ORIGINAL ARTICLE

A COMPARISION OF 0.5% ROPIVACAINE AND 0.5% BUPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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ABSTRACT

Background: Brachial plexus blocks are among the most commonly performed peripheral neural blocks for upper extremity surgeries in clinical practice. The present study was performed to compare the clinical characteristics of ropivacaine 0.5% and bupivacaine 0.5% when used for supraclavicular brachial plexus block.

Methodology: This was the comparative study where cases were randomly divided into two groups (Group R-Ropivacaine and Group B-Bupivacaine) and administered the drug. Pulse, blood pressure, sensory and motor blockade were monitored and complications of brachial plexus block and side effects of local anaesthetics used were also noted.

Results: The mean onset time of motor blockade was 14.33±4.92 minutes in Group R and 15.30±5.01 minutes in Group B while mean duration of pain relief was 688±86.78 minutes in Group R and 664.37±102.97 minutes in Group B. There was no statistically significant difference in onset of sensory block, duration of sensory block, onset of motor block, duration of motor block, mean duration of pain relief and VAS between two groups ($p>0.05$).

Conclusion: Supraclavicular brachial plexus block using 0.5% ropivacaine were similar in terms of onset of sensory and motor block, duration of sensory and motor block, duration of analgesia, post-operative analgesic supplements, incidence of side effects and complications as compared with 0.5% bupivacaine.

Keywords: Supraclavicular approach, brachial plexus block, Ropivacaine, Bupivacaine

INTRODUCTION

Brachial plexus blocks are among the most commonly performed peripheral neural blocks for upper extremity surgeries in clinical practice.[1] It offers many advantages over general anaesthesia for upper limb surgeries such as sympathetic block, better postoperative analgesia, high success rate and fewer side effects.[2]

The supraclavicular approach to blockade offers several advantages over the other routes because of its ease, reliability and high success rates. Compared with the axillary approach it does not cause sparing of the musculocutaneous or axillary nerves. Bupivacaine is a long acting local anaesthetic used widely in modern anaesthetic practice. It has the potential for severe cardiovascular and central nervous system toxicity which results in the continuing search for new and safer agents for clinical use.

Ropivacaine is a new amide local anaesthetic that has been shown in animal studies to be similar to bupivacaine in terms of onset and duration of brachial plexus block.[3] In human brachial plexus studies, ropivacaine 0.5% with or without epinephrine, has been shown to provide effective sensory and motor block of prolonged duration.[4] The toxicity of ropivacaine has been reported to be less than that of bupivacaine.The current study was performed to compare the clinical characteristics of ropivacaine 0.5% and bupivacaine 0.5% when used for supraclavicular brachial plexus block.

MATERIALS& METHODS

The present study was on cases of either sex of ASA Class I or II between age group of 18 and 50 years, weighing between 40 and 60 kilograms, scheduled for upper limb surgeries under supraclavicular brachial plexus block, after approval by ethical committee, at the Government Medical College and New Civil Hospital, Surat.

A detailed history was taken and the patients were thoroughly examined on the previous day before the surgery. The procedure to be performed was explained to each patient and an informed consent was taken. Patients with a history of cardiac, respiratory, hepatic or renal disease, leprosy or convulsion, pregnant women, contraindications for brachial plexus block such as clotting disorders, cutaneous local infections, anomalies of neck and shoulder, fracture clavicle, patients known to be sensitive or allergic to clonidine, lignocaine or bupivacaine are excluded from the study.

Pulse and blood pressure were measured in preanaesthesia room, intravenous line was established on the contralateral arm and the patients were premedicated with Inj. Glycopyrrolate 0.2 mg intramuscularly half an hour before performing the block and Inj. Midazolam 1 mg iv on arrival in operation theatre.

The patients were randomly and equally divided into two groups of 30 each. The group R (Ropivacaine) cases were given 20 ml of 0.75% ropivacaine + 10 ml of normal saline (total volume 30 ml) while Group B (Bupivacaine) cases received 30 ml of 0.5% bupivacaine.

The patients were taken in operation theatre and placed in supine position. A bolster of adequate size was placed between the shoulder blades. After turning the head to opposite side, painting and draping of the supraclavicular region was done. The supraclavicular block was performed by classical approach with a 23 gauge 4 cm needle. The neurovascular bundle was located by walking the needle anteriorly and posteriorly along the fist rib and the drug was injected on obtaining parasthesia after negative aspiration for blood.

Pulse, blood pressure, sensory and motor blockade were monitored every 5 minutes up to 30 minutes, at 45 minutes, at 1 hour and then at hourly intervals for 6 hours and then 2 hourly up to 12 hours and then at 15, 18 and 24 hours. Complications of brachial plexus block and side effects of local anaesthetics used were also noted.

Sensory blockade was assessed by a 3 point sensory score, 0-Sharp pain on pinprick, 1-Touch sensation on pinprick, 2-Not even touch sensation on pinprick. Onset of sensory blockade was taken as the time between injection and the complete ablation of pinprick test (sensory score-2). Duration of sensory block was defined as the time from complete block to return of the parasthesia (sensory score-1). If a sensory score of 2 was not achieved even after 45 minutes or if there was a sparing in any segment, the sensory analgesia was deemed to be not satisfactory and general anaesthesia was supplemented and these patients were excluded from the study.

Motor blockade was accessed by a 3 point motor score described by Bromage, 0-Full flexion and full extension of elbow, wrist and fingers, 1-Ability to move fingers only, 2-Inability to move fingers. Onset of motor blockade was considered as the time from performance of block to the time when a complete inability to move fingers (score-2) was achieved. Duration of motor blockade was considered as time from complete motor block to the restoration of full flexion and extension of elbow, wrist and fingers (score-0).

