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Comparative eveluation of INJ. Ropivacaine (0.5%) + INJ. normal saline (1 mililitre) and INJ. Ropivacaine (0.5%) + INJ. Dexmedetomidine (50 microgram) In supraclavicular brachial plexus block for upper limb surgery

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Introduction

Anaesthesia has evolved into a speciality subject over decades with lots of improvement in methods employed and drugs used to provide anaesthesia with least com plication. General anaesthesia was one of the most common method employed to provide anaesthesia for upper limb surgeries.

With introduction of newer and safer local anaesthetics and better advantage, regional ana esthesia has taken over as principle technique for upper limb surgeries. Local anaesthesia by chemical means has come to play a great role in surgery, today no part of body is in accessible to this form of pain relief.

In this era of rapid industrialization and mechanisation, cases of accidental upper limb injuries are increasing. To cope with this workload a technique of anaesthesia must be available which would be simple, safe, easy to administer, rapid and economical so that it can applied on larger scale.

Supraclavicular plexus block provides anaesthesia for surgeries of lower third of humerus, around elbow joint, forearm and hand. This block also relieves tourniquet pain. Supraclavicular plexus block technique was chosen for upper limb surgeries in our study.

There are few potential complications like pneumothorax, injury to vessels, hematoma. Advantages of supra clavicular brachial plexus block over General ana esthesia are - ease of administration, lower incidence of major intraoperative or post operative complications, avoidance of the toxic effects of some general An aesthetic agents, provision of excellent operating conditions, pleasant recovery, and less difficulty in the recovery room.

Role of supraclavicular block has expanded from Operation theatre into an area of postoperative and chronic pain management.

The aim of our study was to assess the characteristics of supraclavicular brachial plexus block using 0.5% Ropivacaine and to study the effect of Dexmedetomidine as an adjuvant

Aims and objectives

This prospective, double blind, randomised study was designed to evaluate efficacy of Ropivacaine with Dex medetomidine versus Ropivacaine with normal saline in supraclavicular brachial plexus block for upper limb surgeries.

Objectives

1. To compare Visual Analog Scale (VAS) pain scores at all measurement times.

2. To compare categorical pain scores at all measurement times.

3. To compare duration of post-operative analgesia of Ropivacaine with Dexmedetomidine versus Ropivacaine with normal saline in supraclavicular brachial plexus block for upper limb surgeries.

4. To Review the literature regarding efficacy of Ropivacaine with Dexmedetomidine versus Ropivacaine with normal saline in supraclavicular brachial plexus block for upper limb surgeries.

Materials and methods

Study population -Sixty patients aged between 18 to 60 years with ASA grade 1or 2 or 3 posted for elective upper limb orthopedic surgeries under supraclavicular brachial plexus block.

Study design

A prospective randomized double blind clinical study Institutional ethical clearance obtained.

Selection criteria

Inclusion criteria

Normal adult patients of either sex, without any co-morbidity, admitted for elective upper limb orthopaedic surgeries.

1. Patient age: 18 to 60 years
2. ASA grade: 1 or 2 or 3
3. Weight: 30 to 90 kg
4. Duration of surgery: 2 Hours.

Exclusion criteria

1. Infection at site of block.
2. H/O any previous reaction to local Anaesthetic.
3. Patient refusing consent
4. Patient with hemorrhagic or neurological disorder.
5. Patient below 18 or above 60 years.
6. Pregnancy.
7. Patients with alcohol abuse.
8. H/O Underlying cardiovascular, psychiatric disease, renal or hepatic disease.

Method of collecting data

A prospective randomized double blind clinical study entitled ‘Comparative eveluation OF INJ. Ropivacaine (0.5%) + INJ. normal saline (1 mililitre) AND INJ. Ropivacaine (0.5%) +INJ. Dexmedetomidine (50 micro gram) IN Supraclavicular brachial plexus block for upper limb surgery for elective upper limb orthopaedic surgeries was undertaken.

The study was undertaken after obtaining ethical committee clearance as well as informed consent from all patients.

Sixty patients aged between 18 to 60 years with ASA grade 1or 2 or 3 posted for elective upper limb orthopedic surgeries were included in the study.

The study patients were randomly divided into 2 groups with 30 patients in each group.

- Group A - Inj. Ropivacaine 0.5% (30 milliliter) + Inj. Normal Saline (1 milliliter)
- Group B - Inj. Ropivacaine 0.5% (30 milliliter) + Inj. Dexmedetomidine (50 microgram)

Method of study

Preanaesthetic assessment was done on evening before surgery.

