ORIGINAL RESEARCH PAPER

Anaesthesiology

KEY WORDS: sciatic-femoral nerve block, spinal anaesthesia, geriatric patient, lower limb orthopaedic surgery.

A COMPARATIVE STUDY OF CLINICAL EFFECTS OF SCIATIC-FEMORAL NERVE BLOCK VERSUS SPINAL ANAESTHESIA IN GERIATRIC PATIENTS IN LOWER LIMB ORTHOPAEDIC SURGERIES.

Dr. Karuna Kumar Das Associate Professor, Department Of Anaesthesiology. Assam Medical College, Dibrugarh.

Dr. Pori Kalita* Third Year Post Graduate Trainee, Department Of Anaesthesiology, Assam Medical College, Dibrugarh. *Corresponding Author

Dr. Mukesh Patir Registrar, Department Of Anaesthesiology, Assam Medical College, Dibrugarh.

Dr. Amio Kumar Deori Professor And Head Of The Department Of Anaesthesiology, Assam Medical College, Dibrugarh.

ABSTRACT

BACKGROUND AND OBJECTIVES- Geriatric group of patients are commonly associated with different co-morbid conditions .They have reduced hemodynamic tolerance and altered sensitivity to anaesthetic agents. sciatic-femoral nerve block and Spinal anaesthesia are two most widespread techniques of regional anaesthesia for lower limb orthopaedic surgeries.
The study was conducted to compare the clinical effects of sciatic-femoral nerve block and spinal anaesthesia in geriatric patients undergoing lower limb orthopaedic surgeries.
MATERIALS AND METHODS- After getting clearance from Institutional Ethics Committee(H), a hospital based observational study was conducted in geriatric patients of 65-85years; ASA grade I,II &III, undergoing lower limb orthopaedic surgeries with a sample size of 48 (24 in each group). Group A received sciatic-femoral nerve block with 0.25% Bupivacaine (20+30ml) and Group B received spinal anaesthesia with 0.5% Hyperbaric Bupivacaine(3ml). Onset and duration of sensory and motor block, intraoperative and postoperative hemodynamic status in terms and duration of post-operative analgesia were compared in both the groups.
RESULT- The onset and duration of sensory and motor block as well as post-operative analgesia were found to be prolonged in sciatic-femoral nerve block as compared to spinal anaesthesia. Heart rate and mean arterial pressure were significantly reduced in the spinal group whereas no significant changes seen in sciatic-femoral group. The study results were found to be statistically significant($p<0.05$).
CONCLUSION- Sciatic-femoral nerve block provides better hemodynamic stability and prolonged post-operative analgesia in comparison with spinal anaesthesia.

INTRODUCTION

Aging is a universal and progressive physiological phenomenon which is characterized by decreased functional capacity, reduced end organ reserve, imbalance in homeostatic mechanism and increased occurrence of pathological process.[1] Geriatric group of patients are commonly associated with different co-morbid conditions and they have lower hemodynamic tolerance compared to other population.[2] Therefore these people need special perioperative care to avoid functional decline to enhance the recovery process.

Regional block is an excellent alternative option of anaesthesia when both general and central neurexial anaesthesia is risky. Spinal anaesthesia has been used since ages for lower limb orthopaedic surgeries. Unilateral anaesthesia with combined sciatic-femoral nerve block is an emerging technique of regional anaesthesia for lower limb surgeries to provide adequate surgical anaesthesia with minimal effects on hemodynamic condition of the patients.[4]

Post-operative pain management is also as important as in peri-operative period. Pain is associated with various adverse sequelae during post-operative period which can be taken care of by sciatic-femoral nerve block and spinal anaesthesia.

The purpose of our study was to compare the onset and duration of motor and sensory block, duration of post-operative analgesia, intraoperative and postoperative hemodynamic conditions, time of rescue analgesia and side effects of sciatic-femoral nerve blocks and spinal anaesthesia in lower limb orthopaedic surgeries in geriatric patients.

