ISSN (P) : 2589-9120 / (O) : 2589-9139
PubMed-National Library of Medicine - ID: 101773527

International Journal of Medical Science and Applied Research (IJMSAR)

Available Online at: https://www.ijmsar.com

Volume – 6, Issue – 2, March – 2023, Page No. : 06 – 15

Comparison of Ropivacaine and Clonidine with Ropivacaine and Dexmedetomidine in Ultrasound Guided Supraclavicular Block for Upper Extremity Surgeries

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Citation of this Article: Dr. Srilekha K, Dr Arun Kumar, Dr Gontumukkala Naveena, Dr Kola Raja Rajeswari Devi, "Comparison of Ropivacaine and Clonidine with Ropivacaine and Dexmedetomidine in Ultrasound Guided Supraclavicular Block for Upper Extremity Surgeries,'' IJMSAR – March – 2023, Vol. – 6, Issue - 2, Page No. 06-15.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

ABSTRACT

Background

Supraclavicular Brachial plexus block (SBPB) is the most common procedure that has been practised for upper limb surgeries[1]. Bupivacaine (amide local anaesthetic) is the most commonly used drug for peripheral nerve block. Ropivacaine[7] is an amino amide local anaesthetic that is prepared as pure S– enantiomer. Clonidine, an α 2-agonist used initially as an antihypertensive agent, it also has sedative, sympatholytic and analgesic properties. Like clonidine, the α-2 receptor agonist dexmedetomidine has been reported to have a rapid onset time, prolong the duration of local anaesthetics, and increase the quality of analgesia in a regional block.

Aim

To compare the efficacy of ropivacaine and clonidine with ropivacaine and dexmedetomidine in the ultrasound-guided supraclavicular block for upper extremity surgeries.

Methods

This comparative and omized study was conducted at a tertiary care centre among 60patients scheduled for various upper extremity surgeries. The study was done from January 2020 to January 2023. Patients were randomized into groups C and D each group

containing 30 patients. Patients with ASA grade I and II, aged 18 to 60 years of both genders, scheduled for elective upper limb surgeries were included. Parameters like age, gender, ASA grade, duration of surgery, onset of sensory, motor blocks, duration of sensory and blocks were compared between two groups.

Results

There is no significant difference in mean age, ASA grade between two groups of patients. Duration of sensory and motor blocks was more indexmedetomidine group. Onset of sensory and motor blocks was quick in dexmedetomidine group. Duration of analgesia was more in dexmedetomidine group. Most common side effect is hypotension.

Conclusion

Adding dexmedetomidine to 0.5% ropivacaine in ultrasound-guided supraclavicular brachial plexus block for patients undergoing upper extremity surgeries provided early onset of sensory and motor blockade and also the prolonged duration of sensory and motor blockadecompared to clonidine added to 0.5 % ropivacaine.

Keywords

Clonidine, Dexmedetomidine, Efficacy, Ropivacaine, Supraclavicular Block, Ultrasound-guided

INTRODUCTION

Supraclavicular Brachial plexus block (SBPB) is the most common procedure that has been practised for upper limb surgeries[1]. It offers profound anaesthesia for surgical procedures for distal to elbow, forearm & hand. It is used as the single technique or along with general anaesthesia for intraoperative & post-operative analgesia[2]. SBPB is a comparatively low-cost anaesthesia technique that provides better operative conditions as it blocks both sensory & motor without any systemic side effects[3]. Brachial plexus block causes sympathetic blockade, resulting in improved blood flow and reduction in vasospasm &edema[4].Common approaches for Brachial plexus block are Interscalene, Supraclavicular, Infraclavicular, and Axillary approch[5].All anaesthesiologists should be familiar with all the above approaches as well as their advantages & limitations. The Supraclavicular approach is the easiest and most consistent method for performing the block. Bupivacaine (amide local anaesthetic) is the most commonly used drug for peripheral nerve block. It is associated with cardiotoxicity when high concentrations are used or administered intravascular accidentally[6], but recently ropivacaine is being successfully used. Ropivacaine[7] is an amino amide local anaesthetic that is prepared as pure S– enantiomer. Ropivacaine has less lipid solubility and produces less central nervous toxicity and cardiotoxicity with less arrhythmogenic potential. Adding an adjuvant[8,9,10] to local anaesthetics for a peripheral nerve block is for early onset of sensory and motor block prolonging the duration of post-operative analgesia with limited adverse effect[11].Several studies have shown that clonidine prolongs the duration of post-operative analgesia. Clonidine, an α 2-agonist used initially as an antihypertensive agent, it also has sedative, sympatholytic and analgesic properties[12.13, 14]. Like clonidine, the α-2 receptor agonist dexmedetomidine has been reported to have a rapid onset time, prolong the duration of local anaesthetics, and increase the quality of analgesia in a regional block[15,16,17]. The block's success depends on proper localization of nerve, placement of the needle, local anaesthetic injection, i.e., right drug, right dose, placed in the right