A routine examination was done by assessing-General condition, Nutritional status, weight, Airway assessment, Complete examination of cardiovascular, respiratory system, Site of block.

The following investigation were done in all patients.

- Haemoglobin(gm%).
- Blood sugar (fasting and post prandial)
- Blood urea and serum creatinine, Standard 12 lead ECG, Chest Xray PA view.

All patients were kept electively nil per oral 6-8 hours before surgery and prior to operation patients were explained about procedure and a written informed consent taken.

Intra venous line secured. Standard monitors like ECG, Pulse oximeter, BP cuff were applied and patient's base line parameter like pulse, blood pressure, respiratory rate, Spo2 were recorded.

All patients were premedicated with: (on operation table)

- Inj. Glycopyrrolate 4µg/ kg iv • Inj. Ondansetron 0.16mg/kg iv • Inj Midazolam 20µg/kg iv

1. Equipments For the procedure

A portable tray containing sterile Syringe of 10 ml, 5 ml, 2 ml. Hypodermic needle 23×1.5" G.

Bowl containing povidine iodine and spirit.

Sponge holding forceps Towel and towel clips.

Study drugs.

For emergency resuscitation

The anaesthesia machine, emergency oxygen source, pipeline oxygen supply, 2 working laryngoscope, appropriate size endo tracheal tubes and connectors, working suction apparatus with suction catheter, oro pharyngeal airways, intra venous fluids, basic Anaesthetic drugs, emergency drugs tray were kept ready. Technique of brachial plexus block [90] (Through supra clavicular approach)

For performing brachial plexus blockade through supraclavicular approach, we used classical technique. The patients were placed in the dorsal recumbent posit ion with the head turned away from the site of brachial block, under all aseptic and antiseptic pre cautions midclavicular point, external jugular vein and subclavian artery pulsation were identified.

About 1cm above the midclavicular point just lateral to subclavian artery pulsation, a 23×1.5" G needle was introduced and directed caudal, downward and medially toward the first rib until paraesthesia was noted along radial and ulnar distribution or motor response was elicited.

Here Anaesthetic solution is injected before every incremental dose negative aspiration for blood was performed to avoid any intravascular injection. Immediately after block, patients were evaluated for the assessment of onset of sensory and motor blockade.

Vitals were recorded before and after the procedure, at 5min, and there after every 10min till end of procedure and postoperatively at every 1 hour till 7 hours. If block was considered to be adequate, surgeons were allowed to apply tourniquet and start the surgery.

If the block was considered to be inadequate for surgery, the patient was given general anaesthesia. Patients were monitored for nausea, vomiting, hypersensitivity reaction, any sign of cardio vascular or central nervous

system toxicity, evidence of pneumothorax, hematoma, post block neuropathy during the study. [91]

In postoperative period, when patient complained of pain at operative site, inj. diclofenac sodium 1.5mg/kg intravenously and the time for rescue analgesia noted. (VAS≥4)

Results

All the patients completed the study and the results were analysed. demographic profile in terms of age, weight, sex ratio and duration of surgery were comparable in all groups

The following parameters were observed in our study.

Table – 1

Mean demographic data in Group A and Group B

Variable	Study Group				t-Test	Significance
	Group A		Group B			
	Mean	SD	Mean	SD		
Age (Yrs)	37.23	13.11	34.23	13.07	>0.05	NS
Weight (Kg)	64.07	4.88	61.47	9.58	>0.05	NS
Gender (M/F)	23/7		19/11			
ASA GRADING (I/II//III)	0/21/9		0/13/17			

