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Original Research Article

Comparison between Two Different Volumes and Fixed Concentration of Ropivicaine in Interscaline Brachial Plexus Block for Arthroscopic Shoulder Surgery: A Randomized Clinical Trial

Dr. Manasa Vijay*
*Associate Professor, Department of Anaesthesia, Sri Balaji Medical College, Hospital and Research Institute Tirupathi, Andhra Pradesh, India.
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ABSTRACT
Aim: To compare the effects of two different volumes of a fixed concentration of ropivacaine used in ultrasound-guided interscalene brachial plexus block for arthroscopic shoulder surgery.
Methods: This prospective, randomized, double-blind study included 40 patients who underwent shoulder arthroscopic surgery under interscaline block. The patients were randomly assigned to two groups to receive ultrasound-guided interscalene block with 0.75 percent of ropivacaine 15 ml and 20 ml. Time to onset of sensory and motor blockade, analgesic duration, and postoperative opioid requirement within 24 hours.
Results: There was no significant difference with the onset and duration of motor and sensory blocks, in both the groups
Conclusion: Compared with 15 ml of 0.75% ropivacaine, 20 ml of 0.75% ropivacaine did not prolong the analgesic duration of interscalene block.

Keywords: Brachial Plexus, Pain Management, Postoperative Pain, Shoulder Pain, Ultrasonography.

INTRODUCTION

Interscalene brachial plexus block (ISB) can spare post op opoid use and can avoid general anaesthesia related complications and hence patient can be discharged early. However routine use of catheters is impractical and unrealistic and may not be possible in all cases because of the lack of expertise and logistics. In addition, there are risks of catheter dislodgement and infection.[1] The duration of ultrasound (US)-guided ISB is reported to be related to the volume and concentration of the local anesthetic (LA).[2] However, only a few studies have evaluated the differences between varying concentrations of a fixed dose of LA.[3,4] Accordingly, this study was conducted to compare two different volumes of ropivacaine with same concentration with with the help of US-guided ISB for arthroscopic shoulder surgery. This study compared 20 ml of0.75% ropivacaine with 15 ml of 0.75% ropivacaine. It was hypothesized that 75 mg of ropivacaine provided in two different volume ratios for US-guided ISB would produce different effects for the motor and analgesic duration of ISB.

MATERIALS AND METHODS

After ethical commity approval from the balaji medical college and research center. All patients signed a written consent form before their participation in the study. Patients aged 18–70 years (American Society of Anesthesiologists' physical status of I, II, or III), who were scheduled to undergo arthroscopic shoulder surgery under interscaline brachial plexus block and had agreed to receive an ISB were enrolled. The exclusion criteria were infection at the ISB site, chronic opioid dependence), pre-existing neurological deficit, chronic obstructive pulmonary disease, coagulopathy, allergy to ropivacaine, pregnancy or lactation, and refusal to participate. A computer-generated sequence of random numbers and a sealed envelope technique were used to randomize the patients to receive ISB with a fixed concentration but different volume of ropivacaine as follows: 15ml of 0.75% ropivacaine (group A) and 20 ml of 0.75 % ropivicaine. under aseptic precautions scanning was performed at the level of the interscalene groove, with the long axis of the probe parallel to the clavicle. The transducer was then moved slightly caudally until the brachial plexus roots were identified. 2% lidocaine was injected into the skin to achieve a wheal. Then, a 25 G, 1.5-inch beveled needle was inserted into the lateral side of the transducer and entered using a lateral-to-

medial, in-plane technique. The target position of the needle was the space between the C5 and C6 roots. The position of the needle was confirmed, and 15 ml of 0.75% ropivacaine or 20 ml of 0.75 % ropivacaine was slowly injected with intermittent aspiration. All ISBs were performed under US guidance by a single expert anesthesiologist. The analgesic duration of the ISB was defined as the time between the end of the ISB and the postoperative initiation of analgesics.