place, by the correct technique. Traditional approach and paraesthesia elicitation may lead to multiple attempts, which results in procedure-related complications such as pain, blood vessel injury, and pneumothorax. SBPB under ultrasound (US) guidance has become popular, leading to the detection of anatomical variation of brachial plexus, accurate needle placement and avoiding needle-related complications like an injury to the blood vessel, pneumothorax & local anaesthetic toxicity[18,19,20].

AIM

To compare the efficacy of ropivacaine and clonidine with ropivacaine and dexmedetomidine in the ultrasound-guided supraclavicular block for upper extremity surgeries

MATERIALS AND METHODS

Source of data: This comparative and omized study was done on patients scheduled for various upper extremity surgeries, ata tertiary care center named Great Eastern Medical School & Hospital(GEMS), Andhra Pradesh, from January 2020 to January 2023.

Inclusion Criteria:

- Patients aged 18 to 60 years
- Both males and females
- Patients with ASA grade I and II
- Patients scheduled for elective upper extremity surgeries under spinal anaesthesia.
- Patients who provided informed consent to participate in the study.

Exclusion Criteria:

- Patients with coagulation abnormalities
- Pregnant and lactating women
- Patients with severe renal, cardiac and liver disorders that interrupt data collection.
- Patients with BMI≥35 Kg/m2.
- Patients with allergies to clonidine, dexmedetomidine, ropivacaine
- Patients with incomplete data
- Patients for whom, block is ineffective.

Sampling: The convenience method was used to select study population.

SAMPLE SIZE CALCULATION

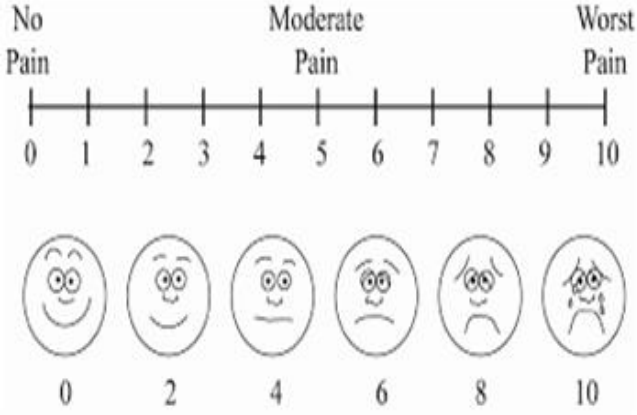
As per the previous study[21]the standard deviation between two groups with respect to duration of analgesia was 38min. Taking 8% error, at 85% confidence intervals, the minimum sample size came to be 60. So, we included 60 patients in our study.

Parameters assessed:

- Age
- Gender
- ASA grade
- Duration of surgery
- Onset of sensory and motor blocks
- Duration of sensory and motor blocks
- Pain assessment using visual analogue scale (VAS), which is a 11-point scale with scores ranging from 0 to 10.

0 implies no pain and 10 implies worst pain as shown below:

Figure 1: Shows VAS score[22]



Motor block was assessed using modified bromage scale

Grade 0impliesNormal motor function with flexion of elbow, wrist, finger, and full extension

Grade 1implies decreased motor strength with ability to move finger only

Grade 2 implies complete motor blockade with inability to move the finger.

METHODOLOGY

60 patients were divided into two groups.Group C included 30 patients who were given ropivacaine with clonidine. Group D included 30 patients who were given ropivacaine with dexmedetomidine. After taking informed consent from each subject, pre-tested proforma was used to collect the data. Data was subjected to analysis and conclusion was drawn.