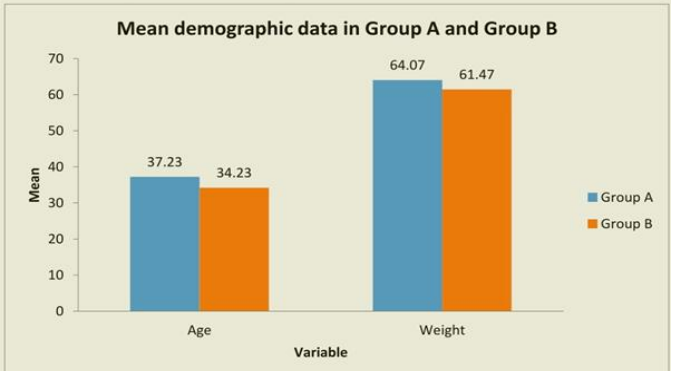
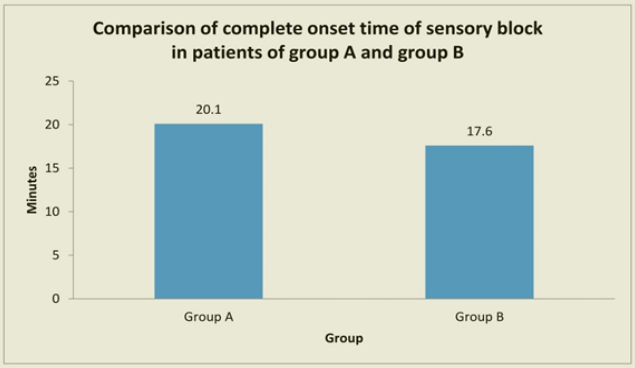


Table – 3

Comparison of complete onset time of sensory block in patients of group A and group B

Variable	Study group				t-Test	Significance
	Group A		Group B			
	Mean	SD	Mean	SD		
Onset of complete sensory block (in min.)	20.1	1.62	17.6	1.25	<0.05	S

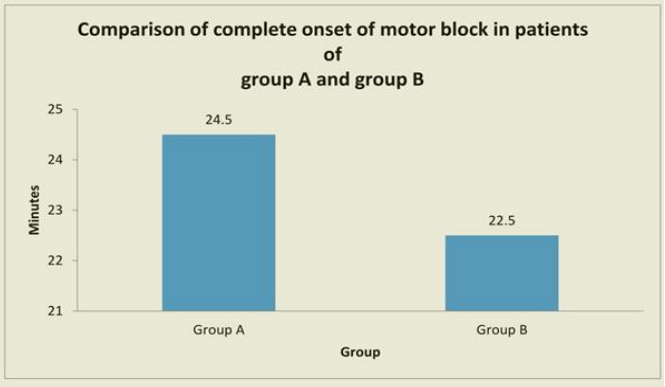


The mean onset time for complete sensory block in group A was 20.1±1.62 min. ,in group B was 17.6±1.25 min.After applying paired t-Test the difference was statistically significant (p<0.05,table 3 ,chart 5)

Table – 4

Comparison of complete onset of motor block in patients of group A and group B

Variable	Study Group				t-Test	Significance
	Group A		Group B			
	Mean	SD	Mean	SD		
Onset of complete motor block (in min.)	24.5	1.48	22.5	1.50	<0.05	S

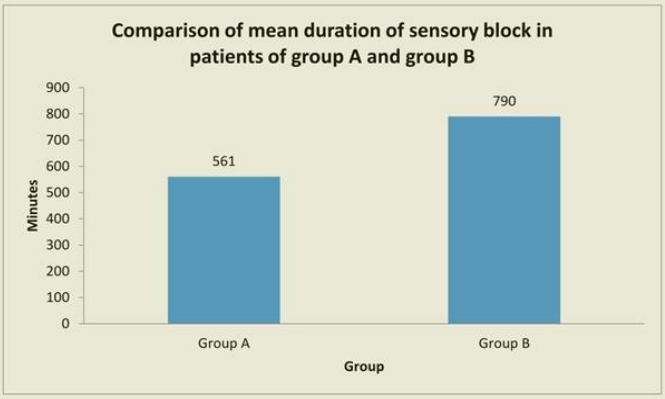


The mean onset time for complete motor block in group A was 24.5±1.48 min and in group B was 22.5±1.50 min. After applying paired t-Test, the difference was statistically significant (p<0.05, table 4, chart 6).

Table – 5

Comparison of mean duration of sensory block in patients of group A and group B

Variable	Study Group				t-Test	Significance
	Group A		Group B			
	Mean	SD	Mean	SD		
Duration of sensory block (in min.)	561.0	33.87	790.3	41.23	<0.05	S

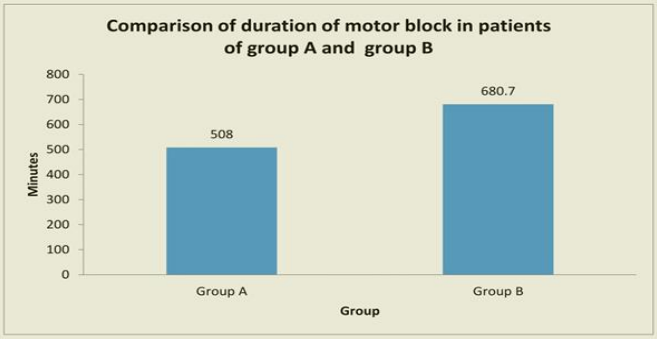


The mean duration of sensory block in group A was 561.0±33.87 min and in group B was 790.3±41.23 min. After applying paired t-Test, the difference was statistically significant (p<0.05, table 5, chart 7).

