Original Article

A Comparative Study Between the Lumbar Plexus Block and Low Spinal with Conventional Spinal Anaesthesia in Hip Surgeries

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Abstract

Background: HIP surgeries are commonly done in elderly patients and they are commonly associated with co-morbidities like Hypertension, Diabetes, Chronic obstructive pulmonary disease, cardiac disease and Renal disease. Spinal anesthesia (SA) is frequently used for hip surgeries. Inherent haemodynamic alterations and effects on the cardiorespiratory system are among the unavoidable side effects of spinal anaesthesia. The objective is to compare between lumbar plexus block with low spinal anesthesia versus conventional spinal anesthesia in terms of hemodynamic stability. **Material and Methods:** A prospective interventional study was undertaken to evaluate Intra and post-operative hemodynamic study, Duration and intensity of postoperative analgesia, time at which rescue analgesic required and dose during first 24 h required in the two groups (group A - lumbar pleuxus block with low spinal anesthesia and group B¬ – conventional spinal anesthesia) undergoing elective hip surgeries. **Results:** Sixty patients between the age group of 20-80 years belonging to ASA I II& III posted for elective hip surgeries were randomly divided into two groups. Each group consisting of 30 patients. Group A to receive 10ml of 0.5% bupivacaine plus 15ml of plane lignocaine in lumbar plexus block and 1-2 ml of 0.5% bupivacaine(H) in low spinal anesthesia. Group B to receive 2-4 ml of 0.5% bupivacaine(H) in conventional spinal anesthesia. Patients with ASA (American society of anaesthesiologists) grade IV, who have known allergies to local anaesthetics drugs, with coagulation disorders or on anti-coagulant drug were excluded from this study. **Conclusion:** Lumbar plexus block with low spinal anesthesia is a superior alternative technique to conventional spinal anesthesia in the intra operative and post operative management of hip surgeries. It provides better hemodynamic stability with variations in heart rate and less hypotensive episodes, post operative analgesia, reduced opioid requirement which can avoid adverse effects of opioids when used in elderly patients. The success rate is 100% with the use of a nerve stimulator.

Keywords: Lumbar Plexus Block, Low Spinal, Conventional Spinal Anaesthesia, Hip Surgeries.

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Introduction

Anaesthesiologists face a medical challenge when treating elderly patients who have hip fractures, which are frequently linked to a high rate of peri-operative morbidity and mortality. It makes sense that there are more hip fracture cases now than in previous decades given that the general population is getting older due to improved healthcare facilities. The bulk of these fractures happen to older people with a variety of comorbidities brought on by ageing naturally. The preferred technique for treating such fractures is surgical repair. As a result surgery for hip fracture represents one of the most common emergency orthopedic procedures performed.[1-6]

Because of its ease of administration, ability to preserve consciousness, effective analgesia, minimal side effects, and enhanced intra- and post-operative pain relief, regional anaesthesia offers a lot to patients, surgeons, and anaesthesiologists.[7]

There may be significant haemodynamic alterations in older patients receiving conventional spinal anaesthesia. Head injuries with neurological damage, epilepsy history, stenotic-valvular diseases, etc., are among the conditions that preclude spinal anaesthesia. In contrast, peripheral nerve blocks of the lower limb can offer optimal peri-operative conditions since there is no haemodynamic instability or pulmonary function depression.[8,9]

Various methods of Lumber Plexus Block are becoming commonplace. hip-level. It is necessary to block the L1 to L4 dermatome, and the best method is to block the lumber plexus posteriorly.[10,11] Although lumbar plexus blocks are technically challenging, they are a dependable anaesthetic approach for hip surgeries given the advent and accessibility of nerve locators. Even in high-risk elderly adults with related medical conditions, lumbar plexus block improves haemodynamic stability.

