Original Article

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Comparison of Dexamethasone versus Dexmedetomidine as an Adjuvant to Local Anesthetic Drug in USG Guided Axillary Brachial Plexus Block

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Abstract

Background: The aim of the present research was to evaluate the safety and effectiveness of adding 8 mg dexamethasone and 50 mcg dexmedetomidine in 20 ml 0.5% bupivacaine in USG guided axillary brachial plexus block in adult subjects. **Subjects and Methods:** A randomized clinical research was performed in 60 subjects aged between 18 to 70 years of either gender having ASA grade I or II undergoing various scheduled upper limb surgeries. USG guided brachial plexus block was given. subjects in group A received 20ml bupivacaine 0.5% and dexamethasone 2ml (8 mg) while those in group B received 20ml bupivacaine 0.5% and dexmedetomidine 0.5ml (50mcg) +1.5 ml NS. Parameters observed were; onset of motor and sensory blockade; duration of motor and sensory blockade; Times of 1st rescue analgesia, cardiorespiratory effects and adverse effects. Post operatively subjects were evaluated by utilizing a 10-point Visual Analogue Scale (VAS). **Results:** There was no significant dissimilarity among the onset of motor and sensory blockade between the two groups. The length of motor block was significantly more in Group A. The duration of sensory block was significantly longer in Group A. The time for first analgesic prerequisite in Group A was 19.18± 0.87 hrs and in Group B was 13.03± 0.80 hrs. No complications were noted in either of the subjects among all the two groups. **Conclusion:** Adding of dexamethasone and dexmedetomidine as an adjuvant to bupivacaine for axillary brachial plexus block considerably extends the duration of sensory and motor block and duration of postoperative analgesia. Duration of motor block, sensory block and post operative analgesia is significantly extends in dexamethasone group compared to dexmedetomidine.

Keywords: Dexamethasone, Dexmedetomidine, Usg Guided Axillary Brachial Plexus Block.

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Introduction

Pain is a subjective and multidimensional occurrence which is frequently unnoticed by health care providers. Nontreated surgical pain may consequence in a reduce in alveolar ventilation and vital capacity and level pneumonic consolidation. It can cause tachycardia, hypertension, myocardial infarction, insomnia and poor wound healing. Significantly, post-operative pain managing is incorporated as one of the imperative discharge criteria in day care anesthesia. It may be linked with deep vein thrombosis (DVT) and pulmonary embolism, pneumonia, delayed wound healing and demoralization.[1]

Brachial plexus block provides us substitute anesthesia method to general anesthesia for upper limb surgeries. It has analgesic and opioid sparing reimbursement for upper limb surgery. Single shot peripheral nerve blocks as an option to general anesthesia have turn out to be a usual anesthesia method all through the world. Constant brachial plexus block can offer extended post-operative analgesia and opioids sparing effect; its utilization is restricted by its charge and management challenges.[2]

Many adjuvants have been added in the attempt to extend the period of local anesthetics like epinephrine butorphanol tartrate, dexamethasone, tramadol, buprenorphine, verapamil, methylprednisolone, clonidine, dexmedetomidine. Of all dexamethasone, dexmedetomidine has exposed capable consequences. Dexamethasone can diminish inflammation and augment the analgesic effect

owing to blockade of nociceptive C fibers and phospholipids A2. Dexmedetomidine, a more selective alpha-2 adrenoreceptor agonist, by acting through the alpha- 2 adrenoreceptor can persuade vasoconstriction along the injection site, prevents quick propagation of the local anesthetic and therefore extend its action.

The present research is performed to assess the onset time, duration of sensory and motor block, post operative analgesic duration, incidence of vomiting, requirements of rescue analgesic in the first 24 hours with 0.5% bupivacaine with 50 mcg of dexmedetomidine compared to 0.5%bupivacaine with 8mg of dexamethasone for USG guided axillary brachial plexus block.[2,3]

Subjects and Methods

A randomized prospective observational clinical study was carried out during the period of 2017 to 2020 after institutional review board approval on 60 subjects aged between 18 to 70 years of either sex having ASA grade I or II undergoing various scheduled upper limb surgeries under axillary brachial plexus block using injection bupivacaine 0.5% - 20ml with injection dexamethasone 2ml (8 mg) or injection dexmedetomidine 0.5ml (50mcg) as an adjuvant.

Pre-Requisites

All subjects went a thorough pre-anesthetic check-up which incorporated history taking, general and systemic examination. usual investigations like hemoglobin, blood sugar, blood urea, serum creatinine, serum electrolytes, prothrombin time with international normalized ratio and liver function test were carried out for all the subjects. Chest X-ray and ECG were also done.