Table - 6

Comparison of duration of motor block in patients of group A and group B

Variable	Study Group				t-Test	Significance
	Group A		Group B			
	Mean	SD	Mean	SD		
Duration of motor block (in min.)	508.0	17.89	680.7	69.38	<0.05	S

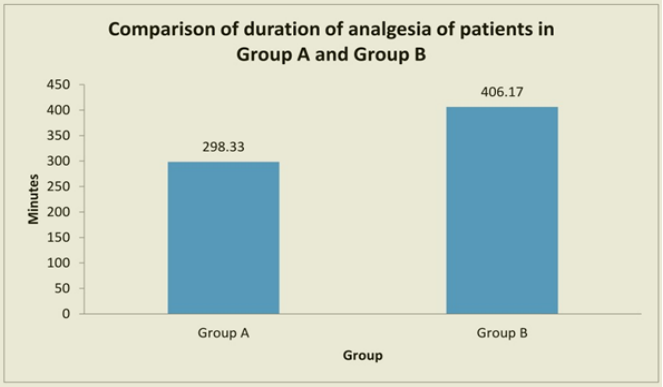


The mean duration of motor block in group A was 508.0±17.89 min and in group B was 680.7±69.38 min. After applying t-Test, the difference was statistically significant (p<0.05, table 6, chart 8).

Table – 7

Comparison of duration of analgesia of patients in group A and group B

Variable	Study Group				t-Test	significance
	Group A		Group B			
	Mean	SD	Mean	SD		
Duration of rescue analgesia given(min.)	298.33	70.36	406.17	73.15	<0.05	S



The mean duration of analgesia in group A was 298.33±70.36min and in group B was 406.17±73.15 min. After applying paired t-Test the difference was statistically highly significant (p<0.05, table 7, chart 9).

Discussion

Regional anesthesia is practiced in most developing countries. The cost of providing regional anesthesia is less, sometimes substantially less, than the cost of an equivalent general anesthetic.

Regional anaesthesia is an important part of the anaesthesiologist ‟ s armamentarium. It provides an alternative to general anaesthesia and is customarily per formed in “difficult” surgical patients whose severe or unstable disease make general anaesthesia undesirable. Regional nerve blocks are based on the concept that pain is conveyed by nerve fibers, which are amenable to interruption anywhere along their pathway.

Supraclavicular approach of brachial plexus block is the most commonly used approach and provides the most complete and reliable anaesthesia for upper limb surgery

For brachial plexus block, a drug that has fast onset, long duration and minimal toxicity could be an advantage. As with other fields, regional anaesthesia has undergone major developments both in technique and drugs avail ability. The quest for safer local anesthetics began towards the end of the 19th century, soon after the toxic effects of cocaine became known.

Levobupivacaine and Ropivacaine, two new long-acting local anesthetics, have been developed as an alternative to Bupivacaine, after the Introduction evidence of its severe toxicity.

Local anesthetics alone for supraclavicular brachial plexus block provide good operative conditions but have a shorter duration of postoperative analgesia. Recently, Dexmedetomidine has been reported as an effective adjuvant for regional anesthetic agents. When given intra venously after or before regional anesthesia, Dexmedetomidine increases the duration of regional anesthesia and provide longer post operative analgesia.[98]

Onset of complete sensory block

The data from our study reveals the time of onset for complete sensory blockade was longer in case of group B (Ropivacaine with Dexmedetomidine) compared to group A (Ropivacaine with normal saline). In our study, the mean onset time for complete sensory block in group A was 20.1 1.62 min. and in group B was 17.6±1.21min.

These results are comparable to other studies.

Gurajala I, Thipparampall K A, Padmaja D et al [87] assessed the influence of Dexmedetomidine added to 0. 5% Ropivacaine on the characteristics of supra clavicular brachial plexus block Patients were randomly allocated using a computer - generated rando mization sequence to receive either 35 mL of Ropivacaine 0.5% with 0.5 mL of isotonic sodium chloride solution (group R, n =18) or 35 mL of Ropivacaine 0.5% with 0.5 ml (50 μg) of Dexmedetomidine (group RD, n = 18). The onset of sensory blockade was faster in the RD group. How ever, there was no statistical significance (P = 0.133). The median onset time of sensory block in group R was 36 (20-45) min. and 24 (15-30) min in group RD.