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Complications are possible with lumbar plexus block. such as ureteral injury, intravascular injection, retroperitoneal haemorrhage, epidural spread, etc., however if done carefully, it is a desirable alternative. We chose to compare spinal anaesthesia and lumber plexus block for fracture neck femur surgery because of the latter's popularity for lower limb orthopaedic procedures.[12,13]

Materials and Methods

The present Prospective interventional study will be conducted on 60 patients posted for elective hip surgeries in the Department of Anaesthesia at Basaveshwara teaching and general hospital attached to Mahadevappa Rampure Medical College Kalaburagi. Duration of study was from 1st october 2019 to 31st march 2021(18 months)

Sample size: 60 patients (each group 30)

Group A- Lumbar Pleuxus Block with Low Spinal Anaesthesia

GROUP B – Conventional Spinal Anesthesia

Sampling procedure: simple random sampling technique

Inclusion criteria:

1. Patients undergoing elective HIP surgeries
2. Between the ages of 20-80 years, of either sex
3. ASA (American society of anaesthesiologists) grade I, II and III
4. BODY WEIGHT 50-90KG

Exclusion criteria:

1. Patients with ASA (American society of anaesthesiologists) grade IV.
2. Patients who have known allergies to local anaesthetics drugs.
3. Patients with coagulation disorders or on anti-coagulant drugs.

For all the patients fulfilling selection criteria, before enrolment, an informed written consent will be taken in the patient own vernacular language after explaining the nature of the study

All patients will be kept fasting 8 hours prior to surgery. Basic monitoring equipment (pulse oximeter, NIBP, ECG monitor) will be checked. Baseline vital parameters will be recorded. All patients will be made to lie supine

GROUP A-- Lumbar Pleuxus Block with Low Spinal Anaesthesia

All patients received lumbar plexus with insulated 22 gauge stimuplex needle (100 mm) attached to a peripheral nerve stimulator. For the lumbar plexus block, the patient was put in lateral decubitus. The midline (spinous processes), both iliac crests, and posterior-superior iliac spine were identified and the lumbar plexus was blocked by the posterior approach. The lumbar plexus was identified by eliciting quadriceps muscle contraction at a current setting below 0.5 mA. Identifying the nerve by contraction of gastrocnemius muscle (foot plantar flexion) and/or tibialis anterior muscle (foot dorsiflexion). 10ml 0.5% Bupivacaine and 15ml of plane 2% lignocaine was used for lumbar plexus component. Then low spinal anaesthesia is given with 1-2 ml 0.5%Bupivacaine (hyperbaric). After completing the block, the patient was placed back in a supine position.

Group B- Conventional Spinal Anesthesia

In the group B, following sterile draping and antiseptic solution skin preparation, Spinal anaesthesia given with 2 to 4 ml of hyperbaric 0.5% bupivacaine at L3-L4 level.

We compared:

1. Intra- and post-operative hemodynamic study
2. Duration and intensity of postoperative analgesia
3. Time at which rescue analgesic required and dose during first 24 h required in the two groups

Duration of analgesia = onset of sensory blockade till the requirement of rescue analgesic.

Intensity of postoperative pain was assessed with visual analog scale (VAS) score. Patients were given analgesic when VAS ≥3 cm or on patient demand.

The anaesthesiologist who observed the patient in the post op period is blinded to the drug injected in the lumbar plexus block. patient is monitored at 1, 2,4 ,6,12,24 hrs postoperatively for blood pressure, saturation, heart rate, and VAS score, no of nausea vomiting and complications if any.

Results

There was statistically significant in age distribution between the two groups (P value is 0.015). The mean age was 60.83(±13.43) in group A and 52.53(±12.23) in group B.

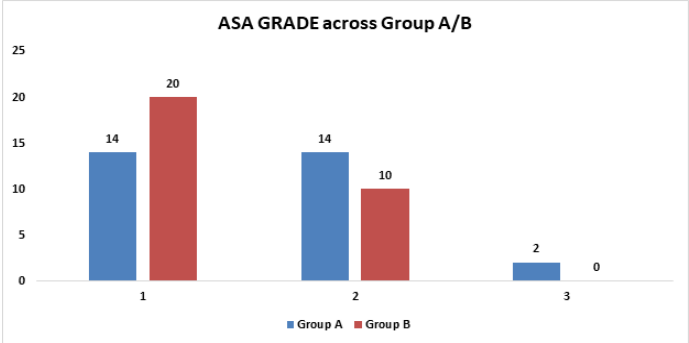

Figure 1: Comparison of ASA grade in both the groups.

