

# Comparative Evaluation of 0.75% Ropivacaine with Ropivacaine 0.75% and Clonidine in Combined Sciatic Femoral Nerve Block for Orthopedic Leg Surgeries

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## Abstract

**Background:** The present study compared between ropivacaine and ropivacaine with clonidine in lower limb orthopedic surgery using sciatic-femoral block. **Subjects and Methods:** The present study was conducted in the department of Anaesthesiology on 60 patients undergoing elective lower limb orthopedic surgery. Patients were divided into 2 groups of 30 each. Group I (Ropivacaine Group) – Patients in whom sciatic femoral block was achieved using 30 mL 0.75% Ropivacaine alone. Group II (Ropivacaine + Clonidine Group) – Patients in whom sciatic femoral block was achieved using 30 mL 0.75% Ropivacaine plus 1 µg/kg clonidine. In both groups, sensory and motor blocks, intraoperative systolic and diastolic blood pressure and VAS score was recorded. **Results:** In our study mean age, mean weight and mean height and mean duration of surgery were non-significant between both groups. The onset of sensory and motor block was non-significant between two groups. The sensory and motor block characteristics have been found to be no difference in both groups that are matched with the block characteristics of hyperbaric ropivacaine versus ropivacaine with clonidine. **Conclusion:** Authors found that ropivacaine 0.75% used in combined sciatic femoral nerve block is well tolerated and provides effective surgical anesthesia as well as relief of postoperative pain. Clonidine as an adjuvant to ropivacaine enhances the quality of combined sciatic femoral nerve block by faster onset of sensory and motor block.

**Keywords:** Anesthesia, Clonidine, Ropivacaine.

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Received: April 2020

Accepted: April 2020

## Introduction

The femoral nerve block (FNB) is one of the easiest peripheral nerve blocks to master because the landmarks are generally easy to identify and the nerve is usually found at a superficial depth.<sup>[1]</sup> The block is usually performed as a single shot; however its duration of action may be extended with a catheter technique. When using a catheter local anesthetic may be delivered by repeated boluses, patient controlled boluses or continuous infusion.<sup>[2]</sup>

A FNB can reduce systemic opiate requirements with their side effects. This may be particularly important in the elderly or those with respiratory disease. Thus the femoral nerve block can be performed to provide perioperative analgesia for fractured neck/shaft of femur or postoperative analgesia after knee surgery.<sup>[3]</sup>

The sciatic nerve supplies motor and sensory innervation to the posterior aspect of the thigh as well as the entire lower leg, except for the medial leg, which is supplied by the saphenous nerve (the terminal branch of the femoral nerve). The sciatic nerve, formed from the anterior rami of spinal nerves L4–S3, is the largest nerve in the body.<sup>[4]</sup>

Ropivacaine blocks impulse conduction in nerve fibers by reversible inhibition of sodium ion influx. It is less lipophilic

than and does not penetrate large myelinated motor fibers.<sup>5</sup> It acts on the pain transmitting A- $\alpha$  and C nerves rather than A- $\beta$  fibers which are involved in motor function. Clonidine stimulates alpha<sub>2</sub> adrenergic neurons in the medulla to cause a decrease in sympathetic outflow to peripheral tissues from the central nervous system.<sup>[6]</sup> The present study compares between ropivacaine and ropivacaine with clonidine in lower limb orthopedic surgery using sciatic-femoral block.

## Subjects and Methods

The present study was conducted in the department of Anaesthesiology in collaboration with Department of Orthopaedic Surgery, Ram Manohar Lohia Combined Hospital, Lucknow. Informed consent will be obtained from all the patients enrolled in the study. 60 patients undergoing elective lower limb orthopedic surgery procedures were recruited for the study. Inclusion Criteria were adult patients aged 18-50 years, ASA Grade I or II and patients scheduled to undergo elective lower limb surgery. Exclusion criteria were patients allergic to trial drug(s), having history of significant coexisting diseases like ischemic heart disease, hypertension, impaired renal functions, rheumatoid arthritis, and severe liver disease.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 30 each. Group I (Ropivacaine Group) – Patients in whom sciatic femoral block was achieved using 30 mL 0.75% Ropivacaine alone. Group II (Ropivacaine + Clonidine Group) – Patients in whom sciatic femoral block was achieved using 30 mL 0.75% Ropivacaine plus 1 µg/kg clonidine.

