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# COMPARATIVE EVALUATION OF UNILATERAL SPINAL ANAESTHESIA AND SCIATIC- FEMORAL NERVE BLOCK WITH BUPIVACAINE AND CLONIDINE IN BELOW KNEE SURGERY

Anaesthesiology

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## ABSTRACT

**Background:** This is a prospective randomized comparative study to compare the efficacy and safety of unilateral spinal anaesthesia and sciatic femoral block by using 14 parameters **Methods:** 60 patients undergoing unilateral below knee surgery were randomly allocated into 2 groups. Group A received unilateral spinal anaesthesia with injection Bupivacaine 0.5% heavy 1.3 ml + injection Clonidine 45µg. Group B received sciatic femoral block. 25ml of test solution ( injection bupivacaine 0.5% 30ml + injection Clonidine 45 µg + distilled water 10ml) used for sciatic block and 15ml for femoral block. **Results:** Unilateral spinal anaesthesia was easier to perform. Onset and complete achievement of sensory and motor blockade is faster with unilateral spinal anaesthesia. Duration of sensory and motor block was prolonged in sciatic-femoral block, so the requirement of first rescue analgesia was prolonged in sciatic-femoral group. Both procedures had hemodynamic stability. Quality of anaesthesia was excellent with unilateral spinal anaesthesia and no intraoperative supplementation was required in this group when compared to sciatic-femoral group. No significant adverse effect noted in either group. Patient and surgeon satisfaction were better with unilateral spinal anaesthesia group. **Conclusion:** Unilateral Spinal anaesthesia is a better choice than sciatic-femoral block .When central neuraxial blockade is contraindicated Sciatic-femoral block can be considered as an alternative procedure. Use of ultrasound for sciatic-femoral block can increase the success rate and decrease the time taken for the procedure and increase the acceptance of the procedure.

## KEYWORDS

Unilateral spinal anaesthesia, Sciatic femoral block, Bupivacaine, Clonidine

## INTRODUCTION

Regional anesthesia can provide excellent anesthesia and prolonged post-operative pain relief [1]. Spinal anesthesia is commonly used because of the simplicity and excellent safety profile [1, 2]. Anaesthesia obtained from combined peripheral nerve block of the lower limb can be used for outpatient surgeries [1, 3, 5, 6, 7]. The study conducted by **Luiz Imbelloni** et al [9] found that, the sciatic – femoral nerve block is easy to perform and can be considered as an alternative for lower limb surgeries. Study of **Kurnz** et al [6] shows that sciatic-femoral nerve block has low pain scores in the postoperative period.

There were only a few literatures available and the previous studies were not effectively comparing the parameters. Majority of study they were using mepivacaine as a drug. The rationale of this randomized, prospective, comparative study is to assess the efficacy & safety of sciatic – femoral nerve block and unilateral spinal anesthesia for lower limb surgeries under 14 parameters using bupivacaine and clonidine. Parameters include time taken to complete procedure, the onset of sensory and motor block, time to achieve complete motor and sensory block, duration of sensory and motor block, hemodynamic changes, the difference in sedation score and VAS score, time for first rescue analgesia, post-operative complication, patients and surgeons satisfaction.

## MATERIAL AND METHODS

It was a prospective randomized comparative study that includes cases between the age of 18 to 50 years undergoing unilateral below-knee surgeries as ASA Grade I, II, III in Government Medical College, Aurangabad. Approval of Institutional Ethical committee obtained. Written, valid, informed consent was taken. 60 patients to be operated on for unilateral below knee surgeries were allocated randomly into 2 groups of 30 subjects each. The sample size was calculated using standard deviation and mean of reference study with power 80 %, ($p < 0.05$) with the help of OpenEpi. software Version3.01 (www.openepi.com)

A specially designed format was used to record the patient's particulars like history, examinations, and investigations. Pre-operative, pulse rate, blood pressure, SpO2, respiratory rate, ECG were noted. Preloading was done with Ringer lactate 10ml/kg. Group A: the patient was kept in lateral position with operating limb towards dependent side; In the L3-L4 intervertebral space 2% Inj. Lignocaine given. Then subarachnoid block was performed [9] with a 23G Qunicke needle with median approach. The bevel of the needle was directed towards the dependent limb [9] & Inj. bupivacaine 0.5% [H] 1.3ml + Inj. Clonidine 45ug [total volume 1.6ml] was injected slowly after aspiration of CSF. The patient was maintained in lateral position for 10 minutes and then into supine position.

