

A COMPARATIVE STUDY OF CONTINUOUS EPIDURAL INFUSION OF 0.25% BUPIVACAINE VS. 0.25% ROPIVACAINE FOR POST OPERATIVE ANALGESIA FOR BILATERAL TKR SURGERY AFTER CSE

Anaesthesiology

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ABSTRACT

Background: Both bupivacaine and ropivacaine are used as postoperative analgesia. Our study aims to compare the continuous epidural infusion of 0.25% bupivacaine vs. 0.25% ropivacaine during post operative analgesia. **Methods:** A prospective cohort study conducted at a tertiary care hospital among 100 patients undergoing bilateral Bilateral total kneereplacement (TKR) surgery with (CSE) combined spinal and epidural anesthesia. Patients in Group A were receiving 0.25% bupivacaine and patients in Group B receiving d'0.25% ropivacaine. **Results:** The mean age of patients undergoing bilateral TKR surgery were 62.34 ± 8.12 (63.56 ± 8.52 in Group A and 61.28 ± 7.78 in Group B) and most were female in both groups. No significant differences were found between groups on assessing pain. No statistical differences were found in NIBP, SPO2, RR, ECG for abnormal rhythm and arrhythmias, ETCO2 and VAS score. **Objective:** To compare the side effects and hemodynamic parameters of 0.25% bupivacaine vs. 0.25% ropivacaine during post operative epidural analgesia. **Conclusion:** Based on our results we conclude ropivacaine 0.25% is as effective as bupivacaine 0.25% in reducing pain and the onset of motor blockade is earlier in patients receiving 0.25% ropivacaine.

KEYWORDS

0.25% bupivacaine, 0.25%ropivacaine, CSE, ,Epidural continuous infusion. Bilateral TKR,VAS Pain score, Modified Bromage scale

INTRODUCTION

The combined spinal-epidural (CSE) technique is a type of anesthesia that involves injecting a drug into the subarachnoid space and placing a catheter into the epidural space during the same procedure and the epidural catheter can be used to prolong or modify the block^[1]. A local anesthetic agent, opioid, or both are administered through the spinal needle after CSF return is visualized^[2]. For total knee replacement (TKR) surgery, a combination spinal-epidural (CSE) anaesthetic approach is preferred since it combines the advantages of both spinal and epidural anaesthesia^[3]. Sufentanil and Fentanyl are the most commonly used intrathecal opioids administered for anesthesia to supplement low-dose local anesthetic. The local anesthetic drugs commonly used in combined spinal-epidural (CSE) anesthesia are bupivacaine, ropivacaine, and levobupivacaine^[4,5]. Bupivacaine is a potent local anesthetic used in regional anesthesia,

MATERIALS AND METHODS

After Institutional Ethics Committee approval, a prospective cohort study conducted at a tertiary care hospital among 100 ASA (American Society of Anesthesiologists) I, II and III consenting adult patients above the age of 18 of either sex undergoing bilateral TKR surgery with CSE anesthesia performed with SA block initially followed by intermittent boluses of 0.5% bupivacaine 5- 7 ml hourly till completion of bilateral TKR surgery. Patients were categorized into two groups with 50 participants in each group.

Patients in Group A were receiving 0.25% bupivacaine and patients in Group B receiving 0.25% ropivacaine. Comparison of side effects and hemodynamic parameters of 0.25% bupivacaine vs. 0.25% ropivacaine during post operative epidural analgesia.

During the course studied hourly NIBP, SPO2, RR, ECG for abnormal rhythm and arrhythmias, ETCO2, VAS score, motor power were assessed side effects studied for 1-2 days. Preoperative Status:

Premedation 75 mic inj. Fentanyl,0.2 Glycopyrolate1 hr before preloading with Hartman solution 500ml,CSE Kit for ANAESTHESIA L2/ L3/L4 Epidural and spinal . Spinal SA B with 0.5%bupivacaine 3.5 ml+ Inj. Fentanyl 25 mic. gms. Monitoring spo2,ECG,NIBP, RR,ETCO2 by epidural anesthesia, spinal anesthesia, and local infiltration^[6]. Ropivacaine is also used in epidural block for surgery such as cesarean section major nerve blocks and local infiltration^[7]. Both bupivacaine and ropivacaine are used as postoperative analgesia^[8]. Our study aims to compare the continuous epidural infusion of 0.25% bupivacaine vs. 0.25% ropivacaine during post operative analgesia mask o2 attached tubing, Spontaneous ventilation,Urine hourly monitoring.Tkr surgery requires tourniquet time bound and mild hypotension which reduces bone oozing during femoral and tibial component dissection usually achieved with spinal and supplemented by epidural activation with bupivacaine 0.5% 5ml hourly for good analgesia with muscle relaxation. Blood and products transfusion started after securing hemostasis as usually 200- 300 mg blood loss seen.

