

To Determine the Effect of Clonidine as an Adjuvant for Ropivacaine in Lower Limb Orthopedic Surgery

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Abstract

Background: The present study determined the effect of Clonidine as an adjuvant for ropivacaine in lower limb orthopedic surgery. **Subjects and Methods:** The present study was conducted on 60 patients undergoing lower limb surgery. Group I patients were given 30 mL 0.75% ropivacaine alone for sciatic femoral block with Group II patients in whom sciatic femoral block will be achieved using 30 mL 0.75% Ropivacaine plus 1 µg/kg clonidine. The time for the first rescue analgesia in the post-operative period, SBP, DBP sedation was assessed by a modified Ramsay sedation scale. **Results:** Group I comprised of 16 males and 14 females and group II had 18 males and 12 females. The difference was non-significant ($P > 0.05$). ASA grade I was seen in 18 patients in group I and 24 in group II, ASA II was seen in 12 in group I and 6 in group II patients. The difference was non-significant ($P > 0.05$). Intra-operative variations in the mean arterial pressure (mmHg) between the cases of the two groups were significant at 5 min, 10 min, 15 min & 60 min during the operation as $P < 0.05$. Post-operative variations in the mean systolic blood pressure (mm of Hg) between the cases of the two groups was not significant at time intervals as $P > 0.05$. The difference in the sedation score between the cases of the two groups was highly significant at time intervals of 1 hour, 2 hours, 3 hours, 8 hours and Immediately post-op as $P < 0.001$ & it was significant at time interval of 6 hr as $p < 0.05$. **Conclusion:** Authors found that clonidine added to ropivacaine 0.75% in an appropriate technique has low side effect profile with considerable therapeutic benefit and enhances the quality of combined sciatic femoral nerve block.

Keywords: Clonidine, Ropivacaine, Sedation.

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Introduction

Orthopaedics is the branch of surgery concerned with conditions involving the musculoskeletal System. Orthopedic surgeons use both surgical and nonsurgical means to treat musculoskeletal trauma, spine disease, sports injuries, degenerative diseases, infections, tumors, and congenital disorders. The femoral nerve is the largest branch of the lumbar plexus and arises from the ventral rami of the second, third and fourth lumbar nerves.^[1]

Femoral nerve block can be used to provide surgical anaesthesia, usually in combination with a sciatic nerve block. This may be advantageous in situations where it would be preferable to avoid general or neuraxial anaesthesia, knee joint, vessels and lies outside the femoral sheath.^[2]

Contraindications for FNB are patient refusal, inflammation or infection over injection site, allergy to local anaesthetics, anticoagulation or bleeding disorders and pre-existing peripheral neuropathies etc.^[3] The sciatic nerve is so large, it can be blocked from several different locations along the lower extremity. Labat's sciatic nerve block is the classic approach, targeting the nerve in the gluteal region. Other sciatic nerve blocks include the anterior and lateral approaches, which allow the patient to remain in the supine

position, as well as the parasacral and prone approaches. Raj's subgluteal approach is performed in the supine position with the hip flexed. Sciatic nerve blocks require adequate set-up because this large nerve resists local anesthetic penetration, leading to longer block onset times.^[4]

Ropivacaine is a long acting local anaesthetic agent belonging to amino amide group. It is structurally related to Bupivacaine, but it is a pure S-enantiomer of 1-propyl-2c,6c-pipecoloxylidide, developed for the purpose of reducing cardio toxicity and improving motor and sensory blockade and even more motor-sparing than bupivacaine.^[5]

Ropivacaine because of its less lipophilic and stereo selective properties has higher threshold for cardio toxicity and CNS toxicity.^[5] It inhibits platelet aggregation and it inhibits the growth of staphylococcus aureus, E. Coli and pseudomonas aeruginosa. Clonidine is an imidazoline derivative having complex actions. It is a partial agonist with high affinity to alpha 2 receptors especially alpha 2A subtype.^[6] The present study determined the effect of Clonidine as an adjuvant for ropivacaine in lower limb orthopedic surgery.

Subjects and Methods

This randomized controlled study was conducted in the

department of Anaesthesiology & department of Orthopaedic Surgery, Ram Manohar Lohia Combined Hospital, Lucknow on 60 patients undergoing elective lower limb orthopedic surgery in age ranged 18-50 years.

Patients' data such as name, age, gender etc. was recorded. Patients were divided into 2 groups. Group I patients were given 30 mL 0.75% ropivacaine alone for sciatic femoral block with Group II patients in whom sciatic femoral block will be achieved using 30 mL 0.75% Ropivacaine plus 1 µg/kg clonidine. The time for the first rescue analgesia in the post-operative period, SBP, DBP sedation was assessed by a modified Ramsay sedation scale. Postoperative pain was recorded for 24 hrs using visual analogue scale.