Onset of complete motor block

In our study, time to onset of complete motor block was assessed by asking the patient to raise hand above head with movement of arm & forearm.

The data from our study reveals the mean time for onset of complete motor blockade in group A was 24.5±1.48 min, in group B was 22.5±1.45 min. ($p<0.05$).

These results are comparable to other studies

Sudani C, Rao S M, Munta K et al [89] their prospective, randomized and double-blinded study included total 60 patients of either sex with age between 18-60 years posted for various elective upper limb surgery and randomly allocated into 2 equal groups of 30 each.

Control Group-R received injection Ropivacaine (0.75%) 30 ml plus 1 ml normal saline and Group-RD received injection Ropivacaine (0.75%) 30 ml plus Dexmedetomidine 25 μg (1 ml) for supraclavicular brachial plexus block. The onset of motor blockade was faster in Group-RD than Group-R. Onset of motor block in Group R was 25.967±2.748 min and in Group RD was 23.333±3.467 min

Duration of sensory block

The data from our study reveals that duration of sensory blockade in group A was 561.0±33.87 min and in group B was 790.3±39.9 min

These results are comparable to other studies

Bangera A, Manasa M, Krishna P et al [88] studied A total of 80 patients belonging to ASA status I, II, and III, scheduled for elective forearm and/or hand surgeries

were randomly allocated into one of the two groups to receive either 39 ml of 0.375% Ropivacaine and 1 ml normal saline (Group R) or 39 ml of 0.375% Ropivacaine and 1 μg/kg Dexmedetomidine diluted to 1 ml with normal saline (Group RD), according to the group allocated by computer generated random table. Duration of sensory block in Group RD was 677.25 ± 99.64 min and in Group R was 494.38 ± 70.64 min and the difference was clinically significant (P < 0.001).

Duration of motor block

The data from our study, reveals that duration of motor blockade was longer in case of Group B (681±67.1) compared to group A (508.0±17.89) (P value<0.0001)

These results are comparable to other studies

Sudani C, Rao S M, Munta K et al [89] in their prospective, randomized and double-blinded study included total 60 patients of either sex with age between 18-60 years posted for various elective upper limb surgery and randomly allocated into 2 equal groups of 30 each, Control Group-R received injection Ropivacaine (0. 75 %) 30 ml plus 1 ml normal saline and Group-RD received injection Ropivacaine (0.75%) 30 ml plus Dexmedetomidine 25 μg (1 ml) for supraclavicular brachial plexus block.

The duration of motor blockade was in Group R was 509.667±24.703 mins while in Group RD was 760.667±28.062 mins (p value<0.0001)

Duration of analgesia

The data from our study reveals that mean duration of analgesia in group A was 298.33±70.36 min and in group B was 406.0±70.8 min (p<0.05)

These results are comparable to other studies

Gurajala I, Thipparampall K A, Padmaja D et al [87] assessed the influence of Dexmedetomidine added to 0.5% Ropivacaine on the characteristics of supra clavicular brachial plexus block Patients were randomly allo cated using a computer - generated rando mization sequence to receive either 35 mL of Ropivacaine 0.5% with 0.5 mL of isotonic sodium chloride solution (group R, n = 18), or 35 mL of Ropivacaine 0.5% with 0.5 ml (50 μg) of Dexmedetomidine (group RD, n = 18). The mean Duration of analgesia in group R was 480 (420-570) min while in group R+D it was 960 (820-1190) min. (p<0.05)

Conclusion

Based on the present clinical comparative study and a short review of past literature I conclude that Ropivacaine 0.5%, newer long-acting local Anaesthetic, is an alternative to bupivacaine 0.5% and lignocaine 2% for brachial plexus block. Ropivacaine is pure left-isomers and due to their three-dimensional structure, this agent have better safety profile over other local anaesthetics in terms of reduced CNS and cardiac toxicity.

Dexmedetomidine as an adjuvant to Ropivacaine in supraclavicular brachial block for upper limb surgery significantly shortens the onset time for sensory & motor block and prolongs the duration of sensory &motor blocks with longer duration of post operative analgesia, causes decrease in need of rescue analgesia in patients with no side effects.

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