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Ultralow dose bupivacaine with fentanyl versus plain bupivacaine in surgical repair of HIP fractures in elderly patients

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Abstract

Introduction: Geriatric patients with significant autonomic dysfunction are the ones who present for hip fracture surgeries, Hence we undertook our study which compares ultralow dose bupivacaine with fentanyl which causes minimal hemodynamic instability with conventional dose of bupivacaine. Opiods and local anaesthetics administered together intrathecally have potent synergistic analgesic effect.

Aim: To compare ultra low dose bupivacaine with fentanyl and conventional dose of bupivacaine in ASA II and ASA III patients posted for hip surgeries in regards to 1. hemodynamic stability, use of vasopressors and perioperative morbidity. 2. Duration of motor and sensory block

Methodology: After obtaining approval from the Institutional Ethical Committee, the study was conducted on 52 patients belonging to physical status ASA classes II and III, aged 60–90 years, scheduled to undergo hip surgeries under spinal anesthesia. Group A will receive 1mL of 0.5% bupivacaine(5mg) + 20 mcg fentanyl and group B will receive 2mL of 0.5% bupivacaine (10 mg).

Results: The demographic data (age, weight, sex and ASA grading) were comparable and statistically non-significant. Mann- Whitney test was used for statistical analysis.

The time of onset of adequate level of sensory block(T10) was longer for group A (128.96 +/- 2.53 sec) than group B (95.57 +/- 2.41 sec) and was statistically significant. Duration of motor block was longer in group B (111.23 +/- 3.64 min) as compared to group A (88 +/- 3.77 min) and was statistically significant.

Duration of sensory block for group B (147.5 +/- 3,46 min) was slightly more compared to group A (141.86 +/- 4.34) and was found to be statistically significant.

Conclusion: The use of ultralow dose bupivacaine plus fentanyl for spinal anaesthesia for surgical repair of hip fractures in elderly patients provides successful anaesthesia and incurs a minimum of hypotension.

Keywords: HIP fracture, ultralow dose bupivacaine, hemodynamic stability, Duration of motor and sensory block VAS (visual analogue score)

Introduction

Geriatric patients with significant autonomic dysfunction are the ones who present for hip fracture surgeries, Hence we undertook our study which compares ultralow dose bupivacaine with fentanyl which causes minimal hemodynamic instability with conventional dose of bupivacaine. Opiods and local anaesthetics administered together intrathecally have potent synergistic analgesic effect. Low dose of bupivacaine with fentanyl causes less perioperative hypotension and decreases need for the use of vasopressors which decreases perioperative morbidity. Thus the aim of this study is to compare ultra-low dose bupivacaine with fentanyl and conventional dose of bupivacaine in ASA II and ASA III patients posted for hip surgeries in regards to i) hemodynamic stability, use of vasopressors and perioperative morbidity and
ii) duration of motor and sensory block

Materials and Methods

Source of Data: All patients aged between 60-90 years undergoing hip surgeries in the department of Anaesthesiology in KVGMC, sullia from March 2020 to August 2020 was included in the study.

1. Study Design: Prospective study.

2. Inclusion Criteria

- Hip fracture surgeries (intertrochanteric and neck of femur cases)
- Patients of ASA II and III
- 60-90 years of age
- Patients weighing between 40-80 Kgs

Exclusion Criteria

- Patient refusal.
- Coagulation disorders.
- Localized infection over injection site.
- Contraindications for FICB
- Patients with uncompensated heart failure, unstable angina, ejection fraction <40%
- Patients with severe aortic and mitral valve stenosis

1. Sample Size

A total of 52 patients with 26 in each group. To identify an effect size at 0.70, at Alpha:0.05 and Beta: 0.80 level of significance, Degree of confidence-95%. Sample size was estimated to be 26 in each group.

$$n = 2\sigma_2 \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

4. Statistical Analysis

Mann- Whitney test was used to find if there was a statistical difference between the two groups and p value <0.05 was considered as statistically significant difference.

5. Methodology

After obtaining approval from the Institutional Ethics Committee and obtaining written informed consent, the study will be conducted on 52 patients belonging to physical status ASA classes II and III, aged 60–80 years, scheduled to undergo hip surgeries under spinal anesthesia.