Group B: Sciatic nerve injection was performed using the classical approach of Labat with Peripheral nerve stimulator (PNS). The patient was kept in modified Sims position [11]. When plantar flexion at 0.5 mA obtained [11], 25ml of test solution (Inj. Bupivacaine 0.5% 30 ml + Inj. Clonidine 45µg + distilled water 10ml) was injected.

The time of completion of injection was taken as time zero. The patient was turned to supine position. The needle of PNS was inserted 2cm lateral to femoral artery and 2cm below the inguinal ligament [12]. When patellar ascension at 0.5 mA was obtained [12], 15ml of test solution was injected.

The sensory & motor blockade assesed every 3 minutes within the first 30 minutes & every 15 minutes in the postoperative period.The sensory blockade was assessed by blunt needle using Hollmen scale[13]. Weak sensation was considered as onset of sensory block. Loss of sensation was considered as complete achievement of sensory block. Duration of sensory block was from time of completion of block to complete recovery.

Motor block was assessed by the modified Bromage scale[20]. The onset of motor block was taken as inability to raise an extended leg, able to move knees and feet[15]. Complete motor block was defined as inability to move knee and feet. Motor block duration was defined as the time from completion of block to complete recovery of motor function [16].Intra-operatively, pulse rate, heart rate, blood pressure, respiratory rate, oxygen saturation, Ramsay's score [21]. VAS Scale [22, 23, 24, 25] was noted immediately before placing the block & spinal anesthesia, and every 5 minutes till the end of the surgery, every 15 minutes in the

recovery room until complete recovery of sensory and motor block and every 4th hourly up to 24 hours.

The quality of surgical anesthesia was assessed by the need for supplemental anesthesia [14,18,19]. Excellent - no supplementary sedative or analgesic required, Good - only sedative required, Fair - sedative and analgesic required, Poor- General anesthesia with endotracheal intubation required. Patient and surgeon's satisfaction was noted on a scale of 10[14]. Data were tabulated in MS Excel and analyzed using Levene's t- test for continuous variables, Chi-Square test for categorical data using statistical software Statistical Package for the Social Sciences (SPSS Ver. 20.)

## RESULTS

Both the groups with respect to age, weight, sex, ASA physical status, and type of surgery were comparable (Table 1).

**Table 1: Distribution of study participants based on demographic parameters**

| Demographic parameters | Group A | Group B | P value |
|---|---|---|---|
| Age ( years) | 41.60 | 42.06 | 0.82 |
| Weight (Kg) | 56.00 | 57.40 | 0.06 |
| Sex (Male/ Female) | 15/15 | 15/15 | 1 |
| ASA grade (I/II/III) | 6/19/5 | 8/17/5 | 0.82 |

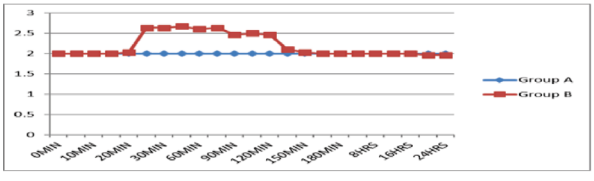
Meantime taken for anesthesia procedure in group A was 5.1 +/- 0.46 min. but for 10 minutes patients were kept in the lateral position; so the total time before initiation of surgery was 15.1 +/- 0.46 and of group B was 19.7 +/-2.97 min. p-value <0.0001. Data regarding onset, time to achieve complete sensory and motor block, duration of the block, duration of surgery are shown in Table 2

**Table 2: Data regarding sensory, motor block and duration of surgery**

| Variables | Group A | Group B | P value |
|---|---|---|---|
| Onset of sensory block(min) | 3+/-0 | 6.5+/-2.89 | <0.0001 |
| Time to achieve complete sensory block(min) | 3.2+/-0.76 | 10.8+/-6.50 | <0.0001 |
| Time of recovery of sensory block(hrs) | 3.07+/-0.19 | 7.39+/-3.02 | <0.0001 |
| Onset of motor block (min) | 5.16+/-0.91 | 11.70+/-4.85 | <0.0001 |
| Time to achieve complete motor block (min) | 5.16+/-0.91 | 23.46+/-10.33 | <0.0001 |
| Duration of motor block(hrs) | 2.65+/-0.34 | 6.67+/-2.71 | <0.0001 |
| Duration of surgery (hrs) | 1.85+/-0.53 | 2.00+/-0.77 | 0.361 |