Post Operative Status:

At the end of the surgery while shifting to postoperative ward, ward epidural infusion started if patient recovered from the effects of epidural anaesthetic, and started feeling the discomfort in the lower limb and the study of post operative epidural analgesia conducted with 6ml/hour dose initially with 0.25% bupivacaine or 0.25% ropivacaine.

Scales:

Pain was measures using VAS score. Regression of motor blockade assessed by the modified Bromage scale, were measured at 5, 10, 15, 30, 45 and 60 minutes after the initial dose.

Inclusion Criteria:

- Patients undergone bilateral TKR surgery with CSE anesthesia techniques with SA block initially followed by intermittent boluses of 0.5% bupivacaine 5- 7 ml hourly.
- No history of allergy or sensitivity to any of the studied local anesthetics.
- ASA grade1, 2 and 3A.

Exclusion Criteria:

- Pediatric patients were excluded from the study.
- Patients with neuromuscular disorder.Spine local site infection. Severe coagulopathy

RESULTS

The mean age of patients undergoing bilateral TKR surgery were 62.34 ± 8.12 (63.56 ± 8.52 in Group A and 61.28 ± 7.78 in Group B). Most were female in both groups. Mean BMI of patients were 26.60 ± 6.02 (26.62 ± 6.64 in Group A and 26.58 ± 5.09 in Group B). ASA grading 1,2 and 3 classification of Group A were 7/25/18 and in Group B were 5/29/17. The incidence of OA was greater in both groups followed by RA and TOA. There is no significant difference in the presence of comorbidities in both groups.

Table 1: Demographic Details

Baseline Characteristics	Group A (N = 50)	Group B (N = 50)	P value
Age	63.56 ± 8.52	61.28 ± 7.78	0.0827
Sex (Male/Female)	17/33	16/34	0.832
BMI	26.62 ± 6.64	26.58 ± 5.09	0.4866
ASA (1/2/3)	7/25/18	5/29/17	0.723
Reason for Surgery (OA/RA/TOA)	31/13/6	33/12/5	0.908
Comorbidities			0.858
Hypertension	14(28%)	17(34%)	
Diabetes mellites	19(38%)	13(26%)	
Heart failure controlled	4(8%)	5(10%)	
Atrial fibrillation with normal ventricular rate	8(16%)	8(16%)	
Coronary heart disease	6(12%)	7(14%)	

Chronic renal failure controlled, with ormokalaemia	3(6%)	2(4%)
chronic liver disease	8(16%)	5(10%)
COPD	4(8%)	7(14%)

The pain score of patients were assessed at various intervals (30 minutes, 2 hours, 4 hours, 12 hours and 24 hours). Based on our assessment on vas score, there is a significant difference between both groups. Patient who received 0.25% ropivacaine as rescue analgesics have a significant better analgesia in reducing pain when compare to the patients who receiving 0.25% bupivacaine as rescue analgesics.

Table 2: Comparison of VAS Pain Score (1 to 10)between Groups O-no Pain, Worst Pain-10

Time	VAS (Mean $\pm$ S.D.)		P Value
	Group A	Group B	
30 mins	0.51 $\pm$ 0.53	0.27 $\pm$ 0.42	0.0137*
2 hrs	2.13 $\pm$ 0.67	1.65 $\pm$ 0.51	0.0001*
4 hrs	2.35 $\pm$ 0.59	2.01 $\pm$ 0.64	0.0069*
6 hrs	2.9 $\pm$ 0.39	1.13 $\pm$ 0.67	<0.0001*
12 hrs	2.73 $\pm$ 0.83	1.37 $\pm$ 0.57	<0.0001*
24 hrs	2.99 $\pm$ 0.86	1.56 $\pm$ 0.71	<0.0001*

On comparison of occurrence of side effects on both groups there is no significant difference between both groups. In both groups most participants experience hypotension (12(24%) in Group A and 11(22%) in Group B.