All patients received diazepam 0.2 mg/kg orally, the night before surgery. They were monitored with automated noninvasive blood pressure, pulse oximetry and electrocardiogram. Sterile syringes with local anesthetic solution were prepared in a double-blinded fashion. For the femoral block, 12 mL of anesthetic solution was used, and for the sciatic block, 18 mL of the same solution was used. Nerve blocks were performed with the aid of a nerve stimulator by using a short-beveled, stimulating needle. First, femoral nerve block was performed, which was immediately followed by the sciatic nerve block. For both femoral and sciatic nerve blocks, the total volume of anesthetic solution was equally divided among the acceptable twitches.

In both groups, sensory and motor blocks, intraoperative systolic and diastolic blood pressure and VAS score was recorded after the completion of anesthetic injection. Results were expressed by mean ± standard deviation. Statistical analysis was performed by IBM SPSS (21.0). P-value was considered significant if <0.05.

**Results**

**Table 1: Demographic profile of patients**

Variables	Group A (30)	Group B (30)	T Value	P Value
Age (Years)	33.10±5.21	34.62±4.07	-1.089	0.251
Male: Female	16:14	18:12	1.214	0.257
Height (cm)	166.17±5.98	165.63±6.93	-1.297	0.602
Weight (kg)	65.54±6.32	63.54±6.83	1.321	0.212
BMI (Kg/m <sup>2</sup> )	25.02±3.15	23.62±3.21	1.231	0.124
Surgery Duration(min)	84.65±9.73	86.02±12.21	0.326	0.214

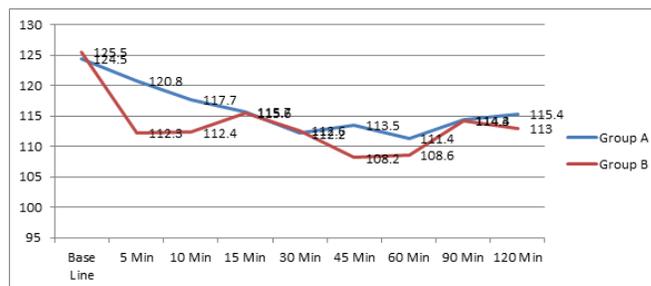
**Table 2: Comparisons of parameters**

Variables	Group A	Group B	T Value	P Value
Onset of sensory block (min)	12.2±1.98	11.10±1.66	1.212	0.022
Onset of motor block (min)	14.7±2.18	13.4±1.67	1.231	0.024
Onset of surgical Anesthesia (min)	17.4±1.99	16.1±1.63	1.221	0.016
Duration of Sensory Block (min)	361.8±45.21	454.2±35.40	7.95	<0.001
Duration of motor block (min)	382.5±48.66	421.5±37.4	7.62	<0.001
Duration of Analgesia (min)	439.0±42.87	521.7±36.54	8.65	<0.001

[Table 1] shows that group A & B each consisting of 30 cases. Mean age was 33.10±5.21 & 34.62±4.07 yrs, male: female ratio was 16:14 & 18:12, mean height was 166.17±5.98 & 165.63±6.93 cms, mean weight was 65.54±6.32 & 63.54±6.83 kg and mean BMI (Kg/M<sup>2</sup>) was 25.02±3.15 & 23.62±3.21 Kg/M<sup>2</sup> respectively. Duration of the surgery was 84.65±9.73 & 86.02±12.21 minutes for the two groups A & B respectively. The variation between the two groups in respect of none of the above parameters was statistically significant as

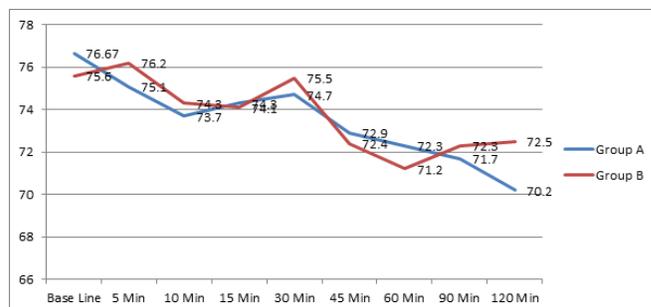
P>0.05.