TECHNIQUE

After taking informed consent, the patient was transferred to the operation theatre. Intravenous access was secured with an 18G intravenous cannula in the non-operating limb & isotonic fluid; Ringer lactate was started. Standard monitors (ECG, NIBP, SPO2 probe) were attached. Supraclavicular brachial plexus block was performed under the strict aseptic conditions using an ultrasound-guided approach, using the in-plane technique. After the real-time visualization of the brachial plexus by ultrasound guidance, a needle was placed near the plexus following the negative aspiration of blood; drug solution was injected into space around the brachial plexus. Sensory blockade assessment was done by pinpricking method, using 23 G Quincke needle every 3 min till the feeling of dull sensation to pinprick felt.

Groups: Patients in group C(n=30) received 0.5% Ropivacaine (19.5 ml) + 75mcg clonidine (0.5ml)

Group D (n=30) 0.5% Ropivacaine (19.5 ml)+50mcg dexmedetomidine(0.5ml) = 20ml

Patients in Group R received 3 mL of 0.75% heavy Ropivacaine.

All the study drugs were prepared in identical volumes (3 ml) in a similar syringe used in the patients' management.

STATISTICAL ANALYSIS

Data analysis was done using SPSS software version 24.0. The results were expressed as mean ± S.D, percentages, and numerical parameters were compared using students t-test between patients of two groups. Categorical parameters were compared using chi square test.

P value < 0.05 was considered significant.

ETHICAL CONSIDERATIONS

Institutional ethical committee approval was taken before conducting the study. Informed consent form was taken from every subject who participated in the study.

RESULTS

DEMOGRAPHY

Age: There is no significant difference in the mean age of patients of both groups as per t test (p=0.94).

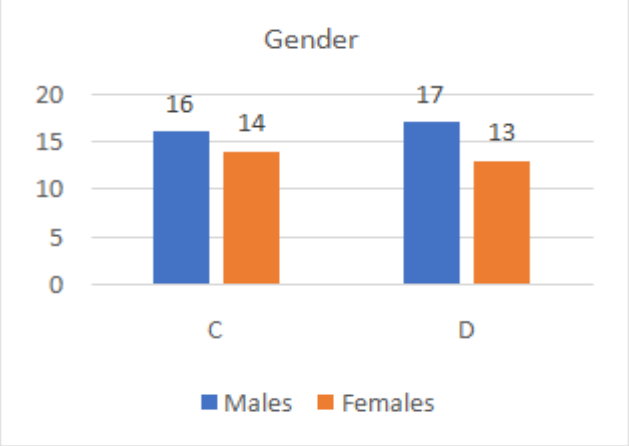
Groups	Mean age	P value
C	38.47±12.28	0.94
D	38.27 ±10.	

Table 1 illustrates mean age of patients in both groups

GENDER

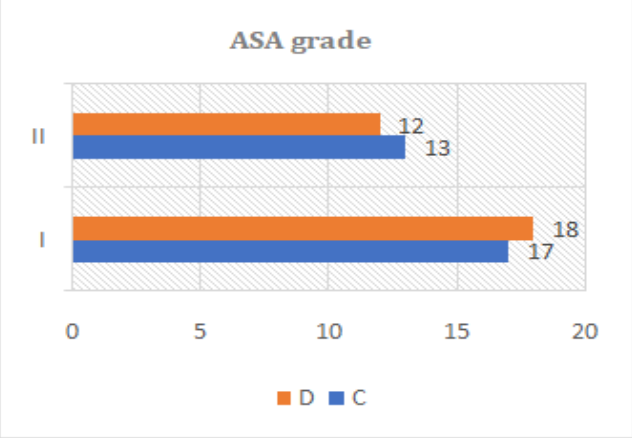
Most of the patients were males in our study,

Graph 1: Gender distribution of patients



ASA Grade

There is no signfiicant difference in ASA grade of patients of both groups as per chi sqaure analysis(p=0.79).



DURATION OF SURGERY

There is no significant difference in the mean duration of surgery in both groups(p=0.51).