AIMS AND OBJECTIVES-

The aim of our study is to compare the clinical, hemodynamic and analgesic effects of sciatic-femoral nerve block and spinal anaesthesia in geriatric patients in lower limb orthopaedic surgeries. Parameters taken are-

- Onset and duration of sensory and motor blockade.
- Intra-operative and post-operative hemodynamic conditions.
- Duration of post-operative analgesia

MATERIALS AND METHODS-

A prospective clinical study was conducted in Assam Medical College Hospital, Dibrugarh during a period of one year after getting approval from Institutional Ethics Committee (H) with a sample size of 48 (24 in each group).

INCLUSION CRITERIA- Patients with ASA grade I, II and III, aged 60-85 years irrespective of gender and patients scheduled for elective lower limb orthopaedic surgeries.

EXCLUSION CRITERIA-

- Patients and relatives not willing to give written informed consent.
- ASA grade IV.
- Patient allergic to local anaesthetics and any drug used in the trial.
- Spinal deformity.
- Patients having any pre-existing neurological deficit.
- Coagulopathy.
- Emergency surgeries.

The patients were randomly divided into two groups-

- GROUP A (n=24) – Combined sciatic-femoral nerve block with bupivacaine 0.25% (20+30 ml)
- GROUP B (n=24) – Spinal anaesthesia with 0.5% bupivacaine (3ml)

Patient Preparation- The patients were visited in the ward on the day before surgery for pre-operative checkup. On arrival to the operation theatre, standard monitors were connected including SPO2, NIBP, ECG and baseline parameters were recorded. I.V. access was secured with 18 gauge i.v. cannula and the patients were preloaded with ringer lactate solution (500 ml).

Group A patients received combined sciatic-femoral nerve block using a peripheral nerve stimulator. For sciatic nerve block the patient was placed in the lateral (Sim's) position, operative side up, thigh maximally flexed and knee flexed. A line was drawn from posterior superior iliac spine to the greater trochanter of femur (line 1). Through the midpoint of line 1, a perpendicular line was drawn extending 5 cm caudally (line 2). Another line was drawn from the greater trochanter to sacral hiatus (line3). The intersecting point of line 2 and line 3 was the point of needle entry for sciatic block. With the help of the peripheral nerve stimulator and with a current of 1mA, a 22 gauge, 100 mm Stimuplex needle was inserted under all aseptic and antiseptic condition. After plantar flexion and/or dorsiflexion of foot was observed, 30 ml of 0.25% bupivacaine was given with frequent needle aspiration through the needle.

For femoral block, patient was placed in supine position with legs extended. A line was drawn between anterior superior iliac spine and pubic tubercle to identify the inguinal ligament. Femoral artery was identified by palpation. 1-1.5 cm below and lateral to the mid inguinal ligament a point was marked which was the needle insertion point for femoral block. Under all aseptic and antiseptic conditions, peripheral nerve stimulator was connected to the patient and needle with current set at .5 to 1 mA, a 22G 100 mm Stimuplex needle was inserted through the point. After attaining adequate patellar and/or quadriceps contraction, 20 ml of 0.25% bupivacaine was given with frequent needle aspiration through the needle.

Group B patients received spinal anaesthesia. Under all aseptic and antiseptic condition lumbar puncture was done using a 25 gauge Quincke spinal needle at L3-L4 interspace and 3 ml of 0.5% bupivacaine heavy was given through the needle.

Sensory block was elicited by pinprick method using a 22G hypodermic needle in the dermatomal areas. The variables recorded for sensory block were onset and duration of sensory block. Motor block was elicited by modified **Bromage score** until complete motor block was achieved(Bromage3). Onset and duration of motor block was recorded. Intra operative and post-operative hemodynamic conditions in terms of blood pressure and heart rate were recorded considering the preoperative parameters as baseline for the same patient.