[Table 2] shows that onset of sensory block was 12.2±1.98 & 11.10±1.66 (min), onset of motor block was 14.7±2.18 & 13.4±1.67 (min) and onset of Surgical Anesthesia was 17.4±1.99 & 16.1±1.63 (min) for group A & B respectively. The duration of sensory Block was 361.8±45.21 (min.) & 454.2±35.40 (min.), duration of motor block was 382.5±48.66. (min.) & 421.5±37.4 (min.) and duration of analgesia was 439.0±42.87 (min.) & 521.7±36.54 (min.) respectively for group A & B.



**Figure 1: Intra operative systolic blood pressure**

[Figure 1] shows that mean SBP after 15 min of start of operation was 115.7±7.29 & 112.4 ± 6.38 (mmHg) whereas the readings of SBP, after 45 min. intra -operative fluctuated to 113.5±7.10 & 108.6±6.38 (mmHg) for cases of group A & B respectively. Then again the mean SBP registered a gradual upward trend in the cases of both the groups A & B which was recorded to be 115.4±6.45 & 113.0±4.55 (mmHg) after 120 minutes of start of operation.



**Figure 2: Intra operative diastolic blood pressure**

**Table 3: Comparison of VAS score**

VAS score	Group A		Group B		T Value	P Value
	Mean	SD	Mean	SD		
Base Line	0.00	0.00	0.00	0.00	-	-
1 hr	0.00	0.00	0.00	0.00	-	-
2 hr	0.92	0.50	0.69	0.45	2.001	0.054
3 hr	1.81	0.63	1.01	0.00	8.012	<0.001
4 hr	2.29	0.63	1.10	0.36	10.326	<0.001
6 hr	2.69	0.54	1.79	0.68	6.145	<0.001
8 hr	3.65	0.63	2.29	0.64	9.120	<0.001

[Figure 2] shows that mean DBP after 15 min. of start of operation were 74.7±5.78 & 75.5±5.19 (mmHg) whereas the reading after 30 min. fluctuated to 75.7±5.68 & 74.3±5.29 (mmHg) for cases of group A & B respectively. Then again mean DBP registered a down-ward trend in cases of group A & B and mean DBP reading at 120 minutes intra-operative was 70.2±6.08 & 72.5±5.02 (mmHg). Intra- operative

variations in the mean diastolic blood pressure between the cases of the two groups was significant at time interval of 60 min as  $P < 0.05$ .

[Table 3] shows that shows VAS Score of the members of both the groups, immediately post-operative and an hour afterwards was zero, after 2 hours post-operative VAS Score was  $0.95 \pm 0.50$  &  $0.72 \pm 0.45$ , after 4 hours  $2.37 \pm 0.63$  &  $1.15 \pm 0.36$  and after 8 hours post-operative score was  $3.60 \pm 0.63$   $2.30 \pm 0.64$ , of group A & B respectively. The variation in the VAS score between the members of the two groups was highly significant at time intervals of 3 hours to 8 hours post-operatively as  $P < 0.001$ .

## Discussion

Pain is an unpleasant nociceptive sensation that originates from noxious stimulation due to disease process or injury including surgical incision which eventually causes impending or ongoing tissue damage in peri-operative period.<sup>[7]</sup> Acute pain accompanies almost all the surgical procedures. Recently adjuvant medications were added to LA to prolong the effect of Sciatic-Femoral nerve block. Clonidine is a selective  $\alpha_2$  ( $\alpha_2$ -2) adrenergic agonist with both analgesic and sedative properties. Ropivacaine is a pure S(-) enantiomer, structurally related to bupivacaine, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles. The efficacy of ropivacaine is similar to that of bupivacaine and levobupivacaine for peripheral nerve blocks.<sup>[9]</sup>