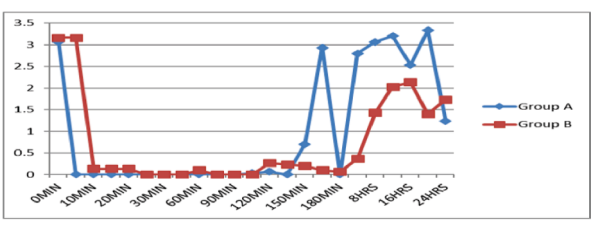
Pulse rate, blood pressure, saturation, respiratory rate at all times were comparable between the two groups and was not statistically significant.

P value of sedation score at 25 min (0.015) 30 min(0.015), 45min(0.010), 60 min(0.021), 75 min(0.016), 90 min (0.041),105 min(0.033), and 120 min(0.041) was significant. (Graph 1)




**Graph 1: Comparison of both groups based on sedation score**

P value of VAS score at 5min (0.00), 165 min (0.00), 4th hour (0.00), 8th hour (0.001) 12th hour (0.016) hour and 20th hour (0.00) was significant. (Graph 2)




**Graph 2: Comparison of two groups based on VAS score**

All subjects in group A had an excellent quality of anesthesia, while that of group B 18 subjects had an excellent quality of anesthesia, 4 had fair quality, 4 had good quality and 4 had poor quality. All subjects in group A did not receive any intraoperative supplementation. 4subjects in group B received general anesthesia due to inadequate block, 4 subjects received midazolam injection, 2 subjects received supplementation of midazolam and dexmedetomidine, and 2 subjects received midazolam and fentanyl.

We observed that 1 subject in group A and 2 subjects in group B had vomiting (not statistically significant). 2 subjects had urinary retention in group A and no subjects had urinary retention in group B (not statistically significant). No subjects in both groups had hypotension, respiratory depression, pruritus, neurological complication. Data regarding the time of first rescue analgesia, patient and surgeons satisfaction were shown in table 3.

**Table 3: Data regarding time of first rescue analgesia, patients and surgeons satisfaction**

| Variables | Group A | Group B | P value |
|---|---|---|---|
| Time of first rescue analgesia(hrs) | 3.45+/-0.39 | 11.86+/-6.31 | <0.001 |
| Patient satisfaction | 10+/-0 | 7.3+/-3.13 | <0.0001 |
| Surgeons satisfaction | 10+/-0 | 8.13+/-2.75 | <0.0001 |

## DISCUSSION

In our study the mean time taken for anesthesia procedure in unilateral spinal anesthesia group is lower than sciatic-femoral group. Study conducted by **Casati A et al (2000)** [10] **LuizImbelloni, Gustavo, Eliana (2010)** [9] **Isil Davarci, Kasim (2013)** [14] concluded that time taken for anesthesia procedure was shorter with spinal anesthesia than sciatic-femoral block. This is because of 2 reasons 1. Sciatic-femoral block two different nerves have to be blocked. In our method after giving sciatic block in lateral decubitus position the patient is turned to supine position for femoral block. To overcome this can try the anterior approach of sciatic nerve **Luiz Imbelloni, Gustavo, Eliana (2010)** [9] so change in position can be avoided. 2. To locate sciatic nerve through the classic approach of labet with peripheral nerve stimulator is difficult as the nerve is deep-seated. USG can be used to locate the nerve and detect anatomic variations. Meantime for onset of sensory block, achievement of complete sensory block and mean duration of motor block was less with unilateral spinal anesthesia than sciatic femoral group. Studies of **Soumi Matti, Bidyut Bikas Gharami, et al (2017)**[17]showed similar results.