Heart rate and mean arterial blood pressure were recorded at 5, 10, 15, 20, 25, 30, 45 minutes, 1, 2, 4, 8 and 12 hours. Hypotension (more than or equal to 15% fall in mean arterial BP from preinduction levels) was treated immediately with IV injection Mephenteramine 6 mg and Bradycardia (heart rate less than 50 beats/min) was treated with injection Atropine 0.6 mg. Total duration of analgesia during post-operative period was recorded as the time for the VAS score to be ≥4 and/or when the patient demanded rescue analgesia. Rescue analgesia was given with Diclofenac 75 mg i.m. During the surgical procedure and postoperative period, adverse events like nausea, vomiting, shivering, respiratory depression, local anaesthetic toxicity, urinary retention, etc were recorded.

STATISTICAL ANASLYSIS- Datas were presented as frequency, percentage and mean ± standard deviation. The statistical analysis was done using the Microsoft Excel and Microsoft Word, t-test and chi-square test were applied to find out significance. The p value of less than 0.05 was considered significant.

RESULT AND OBSERVATION-

The study consisted of 48 patients of either sex between 60-85 years of age belonging to ASA grade I, II and III physical status scheduled for lower limb orthopaedic surgeries where the patients were divided into two groups-

- **Group A** received sciatic-femoral nerve block with 0.25% Bupivacaine (20+30) ml.
- **Group B** received spinal anaesthesia with 3 ml of 0.5% Bupivacaine heavy.

The parameters taken for this study were age, sex, weight, height, duration of surgery, onset of sensory block, onset of motor block, duration of sensory block, duration of motor block, duration of analgesia, heart rate, mean arterial pressure, respiratory rate, and side effects.

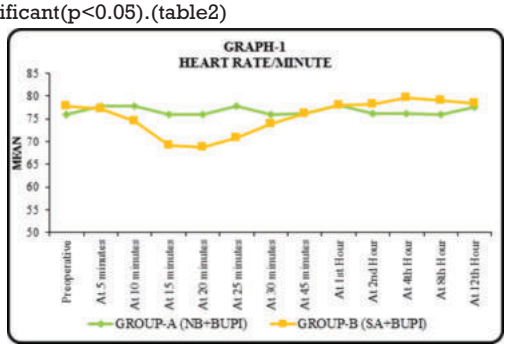
In our study there no significant difference was found in between two groups in respect to demographic variables.

Table 1-comparison Of Onset And Duration Of Sensory And Motor Block, Duration Of Post-operative Analgesia

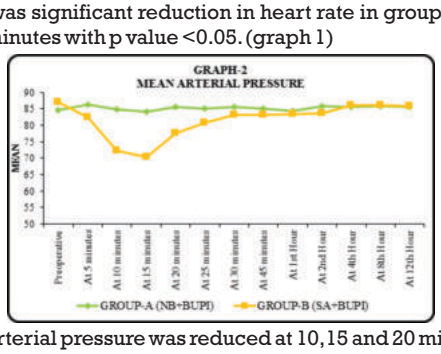
	GroupA (n=24)	GroupB (n=24)	P value
ONSET OF SENSORY BLOCK	11.92±1.31	4.34±0.70	<0.001
ONSET OF MOTOR BLOCK	17.28±1.25	7.33±0.63	<0.001
DURATION OF SENSORY BLOCK	507.83±59.75	180.58±5.06	<0.001
DURATION OF MOTOR BLOCK	215.25±46.36	138±9.21	<0.05
DURATION OF POST OPERATIVE ANALGESIA	518.38±58.56	189.33±7.69	<0.001

All data were presented as mean±SD, and p<0.05 considered as statistically significant.

The mean onset of sensory and motor block were longer in group A compared to group B. There was highly significant statistical difference in two groups (p <0.001). The mean duration of sensory and motor block were prolonged in group A as compared to group B and the datas were statistically significant. The duration of post-operative analgesia was longer in group A than that of group B which is statistically significant(p<0.05).(table2)



There was significant reduction in heart rate in group A at 15, 20, 25 minutes with p value <0.05. (graph 1)



Mean arterial pressure was reduced at 10, 15 and 20 minutes in group A as compared to group B. The values were statistically significant(p<0.05).(graph 2).

