOTOR BLOCK	17.2±1.01	15.12±1.51	0.0001 (P<0.001)
DURATION OF SENSORY BLOCK	484.8±47.7	589±0.29	0.0001 (P<0.001)
DURATION OF MOTOR BLOCK	427.2±47.2	486±36.6	0.0005 (P<0.001)
FIRST ANALGESIC REQUIREMENT	543.6±21	1127±138.6	0.0001 (P<0.001)

Statistical significant difference in above parameters between both group (p<0.05)

The demographic data were similar in each group [Table 1]. Sensory and motor block onset time was earlier in group RD as compared with group R [Table 2] (P < 0.001). Sensory and motor blockade durations were longer in group RD than in group R [Table 2] (P < 0.001). Duration of analgesia was significantly longer in group RD than in group R [Table 2] (P < 0.001). However one patient in group RD complain mild pain and discomfort, but no additional analgesic required. It was clinically insignificant between the two groups. No side effects including nausea, vomiting, hypotension, and hypoxemia were reported in either group.

Figure 1: Onset of sensory and motor block

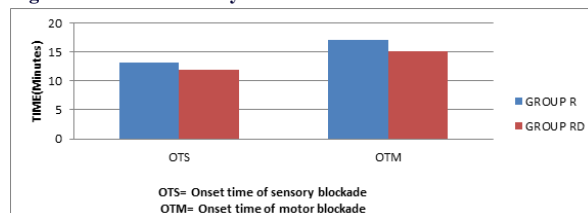


Figure 2: Duration of sensory and motor block

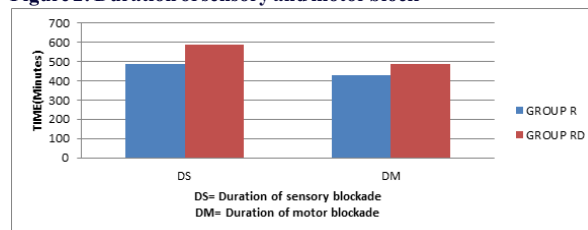
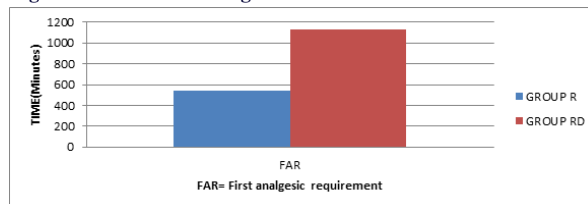


Figure 3: Duration of analgesia



DISCUSSION:

Supraclavicular block is easy and safe procedure for upper limb surgeries which provide quick, dense anesthetic block. Efficacy and success rate increases with experience. Ropivacaine alone provide duration of analgesia not more than 4-6 hours. In previous studies, various steroid used as adjuvants with local anesthetic for prolongation of duration of analgesia.^(5,6) Here we used dexamethasone which is derivative of synthetic glucocorticoid because of its highly potent anti-inflammatory property about 25-30 times potent as hydrocortisone with no mineralocorticoid property. It is safe and no side effects.

In our study we found that duration of analgesia was two fold increase in Ropivacaine with dexamethasone adjuvant group so first analgesic requirements mean time was 1127±138.6 in RD group and 543.6±21 in R group. Total dose of rescue analgesic was higher in Group R as compared to Group RD, which was statistically highly significant (P<0.001). There results coincide with study of Kumar S et al. (2014)⁽⁵⁾ in which Group R patients required first rescue analgesia earlier (557 ± 58.99 min) than those of Group D patients (1179.4 ± 108.60 min), which was also found statistically highly significant in Group D (P<0.001).

In our study highly significantly (p<0.001) early onset of sensory and motor block was noticed in group RD (11.96±1.04 min. and 15.12±1.51 min respectively) as compared to R group (13.2±1.02 and 17.2±1.01 min. respectively) which is due to synergistic action of dexamethasone with LA on nerve blockade. Our results coincide with study done by Feroz Ahmed Dar et al (2013)⁽⁶⁾ where they also noticed highly significantly (p<0.05) earlier onset of sensory and motor block as 14.65±3.31 and 18.01±4.51 min respectively in RD group as compared to R group 17.5±4.2 min and 20.67±3.03 min respectively.

Kumar S et al. (2014)⁽⁵⁾ studied that duration of sensory and motor

block highly significantly increase ($p < 0.001$) in dexamethasone group was 1179.4 ± 108.60 min and 1091.0 ± 106.74 min respectively compare to control R group was 557.25 ± 58.99 min and 465.62 ± 54.29 min respectively which coincides with results of our study where duration of sensory and motor block was 589 ± 29.9 min and 486 ± 36.6 min respectively in RD group, and 484.8 ± 47.7 min and 427.2 ± 47.2 min respectively in R group.

The mechanism of analgesia induced by dexamethasone is not fully understood and this effect is suspected to be mediated by their anti inflammatory or immunosuppressive effects. According to Attardi B et al (1993)⁽⁷⁾ steroids might bring about this effect by altering the function of potassium channels in the excitable cells and this might be the probable mechanism of action for prolongation of postoperative analgesia by dexamethasone in our study. The dose of dexamethasone as an adjuvant to local anesthetics for peripheral nerve block has not been described. We selected a dose of 8 mg because administration of this dose seems to be safe in adults.

In our study no major side effects like nausea, vomiting, bradycardia, hypotension and other were noted in both groups intraoperatively. Postoperatively no complication were observed in both groups.

We concluded that Dexamethasone (8 mg) when used as an adjuvant to 0.5% ropivacaine for upper extremity surgeries under nerve simulator-guided SCBP block delayed the need of rescue analgesic, decreased requirement for the same in first 24 h, produced faster onset, and prolonged the duration of sensory and motor block.

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