Postoperative analgesia was assessed by the 10 point visual analogue scale. The postoperative analgesic was taken as time from onset of sensory block to time when patient has a visual analogue scale of > 5. No pain considered as score 0 and worst pain considered as score of 10.

Analgesic injection Diclofenac Sodium (1.5 mg/kg intramuscularly) was given when VAS > 5. Total analgesic requirements in 24 hours were recorded.

The results were expressed as mean+SD. Statistical analysis consisted of Z test with $p<0.05$ considered as significant and $p<0.01$ considered as highly significant.

RESULTS

The present study has been carried out in 60 patients in the age group of 18 to 50 years.

Table 1: Age and gender distribution of cases

Parameter	Group R (Ropivacaine)	Group B (Bupivacaine)
Age group (years)		
18-40	15 (50)	22 (63.6)
41-50	15 (50)	8 (36.4)
Gender		
Male	25 (83.3)	21 (70)
Female	5 (16.7)	9 (30)

The mean age of cases in the Ropivacaine was 38.96 ± 9.64 years while it was 33.93 ± 10.7 years.

The distribution of patients with respect to age was comparable in both the groups (p>0.05).
In Group R, the mean duration of surgical procedure was 95.27± 45.31 minutes and in Group B, it was 100.04±35.12 minutes which was comparable in both the groups (p>0.05).There was no statistically significant change in pulse rate and systolic blood pressure between two groups in first 24 hrs (p>0.05).

Table 2: Onset and Duration of Sensory Block, motor block and pain relief on both groups

Time (min)	Group R	Group B	p value
	Mean±SD	Mean±SD	
Onset of sensory block	10.73±3.11	12.00±2.88	>0.05
Duration of sensory block	554.27±90.04	523.20±108.56	>0.05
Onset of motor block	14.33±4.92	15.30±5.01	>0.05
Duration of motor block	480.43±55.26	507.70±56.07	>0.05
Duration of pain relief	688±86.78	664.37±102.97	>0.05

There was no statistically significant difference in onset of sensory block, duration of sensory block,onset of motor block, duration of motor block, mean duration of pain relief and VASbetween two groups (p>0.05).

Table 3: Postoperative Analgesic Consumption in 24 Hours

Injections	Group R (%)	Group B (%)	P value
1	15 (50)	16 (53.4)	>0.05
2	15 (50)	13 (43.3)	
3	0	1 (3.3)	

In Group R, 50% of patients required 1 injection and 50% of the patients required 2 injections of inj. Diclofenac for post operative analgesia in first 24 hours.In Group B, 53.34% of patients required 1 injection, 43.33% of the patients required 2 injections and 3.33% patients required 3 injections of inj. Diclofenac for post operative analgesia in first 24 hours.The difference between the two groups were not statistically significant ('p' value>0.05).

Table 4: Comparison of Complications Between the Two Groups

Complication	Group R	Group B
Nausea	2 (6.67)	4 (13.33)
Horner's syndrome	1 (3.33)	3 (10)

In our study 6.67% of patients had nausea in the ropivacaine group and 13.33% of patients had nausea in bupivacaine group.3.33% of patients in the ropivacaine group and 10% of patients in bupivacaine group had suffered from Horner's syndrome.

DISCUSSION

Ropivacaine is a long-acting amide local anaesthetic with a potentially improved safety profile when contrasted to bupivacaine.[5] Rosemary Hickey et al (1991)[6], Vilho A Vainionpaa et al (1995)[7], Stephen M Klein et al (1998)[8] and Laura Bertini et al (1999)[9] used 0.5% ropivacaine and compared it with 0.5% bupivacaine in brachial plexus block.

Rosemary Hickey et al (1992)[10] used 0.25% ropivacaine and compared it with 0.25% bupivacaine in brachial plexus block. They demonstrated that this concentration was unsuitable because of a high failure rate. This was due to the fact that the concentration was borderline with respect to the threshold necessary to develop anaesthesia and complete motor paralysis was not frequently seen. Stephen M Klein et al (1998)[8], Himat Vaghadia et al (1999)[11] and Laura Bertini et al (1999)[9] used 0.75% ropivacaine and compared it with 0.5% bupivacaine in brachial plexus block. They demonstrated that there was no added advantage of increasing concentration of ropivacaine from 0.5% to 0.75% in brachial plexus block.

Rosemary Hickey et al (1991)[6] did not observe at significant variation in the mean heart rate and systolic blood pressure between 0.5% ropivacaine and 0.5% bupivacaine at different time intervals.

The theoretic advantage of ropivacaine over bupivacaine is its lesser potential for cardiac toxicity. In isolated rabbit Purkinje's fibre ventricular muscle preparations, the effect of ropivacaine on the transmembrane action potential was generally less than that of bupivacaine.[12] Intact animal studies have also demonstrated that ropivacaine is associated with a lesser arrythmogenic potential than bupivacaine.[13] In terms of cardiovascular effects observed in the study by Scott et al (1989)[5] ,both ropivacaine and bupivacaine caused evidence of depression of conduction (ECG) and contractility (M-mode ECHO), but these effects appeared at

lower dosages and plasma concentrations of bupivacaine than of ropivacaine.

In view of the lesser potential for toxicity of ropivacaine demonstrated in the animal and volunteer studies, ropivacaine may be advantageous in brachial plexus and other regional blocks in which the potential for intravascular injection exists.[14]

CONCLUSION

Supraclavicular brachial plexus block using 0.5% ropivacaine were similar in terms of onset of sensory and motor block, duration of sensory and motor block, duration of analgesia, post-operative analgesic supplements, incidence of side effects and complications as compared with 0.5% bupivacaine.

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