Inclusion Criteria

- Subject aged between 18 to 70 years
- Having ASA grade I or II
- Undergoing diverse upper limb surgeries
- Planned surgeries

Exclusion Criteria

- ASA grade > 3
- Unwillingness of subjects
- Allergic to local anesthetics
- Local infection
- Subjects on anticoagulants or bleeding disorders& altered coagulation
- Neurological deficit involving brachial plexus

Preparation

All subjects were kept nil by mouth for at least 6 hours prior to surgery. An intravenous line was secured. Baseline pulse, blood pressure, saturation and respiratory rate were recorded.

Groups: Subjects were arbitrarily owed to either of the 2 groups of 30 each.

Group A: Injection Bupivacaine 0.5% 20ml Injection Dexamethasone 2ml (8 mg)

Group-B: Injection Bupivacaine 0.5% - 20ml

Injection Dexmedetomidine 0.5ml (50mcg) +1.5 ml NS

Pre-Medication

All subjects were pre-medicated with Inj. glycopyrrolate 0.004 mg/kg iv, Inj. ondansetron 0.08 mg/kg iv, Inj. midazolam 0.02 mg/kg iv. Vitals were noted before and after pre-medication.

Procedure

The subject was placed in the supine place, with the head twisted away from the side to be blocked and the ipsilateral arm adducted. Ultrasound assessment of the axilla was carrying out using a ultrasound machine with a 38-mm high frequency linear array transducer.

A 23G -3.75 cm sterile block needle was introduced percutaneously at the center of the transducer, directly parallel to the scanning beam. The needle was repositioned during injection and circumferential perineural injectate spread was ensured. After blockade of the ulnar, median, and radial nerves, the block needle was withdrawn to the subcutaneous tissues and redirected toward the musculocutaneous nerve.

The subjects were randomly divided into two groups. subjects in group A received 20ml bupivacaine 0.5% and dexamethasone 2ml (8 mg) while those in group B received 20ml bupivacaine 0.5% and dexmedetomidine 0.5ml (50mcg) +1.5 ml NS.

Sensory and motor function was evaluated in the innervations of each of the nerves. Block evaluation was performed at 5-min intervals up to 30 min following conclusion of the last perineural injection.

Sensory block was assessed by pin prick test using a 3-point scale :0 = normal sensation, 1= loss of sensation of pin prick(analgesia),2=loss of sensation of touch (anesthesia).Motor block assessed by using 3-point scale :0=normal motor function, 1=reduced motor strength but able to move fingers,2=complete motor block.

Onset time of sensory blockade, Complete sensory block, Duration of sensory block was, Onset of motor block, Duration of motor block was assessed.[4]

If the effect was inadequate, general anesthesia was given and those subjects were excluded from the study. Intra operatively tourniquet time, hemodynamic parameters like pulse rate, oxygen saturation, noninvasive arterial blood pressure, ECG were monitored at every 15min. Postoperatively subject was observed till rescue analgesia was given.

Total duration of analgesia was measured. Post operatively subjects were assessed by using a 10 point Visual Analogue Scale (VAS). The rescue analgesia in the form of inj. diclofenac sodium 75mg intravenously was administered at the VAD score of >3.[5]

Statistical Analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results & Discussion

No significant dissimilarity was observed in male: female ratio, weight, and age of subjects among both the groups. The mean onset of sensory and motor block was not significantly difference in both groups.

Table 1: Demographic Data

	Group A (n=30)	Group B (n=30)	P value	Inference
Sex(M/F)	16:14	15:15	>0.05	NS
Age(Years)	40.2 ±14.27	40.23±15.10	>0.05	NS
Weight(Kg)	49.57±6.02	51.7±5.86	>0.05	NS

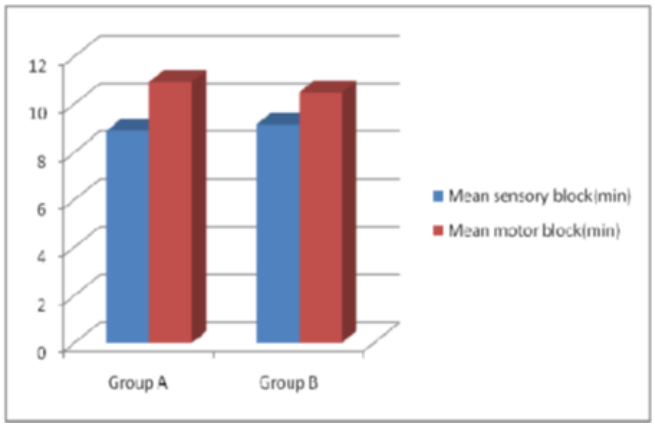

Figure 1: Onset of Anesthesia

The mean onset of sensory and motor block was not significantly difference in both groups.