Table 1: comparison of gender wise distribution in both the groups

Sex	Group A/B		Total	p value
	Group A	Group B		Chi square
Female	15(50%)	7(23.33%)	22(36.67%)	0.032
Male	15(50%)	23(76.67%)	38(63.33%)	
Total	30(100%)	30(100%)	60(100%)	

The mean time at first rescue analgesia in group A was 559.67(±45.5) minutes and in group B was 166.03(±13.51) minutes. There was very highly statistical significant difference between the two groups(P<0.000)

Table 2: Comparison of 24Hhr requirement of Tramadol in both the groups.

24 HR REQUIREMENT OF Tramadol	Group A/B		Total	p value
	Group A	Group B		Chi square
100mg	6(20%)	0(0%)	6(10%)	
200mg	20(66.67%)	0(0%)	20(33.33%)	0.000
300mg	4(13.33%)	28(93.33%)	32(53.33%)	
400mg	0(0%)	2(6.67%)	2(3.33%)	
Total	30(100%)	30(100%)	60(100%)	

The mean 24Hr requirement of Tramadol in group A was 193.33(±58.33) milligram and in group B was 306.67(±25.37) in milligrams. There was very highly statistical significant difference between the groups (P<0.000).

Table 3: Comparison of 24Hhr requirement of Fentanyl(mcg) in both the groups

24 HR REQUIREMENT of Fentanyl(mcg)	Group A/B		Total
	Group A	Group B	
0mcg	30(100%)	25(83.33%)	55(91.67%)
80mcg	0(0%)	1(3.33%)	1(1.67%)
100mcg	0(0%)	4(13.33%)	4(6.67%)
Total	30(100%)	30(100%)	60(100%)

The 24 Hr requirement of Fentanyl was 0(±0) in group A and 16(±36.54) mcg in group-B. There was statistically significant between the two groups.

Table 4: Comparison of intra operative mean heart rate (bpm) at various time intervals between the two groups

Variable(n1/n2)	Group A	Group B	p value- Student t test
IO HR BASELINE	81.6(±7.21)	91.47(±5.12)	.000
IO HR 05MIN	84.07(±6.86)	103.77(±8.95)	.000
IO HR 10 MIN	85.93(±6.69)	106.77(±8.04)	.000
IO HR 15 MIN	85(±7.16)	96.1(±3.61)	.000
IO HR 20 MIN	82.2(±5.95)	96.63(±4.16)	.000
IO HR 30MIN	80.87(±5.06)	91.97(±3.64)	.000
IO HR 45MIN	80.07(±4.02)	89.57(±2.69)	.000
IO HR 60MIN	80.93(±4.13)	89.13(±2.15)	.000
IO HR 75MIN	80.33(±3.79)	89.67(±2.62)	.000
IO HR 90MIN	80.93(±3.74)	89.17(±3.59)	.000
IO HR 120MIN[28/28]	81.61(±4.64)	89.21(±2.53)	.000
IO HR 150MIN[2/5]	78(±2.83)	86.4(±4.34)	.057

The mean heart rate at various intervals in group A was on lower side as shown in above table. when compared to group B as there were episodes of tachycardia. And this was statistically significant difference between the two groups(p value is 0.000).