Table 2 shows duration of surgery

Duration of surgery	Group C	Group D
Mean±SD	98.50±16.76	101.33±16.49
P value	0.5118^{NS}	

ONSET OF SENSORY AND MOTOR BLOCKS

Onset of sensory and motor blocks were quick in D group patients.

Table 3 shows onset of sensory and motor blocks

Parameters	C	D	P value
Onset of sensory block	7.67±1.30	6.70±0.70	0.0007
Onset of motor block	12.37±1.07	11.20±1.03	0.002

DURATION OF SENSORY AND MOTOR BLOCKS

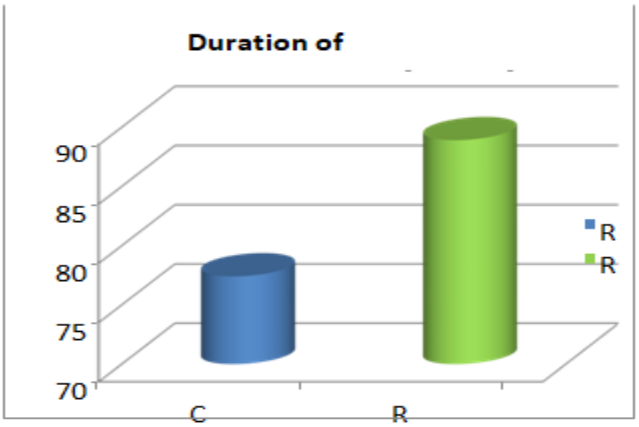
Onset of sensory and motor blocks were quick in D group patients. Table 4 shows duration of sensory and motor blocks.

Parameters	C	D	P value
Duration of motor block	668.50 ± 40.24	719.67 ± 29.18	0.001
Duration of sensory block	715.33 ± 38.12	777±28.67min	0.001

DURATION OF ANALGESIA

Duration of analgesia is significantly more in D group patients. It was 774 min in C group and 889min in D group patients.

Graph 3 shows duration of analgesia



SIDE EFFECTS

The most common side effect seen was hypotension followed by dry mouth.

Table 5 shows side effects of both groups

Side effects	Group C	Group D
Dry mouth	6.7%	6.7%
Hypotension	13.3%	13.3%
Nausea/vomiting	nil	10%

DISCUSSION

In the current study, we compared clonidine and ropivacaine with dexmedetomidine with ropivacaine for patients scheduled for upper extremity surgeries under US-guided SBPB.

There is no significant difference in mean age, ASA grade between two groups of patients. Duration of sensory and motor blocks was more in dexmedetomidine group. Onset of sensory and motor blocks was quick in dexmedetomidine group. Duration of analgesia was more in dexmedetomidine group. Most common side effect is hypotension.

Priyanka Singla et al.[23] in 2018 conducted a observational study to compare dexmedetomidine and clonidine as adjuvant to local anaesthetic ropivacaine (0.5%) in supraclavicular brachial plexus block for upper limb surgery and concluded thatdexmedetomidine have prolonged effective analgesia compared to clonidine group similar to our study. **Karthik G et. al.[24] and Sarita Swami et al.[25]** also reported significantly longer duration of analgesia with dexmedetomidine than clonidine, similar to our study.

Most of the patients had hypotension which was managed with IV crystalloids.

Zhang et. al,[26] in 2014 reported prolongation of duration of sensory and motor blockade in patients who received dexmedetomidine compared to control group for axillary brachial plexus blockade. **Esmaoglu *et al*.**[27] found significant bradycardia in dexmedetomidine and levobupivacaine group than levobupivacaine alone. Studies done by **Se Hee Kang et al**[28]also observed dexmedetomidine is a potential anaesthetic adjuvant that can facilitate better anaesthesia and analgesia when administered in BPB and provides significant muscle relaxation when added to local anaesthetics.

CONCLUSION

Adding dexmedetomidine to 0.5% ropivacaine in ultrasound-guided supraclavicular brachial plexus block for patients undergoing upper extremity surgeries provided early onset of sensory and motor blockade and also the prolonged duration of sensory and motor blockade, and analgesia compared to clonidine added to 0.5 % ropivacaine.

The study is self-sponsored.

There were no conflicts of interest.

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