A day prior, preoperative visit will be made and thorough clinical evaluation will be conducted and necessary investigations will be ordered and reviewed. Written informed consent will be taken for the procedure.

After shifting patients to preoperative room, baseline heart rate (HR), blood pressure (BP), mean arterial pressure (MAP), oxygen saturation (SpO_2), visual analogue score, bromage score will be recorded.

Patients will be randomly allocated to two groups, group A and group B.USG guided Fascia iliaca compartment block will be given 20 mins before subarachnoid block with 20mLof 0.25% bupivacaine for both the groups. Sensory block, Bromage score and VAS score are recorded. Patients will be positioned for subarachnoid block in lateral decubitus position with side to be operated placed down once VAS score is <2. group A will receive 1mL of 0.5% bupivacaine(5mg) + 20 mcg fentanyl and group B will receive 2mL of 0.5% bupivacaine (10 mg). pulse, blood pressure and SpO_2 will be recorded every 5 min for first half an hour and thereafter every 10 mins till the end of surgery. SBP of <90 mmhg or a decrease of more than 30% from baseline mean arterial pressure will be considered as hypotension and will be treated with IV bolus of ephedrine 6mg. After surgery, patients will be shifted to postanesthetic care unit and hemodynamics will be monitored.

At PACU vitals, bromage score, VAS levels are assessed and recorded every 20 minutes uptill Bromage score becomes 0.

Sensory block is assessed every 1 hour for 24 hours.

Sensory block (duration of analgesia): time interval between onset of sensory block till the patients first reports VAS score of more than or equal to 4

The time to first postoperative rescue analgesia as evidenced by VAS ≥4 will be noted and rescue analgesia in the form of injection tramadol 1.5mg/kg will be administered IV.

Results

This study was done in 52 patients undergoing elective hip surgeries under spinal anaesthesia. The demographic data (age, weight, sex and ASA grading) were comparable and statistically non significant. Equal distribution of males and females were done in both groups was done and majority of them were ASA II. Mann- Whitney test was used for statistical analysis.

The time of onset of adequate level of sensory block(T10) was longer for group A (128.96 +/- 2.53 sec) than group B (95.57 +/- 2.41 sec) and was statistically significant.

Duration of motor block was longer in group B (111.23 +/- 3.64 min) as compared to group A (88 +/- 3.77 min) and was statistically significant. Duration of sensory block for group B (147.5 +/- 3,46 min) was slightly more compared to group A (141.86 +/- 4.34) and was found to be statistically significant. none of the patients required anaesthetic interventions during surgery.

Less fall in blood pressure and heart rate was noted in group A compared to group B,thus there is a better hemodynamic stability.

Discussion

The use of ultralow dose bupivacaine plus fentanyl for spinal anaesthesia for surgical repair of hip fractures in elderly patients provides successful anaesthesia and incurs a minimum of hypotension.

The hemodynamic stability of these patients were reflected in the minimal need for vasopressor support of blood pressure The high incidence of coronary disease in this population increases the risk of ischemia secondary to

hypotension. Use of single shot low dosage local anaesthetic may limit hypotension, opiods and local anaesthetics administered together intrathecally have a synergistic effect.

Based on the study by Ben David we reduced the dose of 0.5% bupivacaine to 5 mg, we found marked hemodynamic stability in our cases compared to conventional dose of bupivacaine

Sachi M *et al* conducted prospective randomized study on sixty patients undergoing elective orthopedic lower limb surgeries concluded that SAB with lower dose bupivacaine and fentanyl is more safer and better option for elderly patients undergoing lower limb orthopedic surgeries.

Bruce BD *et al* conducted a study on twenty elderly patients undergoing surgical repair of hip fracture concluded that low dose bupivacaine with fentanyl causes less hypotension and nearly eliminated the need for vasopressor support.

Sumit K *et al* conducted a double blinded prospective study on fifty elderly patients undergoing lower limb surgery and concluded that the dose of a local anaesthetic can be safely and significantly lowered by 40% with addition of low dose sufentanil, there by avoiding hemodynamic fluctuation.

Mehdi S *et al* conducted a case control clinical trial on eighty elderly patients undergoing hip surgeries and concluded that SAB with low dose bupivacaine and sufentanil is safe with hemodynamic stability.