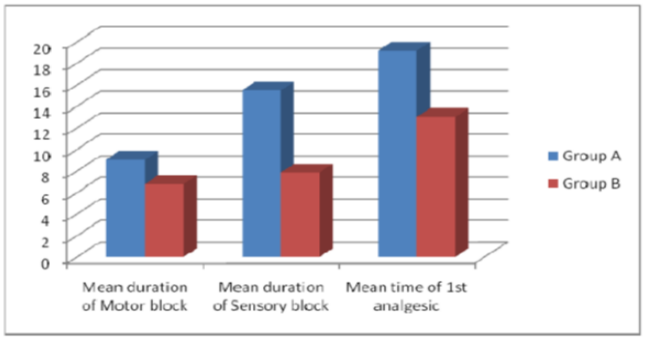

Figure 2: Duration of Analgesia and Anesthesia

Mean duration of motor block and sensory block are significantly extended in Group A than in group B. Mean time for first analgesic condition for Group A is 19.18±0.87 hrs and it is significantly extended than that in Group B (13.03±0.80) hrs.

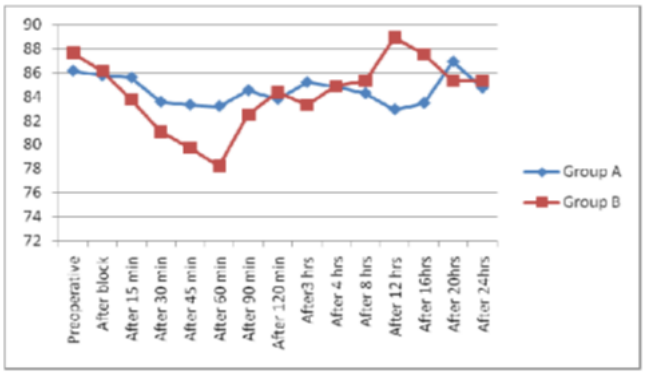

Figure 3: Pulse Variation with Time

As illustrated above in [Figure 3] shows that reduced heart rate was observed in Group B they were within 20% of the baseline.

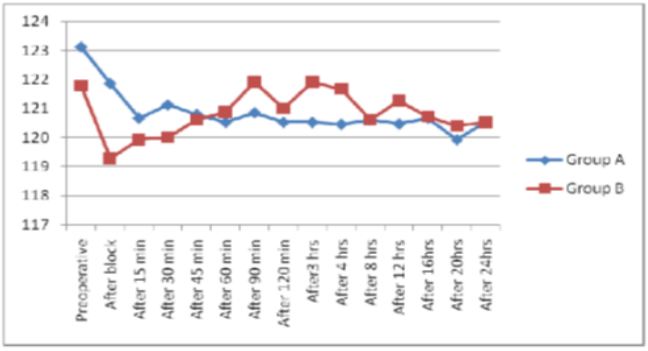

Figure 4: Systolic BP Variation with Time

The figure shows that there is no significant dissimilarity in systolic BP in the perioperative period in both groups.

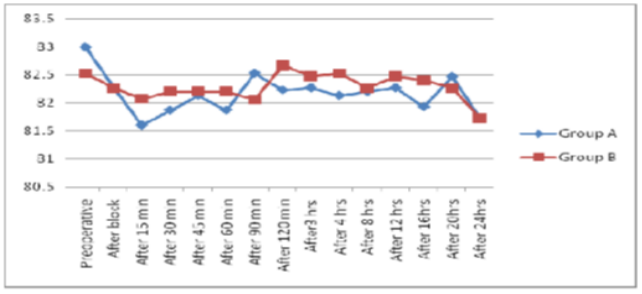

Figure 5: Diastolic BP Variation with Time

The figure shows that there is no significance difference in diastolic BP in the perioperative period in both groups.

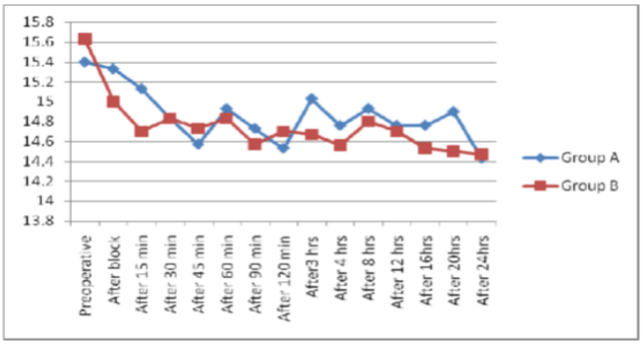

Figure 6: Respiratory Rate Variation with Time

Figure demonstrates that there is no significance difference in respiratory rate in the perioperative period in both groups.