Meantime of onset of motor block, time to achieve complete motor block, and duration of motor block was more with sciatic femoral block than with unilateral spinal anesthesia Studies of **Cappelleri G et al (2000)**[3], **Isil Davarci, Kasim, et al(2013)**[14], **Soumi Matti, Bidyut Bikas Gharami, et al (2017)**[17] found similar results. But study of **Felix Montes et al (2008)** [5] found that the duration of motor blockade was comparable between the two groups. This result may be due to the use of 20ml of 2 % Lidocaine and 20 ml of 0.5 % Bupivacaine. When we are combining rapid onset local anesthetic like Lidocaine with slow onset Bupivacaine onset of the block increases, but additive toxicity should be kept in mind.

The meantime of first rescue analgesia was shorter in the unilateral spinal anesthesia group due to early regression of block. This may be due to the amount of Bupivacaine used for unilateral spinal anesthesia being 7mg, which was considered a low dose. Study conducted by **Felix Montes et al (2008)** [5] **Isil Davarci, Kasim et al (2013)**[14] **Soumi Matti, Bidyut Bikas Gharami et al (2017)**[17] showed similar results.

P values of Pulse rate, Blood pressure, respiratory rate, SPo2 were not statistically significant at all times. Similar results were obtained by **Cappelleri G et al (2000)** [3] **Isil Davarci, Kasim et al (2013)**[14]. Studies of **SoumiMatti, BidyutBikasGharami et al (2017)**[17]heart rate variation, mean arterial pressure more in spinal anesthesia group than sciatic-femoral group of patients( $p < 0.005$ ). This may be due to the use of 2.5 ml of 0.5 % hyperbaric bupivacaine for spinal anesthesia. **Borghi B, Stagni F,Bugamelli S,Pain MB,Nepotism ML et al.[ 2003]**[4] found that when the dose of spinal anesthesia increases the block height increases showing bilateral effects and autonomic side effects.

The difference in quality of anaesthesia was due to the failure of block which required conversion into general anesthesia and required

intraoperative supplementation, thus mean sedation scores were more in the sciatic femoral group than the unilateral spinal anesthesia group. The study conducted by **Isil Davarci, Kasim et al (2013)**[14] found that all patients in both groups had adequate nerve block (this observation was due to the usage of ultrasound for the sciatic-femoral block which increased the success rate in this group) except one from each group(inadequate nerve block) which required additional analgesia.

VAS score was more in the unilateral anesthesia group due to early recovery of sensory and motor block. The study conducted by **Isil Davarci, Kasim et al (2013)**[14] **SoumiMatti, BidyutBikasGharami et al (2017)**[17] observed that VAS score was less in sciatic-femoral group than spinal group ( $p < 0.005$).

In our study Mean value of patient satisfaction in Group A was 10 +/- 0 and in Group B was 7.3+/- 3.13 ($P < 0.0001$ ). This difference was due to the single needle prick, excellent quality of anaesthesia in Group A and two site needle puncture and a change in position was required for group B. The study conducted by **Felix Montes et al (2008)**[15] found that patient satisfaction was high with both techniques. The study conducted by **Isil Davarci, Kasim et al (2013)**[14] concluded that better patient satisfaction was in the sciatic femoral group compared with the unilateral spinal anesthesia group. The use of USG increased the success rate and decrease the time for the block .Study by **SoumiMatti, BidyutBikasGharami et al (2017)**[17] found that patient satisfaction was similar in both groups( p 0.038). They used an anterior approach to block the sciatic nerve so a change in position was not needed. The mean value of surgeon's satisfaction in group A was 10 +/- 0 and in Group B was 8.13 +/- 2.75 ($p < 0.0001$) this difference may be due to the time taken for anesthesia procedure, time taken to achieve complete sensory and motor blockade, failure rates being more for the sciatic-femoral block.

## CONCLUSION

Unilateral spinal anesthesia is a better choice than a sciatic-femoral block due to the easy to perform, time taken for onset and complete achievement of sensory and motor block is less, better patient and surgeon's satisfaction, no adverse effects, and stable hemodynamic profile. When the central neuraxial blockade is contraindicated, sciatic-femoral block can be considered as an alternative. Use of ultrasound for sciatic-femoral block , combining rapid-acting local anesthetic with slow-acting one we can increase the success rate and decrease the time taken for the procedure and increase the acceptance of the procedure.

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