Table 1: Demographics of the study Population

Parameters	Group A	Group B	U Value	Z Score	P Value
Age (yrs)	77.96 ±7.32	79.23± 8.57	303.5	-0.622	0.5352
Height (cm)	159.65±7.34	158.92±7.37	305.5	0.5856	0.5552
Duration of Surgery (min)	90.84±4.68	93.73±4.14	216.5	0.5856	0.5552
Male: Female	6:20	9:17	-	-	-
ASA Grade II: III	16:10	17:9	-	-	-

Table 2: characteristics of spinal block

Characteristics	Group A	Group B	U Value	Z Score	P Value
Time of onset of adequate block –T 10 (sec)	128.96±2.53	95.57±2.41	0	6.1766	<0.0001*
Duration of motor block (min)	88±3.77	111.23±3.64	0	-6.1766	<0.0001*
Duration of sensory block (min)	141.86±4.34	147.5±3.46	114.5	-4.0811	<0.0001*

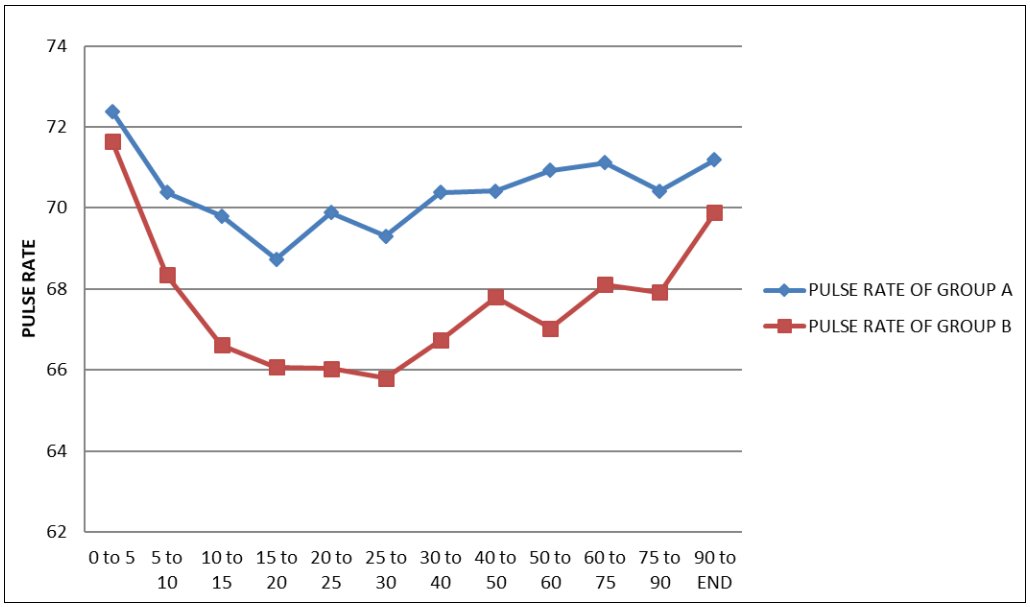
Table 3: Comparison of hemodynamic parameters among the two groups

Hemodynamic Parameters	Group A	Group B	U Value	Z Score	P Value
Pulse Rate (MIN)					
0 to 5	72.38	71.65	334.5	0.0549	0.96012
5 to 10	70.38	68.34	299	0.0549	0.48392
10 to 15	69.8	66.61	263.5	0.0549	0.17702
15 to 20	68.73	66.07	266	0.0549	0.1902
20 to 25	69.88	66.03	257.5	1.4641	0.1443
25 to 30	69.3	65.8	267	1.2902	0.19706
30 to 40	70.38	66.73	230.5	1.9582	0.0500
40 to 50	70.42	67.8	257.5	1.4641	0.1443
50 to 60	70.92	67.03	268	1.2719	0.2040
60 to 75	71.11	68.11	270	1.2353	0.2149
75 to 90	70.42	67.92	280.5	1.0431	0.2983
90 to END	71.19	69.88	311	0.48498	0.6312
Systolic Blood Pressure (MIN)					
0 to 5	146.53	148.38	302.5	-0.6405	0.52218
5 to 10	142	141.53	338	0.00915	0.99202
10 to 15	134.23	134.23	335.5	-0.0366	0.9681
15 to 20	133.96	128.38	249	1.6196	0.10524
20 to 25	134.23	125	179.5	2.8915	0.00386*
25 to 30	131.23	124.46	210	2.3334	0.0198*
30 to 40	135.61	127.38	189.5	2.7085	0.00672*
40 to 50	135.07	128.61	237.5	1.8301	0.0672
50 to 60	136.38	133.3	276.5	1.1163	0.2627
60 to 90	137.5	138.03	328.5	-0.16471	0.87288
90 to END	141.69	137	276	1.12552	0.25848
Diastolic Blood Pressure (MIN)					
0 to 5	89.92	87.61	296	0.7595	0.44726
5 to 10	86.69	80.8	233.5	1.9033	0.05744
10 to 15	82.53	76.42	228	2.00398	0.0455*