Block assessment- Neural blockade was evaluated by a clinician who was blinded to the volume and concentration of the injected ropivacaine. Sensory blockade and motor blockade were checked every 3 min for up to 30 min after ISB. Sensory blockade was tested via pinpricks on the C4 (top of the shoulder), C5 (deltoid area), C6 (first fingertip), C7 (middle fingertip), and C8 (little fingertip) dermatomes. The sensory blockade was evaluated using a 3-point verbal rating scale, in which 2, 1, and 0 indicated normal sensation, dull sensation, and absence of sensation, respectively. Motor blockade was evaluated by shoulder abduction (deltoid sign) and forearm flexion, using the modified Bromage scale as follows: 4, full power; 3, reduced power but able to lift the arm against resistance; 2, able to move the muscle group against gravity but unable to lift the arm against resistance; 1, perceptible muscle contraction, but unable to move on purpose; and 0, unable to move the relevant muscle group. The onset time for a sensory block was defined as the time that elapsed between the end of the ISB procedure and the moment when the pinprick test of the deltoid area yielded a score of 0. Successful blockade was defined as an adequate motor blockade with a score of ≤ 2 for shoulder abduction and the absence of sensation with pinpricks of the deltoid area. Block failure was considered if shoulder abduction was possible after 30 min or if the pinpricks were felt in the deltoid area; these patients were excluded from the study.

RESULTS

Sl. No.		Group A (n=30)	Group B(n=30)	Statistical Significance
1	Age group (yr.)			
(a)	Less than 50 Years	10 (33.3)	7 (23.3)	$\chi2=0.739^{@}$ (p=0.389) df= 1
(b)	Above 50 Years	20 (66.7)	23 (76.7)	
	Total	30 (100.0)	30 (100.0)	
2	Mean age &SD (yr.)	53.53 ±18.52	58.47 ±16.22	$t=1.098^{@}$; p=0.277
	Mean Ht.&SD	168.77 ± 6.055	166.13± 6.421	$t=1.634^{@}$; p=0.108
3	Mean wt. & SD	70.43.± 11 45	70.67±10.84	$t=0.081^{@}$; p=0.936
4	Mean BMI	24.67.±3.39	25.54.± 3.257	$t=1.017^{@}$; p=0.313
5	Sex			
(a)	Male	19 (63.3)	11 (36.7)	$\chi2=4.267^{*}$ (p=0.039) df= 1
(b)	Female	11 (36.7)	19 (63.3)	
	Total	25 (100.0)	25 (100.0)	
6.	Time Taken for censory block (T8)	8.67 ±1.093	3.17 ± 0.747	$t=22.753^{**}$; p=0.000
7	Time taken to achieve Motor Block (Grade III)	8.83 ±1.234	3.03 ±0.718	$t=22.247^{**}$; p=0.000
8	ASA			
	Grade 1	10 (33.3)	5 (16.7)	$\chi2=2.222$ (p=0.136); df=1
	Grade 2	20 (66.7)	25 (83.3)	

Table 1: Demographic Distribution

not significant

Duration	N	Group B Mean± SD	Group A Mean± SD	Mean Difference	95% Confidence Interval	t-value (P Value)
T_{Basal}	30	81.67±13.91	78.83±13.56	2.83	-4.04 - 9.70	0.844 (0.406)
T_5	30	81.67±13.86	76.70±9.26	4.97	-1.66 - 11.60	1.532 (0.136)
T_{10}	30	79.00±12.47	75.43±9.93	3.57	-2.93 - 10.06	1.123 (0.271)
T_{15}	30	78.80±12.12	75.07±10.53	3.73	-2.43 - 9.89	1.240 (0.225)
T_{20}	30	77.57±10.13	74.33±9.02	3.23	-1.82 - 8.28	1.310 (0.201)
T_{25}	30	76.63±9.40	73.97±9.17	2.67	-2.19 - 7.53	1.122 (0.271)
T_{30}	30	77.83±10.35	72.47±8.26	5.37	0.61 - 10.12	2.310* (0.028)
T_{45}	30	76.07±9.99	73.37±8.45	2.70	-1.84 - 7.24	1.216 (0.234)
T_{60}	30	76.50±8.17	73.67±9.16	2.83	-1.44 - 7.11	1.355 (0.186)
T_{75}	30	76.97±8.64	73.30±9.12	3.67	-1.18 - 8.51	1.547 (0.133)
T_{90}	30	76.67±8.26	73.57±8.81	3.10	-1.38 - 7.58	1.414 (0.168)
T_{105}	30	77.60±8.30	76.07±9.51	1.53	-2.90 - 5.96	0.708 (0.485)
T_{120}	30	77.13±7.78	78.67±8.75	-1.53	-6.01 - 2.94	0.700 (0.489)
T_{150}	30	77.47±9.13	79.70±8.58	-2.23	-6.77 - 2.31	1.006 (0.323)
T_{180}	30	81.67±13.91	80.83±9.07	-4.10	-8.61 - 0.41	1.860 (0.073)