Modified Ramsay Sedation Scale

Indication	Score
Anxious, agitated, restless	1
Awake, cooperative, oriented, tranquil	2
Semiasleep but responds to commands	3
Asleep but responds briskly to glabellar tap or loud auditory stimulus	4
Asleep with sluggish or decreased response to glabellar tap or loud auditory stimulus	5
No response can be elicited	6

Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table 1: Distribution of patients

Variables	Group A	Group B	P Value
Male	16	18	0.421
Female	14	12	
Total	30	30	

[Table 1] shows that group I comprised of 16 males and 14 females and group II had 18 males and 12 females. The difference was non- significant (P> 0.05).

Table 2: ASA status

Variables	Group A	Group B	P Value
ASA I	18	24	0.201
ASA II	12	6	
Total	30	30	

[Table 2] shows that ASA grade I was seen 18 patients in group I and 24 in group II, ASA II was seen in 12 in group I and 6 in group II patients. The difference was non- significant (P> 0.05).

Table 3: Assessment of intra- operative mean arterial pressure

MAP (mm/Hg)	Group A		Group B		T Value	P Value
	Mean	SD	Mean	SD		
Base Line	94.7	5.24	91.4	5.39	0.010	0.314
5 Min	90.3	5.35	86.6	4.24	1.564	0.004
10 Min	86.2	5.46	84.8	4.37	1.624	0.003
15 Min	88.3	5.45	85.4	4.31	1.589	0.040
30 Min	87.3	5.36	85.3	4.54	1.632	0.108
45 Min	88.5	5.20	86.2	4.55	1.625	0.073
60 Min	85.5	5.50	84.9	4.53	1.712	0.001
90 Min	86.7	5.35	83.2	5.52	1.742	0.243
120 Min	86.2	5.40	84.0	4.03	0.754	0.950

[Table 3] shows that MAP after 60 minutes of start of operation was 85.5±5.35 & 83.2±5.35 (mmHg) whereas the readings after 120 minutes fluctuated to 86.2±5.40 & 84.0±4.03 (mmHg) for the cases of groups A & B respectively. Intra- operative variations in the mean arterial pressure (mmHg) between the cases of the two groups were significant at 5 min, 10 min, 15 min & 60 min during the operation as P<0.05.

Table 4: Post-operative systolic blood pressure

Systolic Blood Pressure (mm/hg)	Group A		Group B		T Value	P Value
	Mean	SD	Mean	SD		
Base Line	125.5	7.14	123.0	7.76	1.457	0.133
1 hr	116.9	7.50	111.6	7.77	1.921	0.076
2 hr	114.3	7.47	111.3	7.10	1.502	0.064
3 hr	118.0	7.92	116.8	6.56	1.510	0.059
4 hr	117.2	7.64	114.1	7.99	1.168	0.274
6 hr	118.2	7.91	119.1	8.03	0.500	0.644
8 hr	118.8	8.20	119.8	8.01	0.524	0.610

[Table 4] shows that the mean SBP readings immediately post operatively were 125.5±7.14 & 123.0±7.76 (mm of Hg), after 4 hours 117.2 ±7.64 & 116.8±7.99 (mm of Hg) and after 8 hours 118.8±8.20 & 119.8±8.01 respectively for the cases of the groups A & B. Post-operative variations in the mean systolic blood pressure (mm of Hg) between the cases of the two groups was not significant at time intervals as P>0.05.

Table 5: Post-operative diastolic blood pressure

Diastolic Blood Pressure (mm/hg)	Group A		Group B		T Value	P Value
	Mean	SD	Mean	SD		
Base Line	75.2	5.59	75.8	4.91	0.821	0.664
1 hr	71.4	5.63	72.4	5.52	2.854	0.172
2 hr	73.4	5.52	72.8	5.04	-0.040	0.664
3 hr	81.3	5.52	72.1	5.08	1.410	0.141
4 hr	71.5	5.77	74.1	5.03	-0.574	0.413
6 hr	71.6	5.52	73.2	4.41	2.011	0.093
8 hr	71.4	5.59	74.1	5.03	-0.511	0.931

[Table 5] shows that the base line DBP immediately post-operative was 77.8±5.77 & 76.8±4.91 (mmHg), after 4 hours post-operative was 72.4±5.59 & 73.1±5.03 (mmHg) and after 8 hours was 72.4±5.59 & 73.1±5.03 (mmHg) respectively in the cases of both groups A & B. Post-operative variations in the mean diastolic blood pressure (mmHg) between the cases of the two groups A & B was not significant at any time interval post operatively as P>0.05.