Table 5: Comparison of intra operative mean arterial pressure at various time intervals between the two groups

Variable(n1/n2)	Group A	Group B	p value- Student t test
IO MAP BASELINE	90.87(±8.85)	101.23(±9.74)	.000
IO MAP 05 MIN	86.43(±8.13)	83.13(±14.01)	.269
IO MAP 10 MIN	82.93(±6.72)	72.07(±10.88)	.000
IO MAP 15 MIN	81.97(±5.4)	74.2(±9.82)	.000
IO MAP 20 MIN	84.07(±4.31)	83.27(±6.46)	.575
IO MAP 30MIN	86.87(±3.74)	88.33(±4.93)	.199
IO MAP 45MIN	88.87(±5.35)	91.07(±6.21)	.147
IO MAP 60MIN	87.93(±6.65)	93.53(±6.38)	.002
IO MAP 75MIN	88.67(±6.46)	94.93(±5.32)	.000
IO MAP 90MIN	89.77(±4.9)	96.8(±6.14)	.000
IO MAP 120MIN[28/28]	91.32(±5.26)	95.86(±5.86)	.004
IO MAP 150MIN[2/4]	91(±1.41)	94(±2.83)	.246

The mean arterial pressure at various intervals in group A was maintained with less hypotensive episodes as shown in above table when compared to group B. And there was statistically significant difference between the two groups at 10min, 15min, 60min, 75min, 90min, and 120min (p<0.05).

Table 6: Comparison of intra operative oxygen saturation at various time intervals between the two groups

Variable(n1/n2)	Group A	Group B	p value- Student t test
IO SPO2 BASELINE	98.9(±1.73)	100(±0)	.001
IO SPO2 05 MIN	99.9(±0.31)	99.77(±0.63)	.299
IO SPO2 10 MIN	99.83(±0.46)	99.77(±0.57)	.620
IO SPO2 15 MIN	99.83(±0.46)	99.83(±0.46)	1.000
IO SPO2 20MIN	99.87(±0.43)	99.83(±0.38)	.753

IO SPO2 30MIN	99.9(±0.31)	100(±0)	.078
IO SPO2 45MIN	99.9(±0.4)	99.77(±0.63)	.331
IO SPO2 60MIN	99.93(±0.37)	99.77(±0.57)	.182
IO SPO2 75MIN	99.9(±0.4)	99.83(±0.46)	.553
IO SPO2 90MIN	99.93(±0.25)	100(±0)	.155
IO SPO2 120MIN[28/28]	100(±0)	99.82(±0.55)	.090
IO SPO2 150MIN[3/4]	99.67(±0.58)	98.75(±0.5)	.074

P value <0.05 is taken as significant

Table 7: Comparison of post operative mean heart rate (bpm) at various time intervals between the two groups

Variable(n1/n2)	Group A	Group B	p value- Student t test
PO HR 00HRS	81.6(±7.21)	91.47(±5.12)	.000
PO HR 02HRS	84.07(±6.86)	89(±2.89)	.001
PO HR 04HRS	89.77(±4.9)	89.8(±4.68)	.979
PO HR 06HRS	91.1(±5.18)	90.3(±3.83)	.499
PO HR 08HRS	82.2(±5.95)	93.9(±7.6)	.000
PO HR 12HRS	80.87(±5.06)	89.63(±4.51)	.000
PO HR 16HRS	80.07(±4.02)	88.7(±3.55)	.000
PO HR 20HRS	80.93(±4.13)	87.7(±3.62)	.000
PO HR 24HRS	80.33(±3.79)	91.47(±5.89)	.000

In group A, the heart rate was stable and varied less than in group B. However, both groups experienced tachycardia episodes, which were statistically significant at 0, 2, 4, 6, 8, 12, 16, 20, and 24 hours. The post operative mean arterial pressure was stable with less variations in group-A when compared to group-B and it was statistically significant in both the groups at 0 ,2, 4, 16,20 Hr time intervals.