Table 2: Heart Rate (Min)

Not significant P> 0.05; *significant at 0.05; P<0.05

Duration	N	Group B Mean± SD	Group A Mean± SD	Mean Difference	95% Confidence Interval	t-value (P Value)
T_{Basal}	30	89.47± 13.07	86.40 ± 16.33	3.07	-3.52-9.66	0.952 (0.349)
T_5	30	90.30 ± 11.43	88.70 ± 17.15	1.60	-3.27-6.47	0.672 (0.507)
T_{10}	30	89.53 ± 8.77	87.10 ± 14.56	2.43	-2.46-7.32	1.018 (0.317)
T_{15}	30	89.80 ± 7.36	85.87 ± 14.05	3.93	-1.82-9.69	1.398 (0.173)
T_{20}	30	89.70 ± 7.57	86.03 ± 13.49	3.67	-1.39-8.72	1.483 (0.149)
T_{25}	30	90.43 ± 8.52	86.40 ± 13.77	4.03	-0.97-9.04	1.648 (0.271)
T_{30}	30	89.30 ± 8.31	84.77 ± 8.54	4.53	0.45-8.62	2.269* (0.031)
T_{45}	30	89.80 ± 7.50	85.80± 11.26	4.00	-1.18-9.18	1.580 (0.125)

T_{60}	30	90.93 ± 7.03	85.03 ± 11.50	5.90	0.57-11.23	2.262* (0.031)
T_{75}	30	90.37± 7.04	85.67 ± 11.56	4.70	-0.54-9.94	1.833 (0.077)
T_{90}	30	91.83 ±7.97	85.33 ± 10.37	6.50	1.56-11.44	2.692* (0.012)
T_{105}	30	92.67 ± 7.12	87.07 ± 9.11	5.60	1.41-9.79	2.733* (0.011)
T_{120}	30	91.83 ± 7.71	87.77 ± 7.51	4.07	-0.26-8.40	1.921 (0.065)
T_{150}	30	91.17 ± 7.33	90.30 ± 8.18	0.87	-3.72-5.45	0.387 (0.702)
T_{180}	30	89.47± 13.07	86.40 ± 16.33	-0.50	-4.98-3.98	0.228 (0.821)

Table 3: Mean Blood Pressure

*significant at 0.05 level; P<0.05

DISCUSSION

Shoulder arthroscopy is a common orthopedic procedure that presents substantial postoperative pain control challenges to the surgeon and the anesthesiologist.[5] General anesthesia is the choice of anaesthesia for shoulder arthroscopic surgeries due its ease in administration and patient comfort. But in patients with decreased pulmonary reserve, smokers, where general anaesthesia is contraindicated, interscaline block is the safest, easiest we can administer with no complications post operative and also with extra benefit of post op analgesia. ropivicaine is less cardiotoxic compared to bupivicaine here it's a safer local anaesthesitic drug to use many studies compared different concentrations of ropivicaine and levobupivicaine for several analgesic blocks[3] in order to look for the minim drug volume required for adequate block and analgesia this study was conducted. A study comparing 1.0 ml/kg of 0.225% and 1.5 ml/kg of 0.15% ropivacaine for caudal analgesia for pediatric orchiopexy reported that the latter formulation produced a higher level of block and provided better quality and longer duration of analgesia.[6] Compared with other studies our study showed there was no difference in the duration of analgesia between the two groups. It could be because of the anatomical structures in the interscaline region like more openness, less firmness to prevent the spread of LA from the target nerves, more variable surrounding vessels that contribute to regression of LA, and a higher non neural-neural tissue ratio.[7] Since we used different volumes of drug which resulted in the same duration of analgesia we could use lesser volume of drug to perform the block.

CONCLUSION

Since there was no difference between the onset and duration of both sensory and motor block between two different volumes of ropivicaine, we can use lesser volume to achieve the same effect with less side effects. Further studies should be done decreasing the volume of ropivacaine.

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