TABLE 3- ADVERSE EFFECTS

Adverse effects	Group A (%)	Group B (%)	P value
Nausea and vomiting	8.33	12.50	0.636
Urinary retention	00	16.67	0.036

DISCUSSION

Geriatric group of patients are commonly associated with different co-morbid conditions for which this group of patients have lower hemodynamic tolerance in comparison with other population. Various modalities of anaesthesia are available for lower limb orthopaedic surgeries like spinal anaesthesia, epidural anaesthesia, peripheral nerve blocks etc. with their own pros and cons. Spinal anaesthesia is a time tested technique whereas combined sciatic-femoral nerve block is an emerging technique for lower limb surgeries.

In our study we found that the mean time of onset of sensory block in group A was 11.92±1.31 minutes which was longer than that in group B in which the time of onset was 4.34±.70 minutes. There was highly significant difference (p <0.001) between the study groups in respect to the time of onset of sensory block. Similarly the onset of motor block was found to be longer (17.28±1.25 minutes) in group A than (7.33±.63 minutes) in group B. There was statistically highly significant difference with p value <0.001. In a similar study Maiti *et al*[5] compared combined sciatic-femoral nerve block and spinal anaesthesia in 60 ASA II and III geriatric patients undergoing lower limb orthopaedic procedure. They found that the onset of sensory and motor block were longer in the group receiving sciatic-femoral block than the group receiving spinal anaesthesia, which was statistically highly significant (p <0.001) and was in accordance with our present study. Awad *et al*[6] carried out a study comparing unilateral spinal anaesthesia and ultrasound guided sciatic-femoral nerve block on 60 adult educated patients, aged 18-60, of both sex, ASA I-II and scheduled for lower limb surgeries. They found that onset of sensory block and motor block were earliar in spinal group, than in sciatic-femoral group which was statistically significant (p<0.05) and similar to our present study. Casati *et al*[7] did a similar study in a group of 50 patients of ASA I and II scheduled for elective knee arthoscopy In their study, the onset of sensory and motor block were longer for sciatic femoral group than in spinal group.

The duration of sensory block was found to be 507.83±59.75 minutes in group A than in group B, 180.58±5.06 minutes. The duration of motor block was 215.25±46.36 minutes in group A and 138±9.21 minutes in group B. From our result duration of both sensory and motor block were found to be longer in patient receiving sciatic-femoral nerve block than spinal anaesthesia and were statistically significant(p<0.05).

Maiti *et al*[5] also found longer duration of sensory and motor block in sciatic-femoral block group as compared to spinal anaesthesia. Awad *et al*[6] also found similar result where the duration of sensory and motor block were longer in sciatic-femoral nerve block group than in spinal group. Similar to our study done by Hussain *et al*[8] the duration of sensory and motor block were found to be prolonged in sciatic-femoral nerve block as compared to spinal anaesthesia. Their findings were statistically significant and in accordance with our present study

We found that the preoperative heart rates were comparable and statistically insignificant in both the groups (p>0.05). Post-operative heart rates were also comparable in both the groups. There was reduction in heart rate at 15, 20 and 25 minutes in group B as compared to group A and values were statistically significant (p <0.05). Maiti *et al*[5] found similar result. They observed that the mean pulse rate was reduced in spinal group at 25, 30, 40 minutes from the baseline whereas there was little change in pulse rate in sciatic-femoral group. This variation was statistically significant (p<0.05). In their study Spasiano *et al*[9] found that the heart rate was reduced at 10, 15 and 30 minutes in spinal group.

Mean arterial pressure was found to be statistically insignificant in the pre-operative period with p value >0.05. In the intraoperative period we found that there was reduction of mean arterial blood pressure in group B at 10, 15 and 20 minutes. There was no significant changes in mean arterial pressure in both the group during post-operative period (p>.0.05). Maiti *et al*[5] in their study also got similar result with reduction in blood pressure at 25, 30 and 35 minutes from baseline as compared to sciatic-femoral group. In the study done by Adali *et al*[10] a significant decrease of MAP values was seen in the spinal anaesthesia group at the 5th and 15th minutes of the surgery when compared with the pre-operative value. Their values were statistically significant (p<0.002) and in accordance with our present study.