The present prospective, randomized, double blind, comparative study was carried out on patients in the department of Anaesthesiology at Dr. Ram Manohar Lohia Combined Hospital, Lucknow (U.P.). Total Adults subjects of (ASA) physical status I and II posted for lower limb surgery under Sciatic-Femoral nerve block were included in this study. The patients were divided into two groups with only Ropivacaine (Group A) & Ropivacaine with Clonidine (Group B), each having 30 patients. Patients of group A received total 32 ml of ropivacaine 0.75% (12 ml for femoral block & 20 ml for sciatic block in each group). The distribution of patients was randomized in two groups using a computer generated program. Patients of group B received total 32 ml of ropivacaine 0.75% (12 ml for femoral block & 20 ml for sciatic block in each group) with Clonidine  $1 \mu\text{g}/\text{kg}$ .

In our study the demographic characteristics like mean age, mean weight and mean height have been recorded. We have found no significant age difference where  $p$  value  $> 0.251$ , while mean weight difference has also not been found significant with  $P$  value 0.212. We have also recorded duration of surgery and no significant gender and ASA score have been also recorded. It is in agreement with Mohan et al.<sup>[10]</sup>

In the present study we found that the onset of sensory and motor block was non-significant between two groups. The sensory and motor block characteristics have been found to be no difference in both groups that are matched with the block characteristics of hyperbaric ropivacaine versus ropivacaine with clonidine.

Bansal et al,<sup>[11]</sup> conducted study on 100 patients scheduled for lower limb surgeries which were randomly divided into two groups of 50 each. In Group A, patients received 20 ml of 0.5% ropivacaine for femoral nerve block and same dose for

sciatic nerve block and in Group B, 25  $\mu\text{g}$  fentanyl was added each for femoral nerve and sciatic nerve block along with ropivacaine. It was found that combined femoral and sciatic nerve block provide longer duration of postoperative analgesia of about 12–13 h. All the above-mentioned parameters were statistically non-significant.

In our study, it has been observed that the systolic blood pressure of intra-operative period of group A and Group B, which is potentiated by clonidine. It has been found that there was non-significant difference between two groups with  $P$  value not less than 0.005. It has been observed that the diastolic blood pressure of intra-operative period of group A and Group B. There was no significant difference between group A and group B with  $P$  value not less than 0.005. In our study, it has been observed that the mean arterial pressure of intra-operative period of group A and Group B, there was not any significant difference between two groups. In our study, we have observed that the variation in mean visual analogue score between the two groups is statistically significant after most of time interval in post-operative with  $P$  value  $< 0.0001$ . Baddoo suggested that combined femoral and sciatic nerve block provides longer duration of postoperative analgesia of about 12–13 h as compared to a central neuraxial block of about 4–5 h.<sup>[12]</sup> This had the beneficial effect of the use of less number of analgesic doses in the form of nonsteroidal anti-inflammatory drugs and opioids which have many side effects such as postoperative nausea, vomiting, sedation, and adequate pain control resulting in early mobilization. The shortcoming of the present study is small sample size, lack of proper assessment of success rate of interscalene brachial plexus block procedure and ropivacaine or clonidine was not used as per body weight in kg.

## Conclusion

Authors found that ropivacaine 0.75% used in combined sciatic femoral nerve block is well tolerated and provides effective surgical anesthesia as well as relief of postoperative pain. Clonidine as an adjuvant to ropivacaine enhances the quality of combined sciatic femoral nerve block by faster onset of sensory and motor block.

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**How to cite this article:** Asthana A, Tiwari JP, Tripathi DK, Prasad B. Comparative Evaluation of 0.75% Ropivacaine with Ropivacaine 0.75% and Clonidine in Combined Sciatic Femoral Nerve Block for Orthopedic Leg Surgeries. *Acad. Anesthesiol. Int*. 2020;5(1):195-98.

DOI: [dx.doi.org/10.21276/aan.2020.5.1.41](https://doi.org/10.21276/aan.2020.5.1.41)

**Source of Support:** Nil, **Conflict of Interest:** None declared.