Table 2: Complications & Adverse Effects

EVENT	No of Subjects	
	Group A	Group B
Tachycardia:p>20/min from baseline	Nil	Nil
Bradycardia:p<20/min from baseline	Nil	Nil
Hypotension : 20% decrease in relation to baseline value	Nil	Nil
Nausea/vomiting	Nil	Nil
Hematoma	Nil	Nil
Neurological squeal	Nil	Nil
LAST	Nil	Nil

As illustrated in [Table 2], no adverse effects were recorded in either of the subjects among all the groups. No incidence of decline in spo2 perioperatively. Brachial plexus blockade for ambulatory upper limb surgeries can significantly decrease pain and permit quicker discharge from hospital when compared with general anesthesia.[6,7]

Dexamethasone appeared as a potent corticosteroids utilized along with bupivacaine. Steroids persuade vasoconstriction diminish the systemic absorption of local anesthetic.6 Dexmedetomidine is a chemically active d-isomer of medetomidine with better specificity to alpha-2 receptors and facade an alpha-2: alpha-1 binding selectivity ratio about close to 1620:1 as a consequence of which unintentional adverse response owing to alpha-1 binding could be minimized.[8]

Demographic data shows no statistically significant dissimilarity between two groups.

Mean onset of sensory block was 8.87± 0.52 min in Group A and 9.13± 0.67 min in Group B. The mean of motor onset was 10.93 ±1.28 min in Group A and 10.48 ±0.45 min in Group B.

Smita R. Engineer et al,[6] concluded that the mean time of onset of sensory and motor block with bupivacaine plus 2ml isotonic saline was 14.32±1.71min and 18.64 ±1.69 min respectively Mohamed Ahmed Hamed et al,[9] also showed similar results.

Naveen Lumar,[2] in a his study observed that the onset of block with bupivacaine plus 2ml isotonic saline was 6.46 ± 2.41min, with bupivacaine plus 8mg dexamethasone was 6.6 ± 3.40min and with bupivacaine plus 50mcg dexmedetomidine was 6.5 ±2.64 and observed that the onset of action of block had no significant dissimilarity among all groups.

There was no significance dissimilarity in the hemodynamics among the 2 groups perioperatively.

No subject in Group A had bradycardia whereas 10 subjects in Group B had bradycardia. Aliye Esmaoglu et al,[4] in their study concluded that heart rate levels in group levobupivacine-dexmedetomidine were significantly lesser than those in group levobupivacaine.

Sarita S. Swami et al,[10] in their study concluded that significantly lower pulse rate was observed but not less than 60beats/min in group bupivacaine plus dexmedetomidine as compare with bupivacaine plus clonidine Group.

In the present research the mean duration of surgery, the mean duration of motor blockade, the mean duration of sensory blockade and duration of sensory block was extended in Group A compared to Group B, Rathna Paramaswamy et al,[11] described that the duration of motor block & sensory block was 281.75 ± 38.68 min & 389.75 ± 40.35 min respectively with bupivacaine plus 2ml saline. They observed the duration of motor block & sensory block was 522.00 ± 53.74 min and 909.25 ± 76.74 min respectively with bupivacaine plus dexamethasone group. They observed the duration of motor block & sensory block was 426.00±60.07 min and 651.50 ±75.77 min respectively with bupivacaine plus ketorolac group.

Mohmed Ahmed Hamed et al,[9] concluded that duration of motor block & sensory block was 420±44.4 min & 473.9±36.8 min respectively with bupivacaine.

Naveen kumar[2] observed that the duration of motor block &sensory block was 128.66±34.93min &201.0 ±49.38min respectively with bupivacaine plus 2ml isotonic saline, with bupivacaine plus 8mg dexamethasone was344.8 ±125.81 min & 637.66 ±237.77 min respectively, with bupivacaine plus 50mcg dexmedetomidine was 279 ±72.04 min & 451.56 ± 129.30min respectively and observed that there was significance prolongation in duration of motor and sensory block in dexamethasone group than dexmedetomidine group.

The time for primary analgesic prerequisite in Group A was 19.18± 0.87hrs and in Group B was 13.03± 0.80hrs and it was significantly more in group A. Rathna Paramaswamy et al,[11] Mohmed Ahmed Hamed et al,[9] and Naveen kumar[2] in their research similar findings.

No complications were observed in both the study groups. RathnaParamaswamy et al,[11] Mohmed Ahmed Hamed et al,[9] and Naveen kumar in their research observed comparable findings.[2]

Conclusion

Onset of sensory and onset of motor block is faster with both the drugs. The use of ultrasonographic guidance not only improves success rate but it necessarily reduces complications. Addition of dexamethasone and dexmedetomidine as an adjuvant to bupivacaine for axillary brachial plexus block significantly prolongs the duration ofsensory and motor block and duration of postoperative analgesia.

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