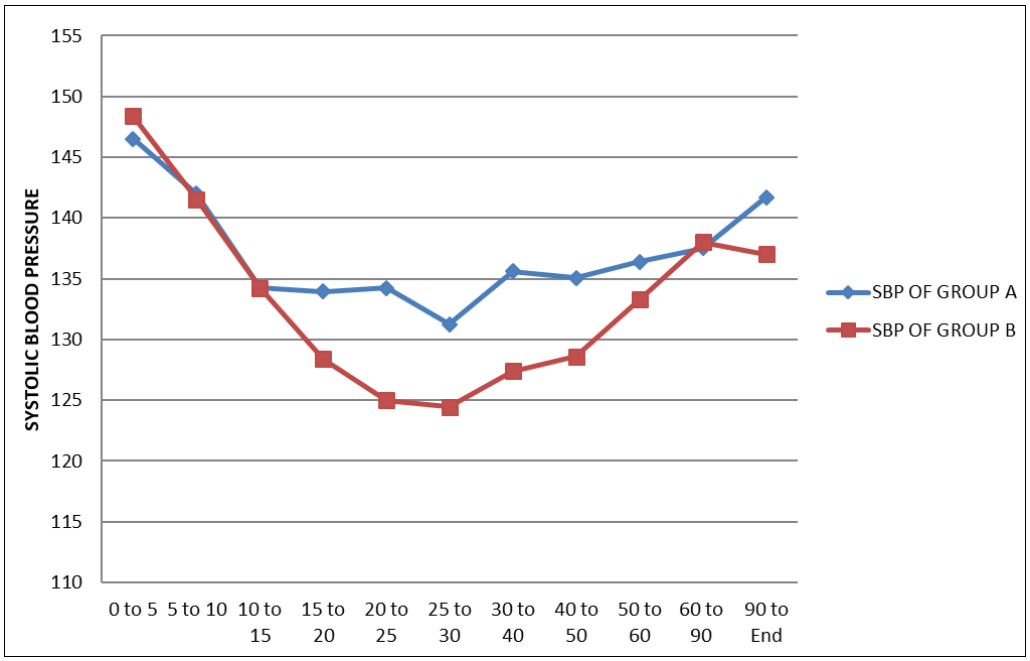
15 to 20	82	73.3	181.5	2.85499	0.00438*
20 to 25	82.07	70.46	105.5	4.24588	<0.00001*
25 to 30	79.69	71	175.5	2.96479	0.00308*
30 to 40	81.46	70.73	126	3.8707	0.0001*
40 to 50	81.5	72.15	136	3.6879	0.00022*
50 to 60	83.03	73.96	133.5	3.7334	0.0002*
60 to 90	85.23	73.69	93.5	4.4654	<0.00001*
90 to END	85.84	76.76	146.5	3.4955	0.00046*