Table 3: Incidence Of Side Effects

Side effects	Group A	Group B	P Value
Hypotension	12(24%)	11(22%)	0.713
Bradycardia	2(4%)	4(8%)	
nausea and vomiting	1(2%)	0(0%)	
Shivering	3(6%)	5(10%)	
Urinary retention	3(6%)	3(6%)	

Regression of motor blockade assessed by the modified Bromage scale, were measured at 5, 10, 15, 30, 45, and 60 minutes after the initial dose. In which we found the onset of motor blockade was earlier in patients with 0.25% ropivacaine analgesia. On statistical analysis we found increased motor blockade in Group B at 5 mins and 10 mins.

Table 4: Comparison Of Motor Blockade After First Dose Of Analgesia:

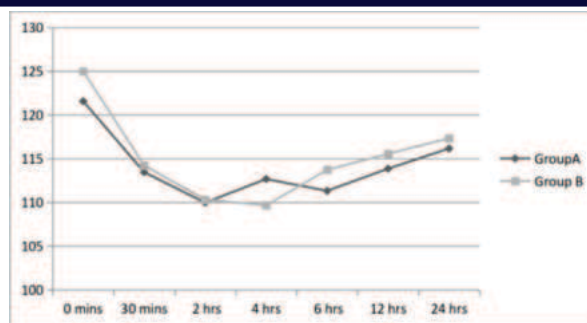
Motor Blockade: frequency of maximum level	Group A	Group B	P Value
5 mins	2(4%)	38(76%)	<0.0001*
10 mins	13(26%)	48(96%)	<0.0001*
15 mins	39(78%)	50(100%)	0.2436
30 mins	50(100%)	50(100%)	1.00
45 mins	50(100%)	50(100%)	1.00
60 mins	50(100%)	50(100%)	1.00

The degree of motor blockade was assessed by Bromage scale. Most participants in Group A (42(84%)) had a degree 2 motor blockade and most participants in Group B (29(58%)) had a degree 1 motor blockade. On comparison of degree of motor blockade after initiation of analgesia we found that 0.25% bupivacaine produce higher level blockade than 0.25% ropivacaine. On statistical analysis we found 0.25% bupivacaine produce significantly higher degree of motor blockade when compared to 0.25% ropivacaine.

Table 5: Comparison Of Degree Of Motor Blockade

Motor Blockade: frequency of maximum level	Group A	Group B	P Value
No blockade	0(0%)	0(0%)	< 0.0001*
Degree 1	6(12%)	29(58%)	
Degree 2	42(84%)	20(40%)	
Degree 3	2(4%)	1(2%)	

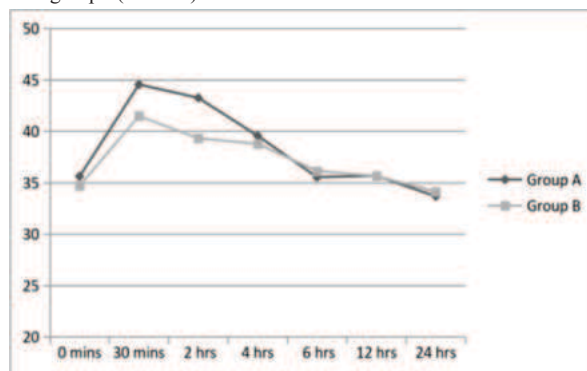
On comparison of systemic blood pressure between groups at various intervals (0 min,30 mins, 2 hrs, 4 hrs, 6 hrs, 12 hrs and 24 hrs) during postoperative analgesia. There is no significant difference between both groups. (P>0.05)



P value: 0.6466

Graph 1: Comparison of SBP Between Groups:

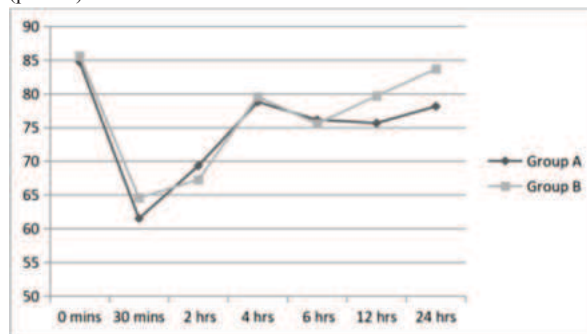
On comparison of systemic ETCO₂ between groups at various intervals (0 min,30 mins, 2 hrs, 4 hrs, 6 hrs, 12 hrs and 24 hrs) during postoperative analgesia. There is no significant difference between both groups. (P>0.05)