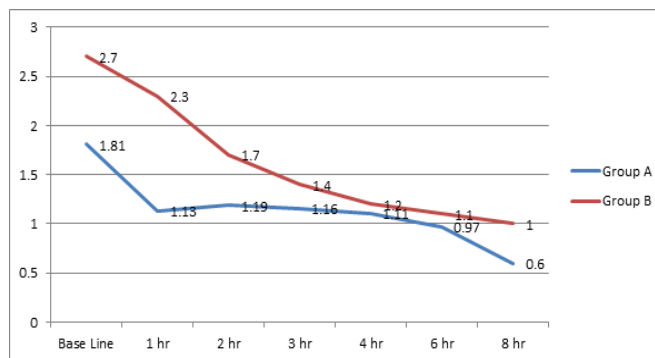


Figure 1: Sedation score

[Figure 1] shows that sedation score immediately post-operative was 1.81 ± 0.607 & 2.7 ± 0.36 , after a lapse of 1 hours score was 1.13 ± 0.438 & 2.3 ± 0.54 , after 4 hours score was 1.11 ± 0.303 & 1.2 ± 0.38 and after 8 hours post-operative score was 0.60 ± 0.490 & 1.0 ± 0.00 of the two groups A & B respectively. The difference in the sedation score between the cases of the two groups was highly significant at time intervals of 1 hour, 2 hours, 3 hours, 8 hours and Immediately post-op as $P < 0.001$ & it was significant at time interval of 6 hr as $p < 0.05$.

Discussion

Post-operative pain is the most common clinical problem in hospitals -among the surgical patients and is attributed as main reason for overnight hospital stay in 17-41% of surgical day care patients.^[7] Ropivacaine with its efficacy, lower propensity for motor block and reduced potential for cardiotoxicity and central nervous system toxicity, appears to be an important option for regional anesthesia and management of postoperative pain.^[8] Clonidine is a selective alpha 2 (α -2) adrenergic agonist with both analgesic and sedative properties.^[9] Its use with ropivacaine in regional blocks has been associated with ropivacaine in regional blocks has been associated with prolongation of the local anesthetic effect.^[10] The present study determine the effect of Clonidine as an adjuvant for ropivacaine in lower limb orthopedic surgery.

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 present study, group I comprised of 16 males and 14 females and group II had 18 males and 12 females. ASA grade I was seen 18 patients in group I and 24 in group II, ASA II was seen in 12 in group I and 6 in group II patients. Anderson et al,^[11] in which participants received bilateral ACBs containing 20 ml ropivacaine 0.5% + 1 ml clonidine $150 \mu\text{g}/\text{ml}$ in one leg and 20 ml ropivacaine 0.5% + 1 ml saline in the other leg. There was no difference in duration of sensory block assessed with an alcohol swab: Mean duration in the leg receiving ropivacaine + clonidine was 19.4 hours compared to 19.3 hours in the leg receiving ropivacaine + placebo with a mean difference of 0.1 hour. No differences in block duration were detected when assessed by: Pinprick, mean difference 0.0 hour, maximum pain during tonic heat stimulation, mean difference -0.7 hour, warmth detection threshold, mean difference -0.1 hour or heat pain detection threshold.

We found that intra- operative variations in the mean arterial pressure (mmHg) between the cases of the two groups were significant at 5 min, 10 min, 15 min & 60 min during the operation as $P < 0.05$. Post-operative variations in the mean systolic blood pressure (mm of Hg) between the cases of the two groups was not significant at time intervals as $P > 0.05$. Post-operative variations in the mean diastolic blood pressure (mmHg) between the cases of the two groups A & B was not

significant at any time interval post operatively as $P > 0.05$. Pratap et al,^[12] performed a bilateral trial on healthy volunteers resembling ours. They injected 0.5 ml of lidocaine 0.5% with $10 \mu\text{g}$ clonidine subcutaneously on one forearm and 0.5 ml of lidocaine 0.5% with saline subcutaneously on the opposite forearm. The duration of anesthesia was prolonged from 3.5 hours to at least 6 hours when clonidine was added. They assumed that $10 \mu\text{g}$ of clonidine would be without systemic effects and concluded that clonidine had a peripheral action in enhancing duration of anesthesia on superficial co-infiltration with lidocaine. However, α 2-receptors are more numerous at peripheral nerve endings compared to axons which may explain the difference in results.

We found that sedation score immediately post-operative was 1.81 ± 0.607 & 2.7 ± 0.36 , after a lapse of 1 hours score was 1.13 ± 0.438 & 2.3 ± 0.54 , after 4 hours score was 1.11 ± 0.303 & 1.2 ± 0.38 and after 8 hours post-operative score was 0.60 ± 0.490 & 1.0 ± 0.00 of the two groups A & B respectively. The difference in the sedation score between the cases of the two groups was highly significant at time intervals of 1 hour, 2 hours, 3 hours, 8 hours and Immediately post-op as $P < 0.001$ & it was significant at time interval of 6 hr as $p < 0.05$.

Conclusion

Authors found that clonidine added to ropivacaine 0.75% in an appropriate technique has low side effect profile with considerable therapeutic benefit and enhances the quality of combined sciatic femoral nerve block.

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