Table 4: Visual analoge score

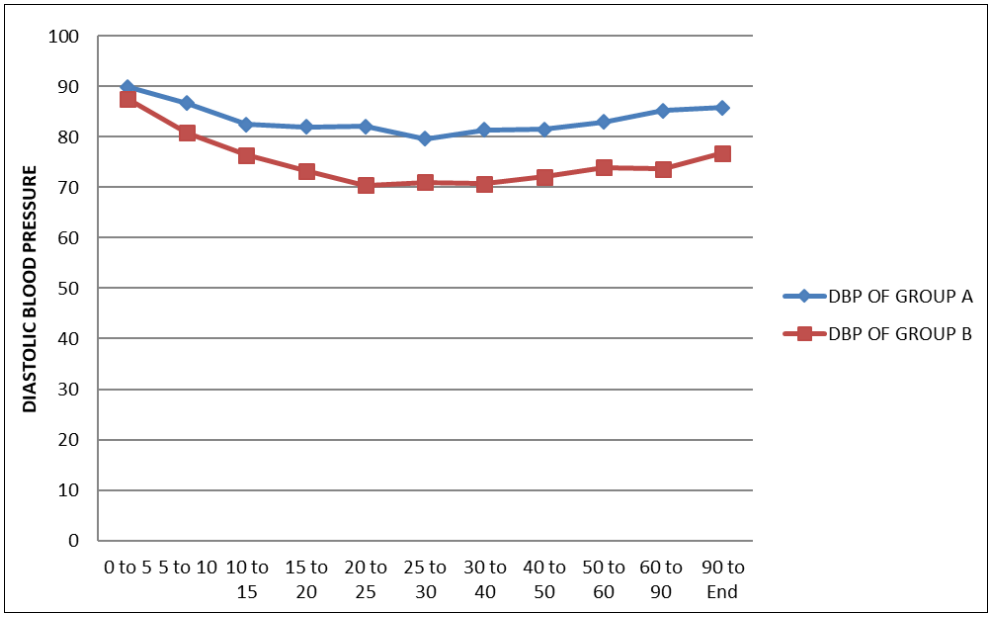
Pain Intensity	Word Scale
0	No pain
1-2	Least pain
3-4	Mild pain
5-6	Moderate pain
7-8	Severe pain
>9	Excruciating pain



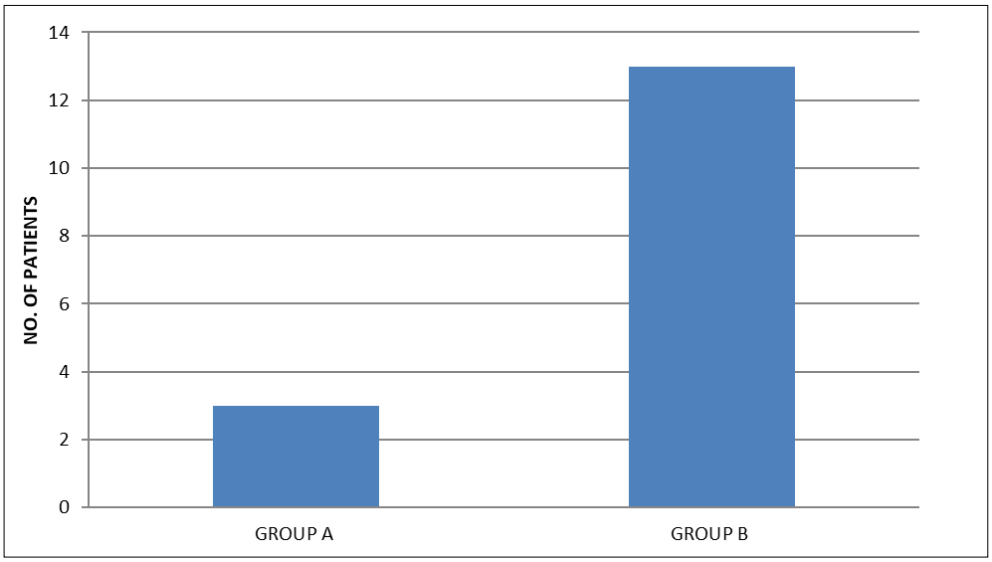
Graph 1: Comparison of Pulse Rate



Graph 2: Comparison of Systolic Blood Pressure



Graph 3: Comparison of Diastolic Blood Pressure



Graph 4: Use of Vasopressors

Conclusion

Subarachnoid block with 1cc bupivacaine + 20mcg fentanyl was found to be more safer and better option, both in terms of hemodynamic stability and lower incidence of complications in elderly patients undergoing hip surgeries.

Fascia iliaca compartment block has been used effectively for providing analgesia during positioning and also in prolonging the duration of postoperative analgesia.

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