P value: 0.3435

Graph 2: Comparison of ETCO2 Between Groups

On comparison of heart rate between groups at various intervals (0 min,30 mins, 2 hrs, 4 hrs, 6 hrs, 12 hrs and 24 hrs) during postoperative analgesia. There is no significant difference between both groups (p>0.05).



P value: 0.5602

Graph 3: Comparison of Heart Rate Between Groups.

DISCUSSION

Our study aims to compare the continuous epidural infusion of 0.25% bupivacaine vs. 0.25% ropivacaine during post operative analgesia and most were female. The mean age of patients undergoing bilateral TKR surgery was 61.8 $\pm$ 9.2 with a male/female ratio of 0.6^[9, 10]. Similarly the mean age of patients undergoing bilateral TKR surgery in our study were 62.34 $\pm$ 8.12 and most were females. Osteoporosis is most common in patients undergoing total knee replacement (TKR), total hip replacement (THR) and spinal procedure^[11, 12]. Similarly most participants in our study were incident with osteoporosis. Based on our assessment on vas score, 0.25% ropivacaine as rescue analgesics have a significant better analgesia in reducing pain. The effectiveness of both drugs in reducing pain was almost same. 0.25% Bupivacaine provided a comparatively longer duration of analgesia, lesser VAS Scores than Ropivacaine^[13]. Results of A. KOCUM et al., states ropivacaine 0.25% is as effective as bupivacaine 0.25% when used for blocking lumbar plexus and sciatic nerve in high-risk patients undergoing hip or femur surgery^[14]. On

comparison of occurrence of side effects on both groups there is no significant difference between both groups. In both groups most participants experience hypotension. Morteza Hashemian et al., states ropivacaine reduces the incidence of hypotension in spinal anesthesia compared to bupivacaine^[15]. We found the onset of motor blockade was earlier in patients with 0.25% ropivacaine analgesia. On statistical analysis we found increased motor blockage in Group B at 5 mins and 10 mins. Kalpana Kulkarni et al., bupivacaine and ropivacaine were comparable in terms of quality of analgesia, hemodynamic stability, degree of motor blockade, requirement of top-up doses, incidence of instrumental delivery and side effects^[16]. No statistical differences were found in NIBP, SPO2, RR, ECG for abnormal rhythm and arrhythmias, ETCO2 and VAS score. Olapour A et al., found no difference between groups in terms of systolic and diastolic blood pressure, but the heart rate of patients in the bupivacaine group is significantly higher than the ropivacaine group^[17]. Our findings state that 0.25% bupivacaine produce higher level blockade than 0.25% ropivacaine. Sonal N. Bhat et al., conclude that use of ropivacaine for intrathecal anesthesia in surgeries provided an adequate level of block for the surgery with faster onset of sensory and motor blockade^[18]. M J Da Conceicao et al., says the ropivacaine group showed a shorter duration of motor block than the bupivacaine group^[19].

CONCLUSION

Based on our results we conclude patient who receive 0.25% Ropivacaine as continuous epidural analgesic have a significant better analgesia in reducing pain. No statistical differences were found in NIBP, SPO2, RR, ECG for abnormal rhythm and arrhythmias, ETCO2 and VAS score. On assessing motor blockade onset of motor blockade was earlier in patients with 0.25% Ropivacaine analgesia and found 0.25% bupivacaine produce significantly higher degree of motor blockade when compared to 0.25% Ropivacaine. No statistical differences in the occurrence of side effects were observed between groups in majority. 2. A small percentage of patients may need extra analgesia with (multimodal analgesia) like paracetamol, NSAIDS, opioids, in addition to continuous local anesthetic's infusion. A few anxious patients were restless inspite of all these settled with local epidural infusion and an anxiolytic. 3. A stand by inotrope infusion should be readily available in the postoperative analgesia ward when patient is on all local anesthetic drug epidural infusion to tackle hypotension

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