Table 8: Comparison of post operative oxygen saturation at various time intervals between the two groups

Variable(n1/n2)	Group A	Group B	p value- Student t test
PO SPO2 00HRS	98.9(±1.73)	99.47(±2.92)	.364
PO SPO2 02HRS	99.93(±0.25)	99.97(±0.18)	.561
PO SPO2 04HRS	99.93(±0.25)	99.7(±0.7)	.092
PO SPO2 06HRS	99.63(±0.93)	99.93(±0.25)	.093
PO SPO2 08HRS	99.3(±1.26)	99.8(±0.55)	.052
PO SPO2 12HRS	99.23(±1.04)	99.9(±0.31)	.001
PO SPO2 16HRS	99.33(±1.09)	99.97(±0.18)	.003
PO SPO2 20HRS	99.2(±1.13)	99.87(±0.43)	.004
PO SPO2 24HRS	98.67(±0.96)	99.93(±0.25)	.000

Discussion

Regardless of anesthetic technique, intraoperative blood pressure stability is a major concern in elderly people. The fall in blood pressure can prove to be detrimental in them and contributes higher morbidity and mortality. A study by Davis et al. discovered that spinal and epidural anaesthesia cause greater drops in systolic blood pressure12. Additionally, the study found that 18% of SAB patients and 24% of patients undergoing general anaesthesia experienced hypotension, which is defined as a drop in systolic blood pressure for ten minutes, over 20% of the pre-induction values. It was also discovered that LPB offered outstanding haemodynamic stability, as shown by the lack of sudden, severe changes in heart rate, systolic and diastolic blood pressure, and mean arterial pressure following LPB. Our investigation revealed that blood pressure had significantly decreased at 10min, 15min, 60min, 75min, 90min, and 120min intervals during intra operative period in group B when compared to group A. This demonstrated that for hip fracture surgeries, an LPB is a good substitute for SAB or general anaesthesia.

According to a study by Amiri et al.13, significant lumbar plexus block, as opposed to spinal anaesthesia, offered significant postoperative pain control and satisfactory intraoperative conditions for the perioperative management of hip fractures. Compared to spinal anaesthesia, peripheral nerve blocks provide analgesia for a longer period of time. Additionally, our study showed that patients who received Lumbar Plexus had a longer postoperative pain-free period than those who received conventional spinal support, with the Lumbar Plexus group experiencing significantly longer first request far analgesia.

The present study was conducted on 60 patients of ASA grade 1 2&3 posted for elective hip surgeries in the department of anaesthesia at Basaveshwara teaching and general hospital attached to Mahadevappa Rampure Medical college Kalaburagi after approval from the local ethics committee and after obtaining consent from each patient.

Sixty patients were selected and allocated into two groups with equal number (30) of patients

Group A- Lumbar Pleuxus Block With Low Spinal Anaesthesia

Group B– Conventional Spinal Anesthesia

The parameters assessed were:

- Intra and post-operative hemodynamic study
- Duration and intensity of postoperative analgesia
- Time at which rescue analgesic required and dose during first 24 h required in the two groups
- Side effects/complications (intraoperative, postoperative)- such as respiratory depression, drowsiness, pruritus, nausea, and vomiting were observed. The time for first rescue

analgesia was 559.67(±45.5) minutes in group-A and 166.03(±13.51) minutes in group-B. This was statistically very highly significant (p value 0.000), that is the duration of analgesia was more in lumbar plexus group when compared to conventional spinal anesthesia.

The 24 hr use of Tramadol was 193.33(±58.33) milligrams in group-a and 306.67(±25.37) milligrams in group –B. This was statistically very highly significant (p value 0.000), that is the requirement of opioid was more in conventional spinal anesthesia when compared to lumbar plexus group.

The intra operative and post operative hemo-dynamics were more stable in group A when compared to group B (as there were episodes of tachycardia and hypotension) and it was statistically significant at time intervals shown in the results.

Conclusion

Lumbar plexus block with low spinal anesthesia is a superior alternative technique to conventional spinal anesthesia in the intra operative and post operative management of hip surgeries. It provides better hemodynamic stability with variations in heart rate and less hypotensive episodes, post operative analgesia, reduced opioid requirement which can avoid adverse effects of opioids when used in elderly patients. The success rate is 100% with the use of a nerve stimulator.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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