The mean duration of analgesia in group A was found to be 518.38±58.56 minutes and 189.33±7.69 minutes in group B. There was statistically significant difference between the two groups with p<0.05. This states that duration of analgesia was prolonged in group A than group B. Maiti *et al*[5] , Awad *et al*[6] found that the duration of analgesia in sciatic-femoral group was longer with sciatic-femoral nerve block as compared to spinal anaesthesia. Their findings were statistically highly significant (p<0.001) and in accordance with our study.

In our study, other adverse effects like nausea, vomiting, local anaesthetic toxicity were comparable in both the groups and statistically insignificant (p >0.05). Awad SS *et al*[6], Maiti S *et al*[5] also found similar result in their studies. Four patients out of 24 patients developed urinary retention in group B whereas no patient complaints of urinary retention in group A in the post-operative period. The finding was statistically significant with p=0.03. In their study Spasiano *et al*[9], Hussain *et al*[8], Casati *et al*[7] also found delayed voiding in spinal group as compared to sciatic-femoral group.

CONCLUSION

From our study we found that sciatic-femoral nerve block provides better hemodynamic stability and longer duration of analgesia along with less side effects compared to spinal anaesthesia. Therefore it is concluded that sciatic-femoral nerve block is an excellent alternative to spinal anaesthesia for geriatric patients in lower limb orthopaedic surgeries.

REFERENCES

1. Weinert, B. T., & Timiras, P. S. (2003). Invited review: Theories of aging. *Journal of applied physiology*, *95*(4), 1706-1716.
2. Parker, M. J., Handoll, H. H., & Griffiths, R. (2004). Anaesthesia for hip fracture surgery in adults. *Cochrane Database of Systematic Reviews*, (4).
3. Grant, C. R., & Checketts, M. R. (2008). Analgesia for primary hip and knee arthroplasty: the role of regional anaesthesia. *Continuing Education in Anaesthesia, Critical Care & Pain*, *8*(2), 56-61.
4. Maiti, S., Gharami, B., Bhattacharya, D., & Ray, A. K. (2017). A comparative study of clinical effects of spinal bupivacaine versus sciatic-femoral nerve block (anterior approach) in high risk geriatric patient for lower limb orthopaedic procedures. *Journal of Evolution of Medical and Dental Sciences*, *6*(30), 2422-2428.
5. Adali, S., Erkalp, K., Erden, V., Comlekci, M., Bulbul, M., & Aldemir, T. (2011). Spinal anesthesia and combined sciatic nerve/lumbar plexus block techniques in lower extremity orthopedic surgery. *Acta Orthop Traumatol Turc*, *45*(4), 225-232.
6. Casati, A., Cappelleri, G., Aldegheri, G., Marchetti, C., Messina, M., & De Ponti, A. (2004). Total intravenous anesthesia, spinal anesthesia or combined sciatic-femoral nerve block for outpatient knee arthroscopy. *Minerva anestesiologica*, *70*(6), 493-502.
7. Hussien, A. E., Abd Elhalim, M. A. E., & Zarad, M. S. (2020). Comparison between ultrasound-guided sciatic–femoral nerve block and unilateral spinal anesthesia in below-knee amputation surgery. *The Scientific Journal of Al-Azhar Medical Faculty, Girls*, *4*(2), 118.
8. Spasiano, A., Flore, I., Pesamosca, A., & Della Rocca, G. (2007). Comparison between spinal anaesthesia and sciatic-femoral block for arthroscopic knee surgery. *Minerva anestesiologica*, *73*(1-2), 13-21.
9. AHMED, M. S., SHIMAA, S., RABAB, M. M., & ASHRAF, E. E. (2019). Comparative Study between Unilateral Spinal Anesthesia Versus Ultrasound Combined Femoro-Sciatic Nerve Block for Lower Limb Surgery. *The Medical Journal of Cairo University*, *87*(September), 3059-3068.