Section: Anesthesiology

Original Research Article

COMPARATIVE EVALUATION OF HYPERBARIC SPINAL ROPIVACAINE WITH HYPERBARIC BUPIVACAINE IN LOWER LIMB AND HIP SURGERY

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Abstract

Background: During the past few years, several advances in joint arthroplasty have been reported. The present study was conducted for comparing Hyperbaric spinal ropivacaine with hyperbaric bupivacaine in lower limb and hip surgery. **Materials and Methods:** A total of 100 patients of ASA Grade I/II scheduled to undergo lower limb and hip surgery were enrolled. All the patients were randomized into two study groups: Ropivacaine group and bupivacaine group; with 50 patients in each group. Pre-anesthetic evaluation was done. Under all aseptic precautions, the subarachnoid blocks were performed. Hemodynamic variables were evaluated in all the patients. Quality of intraoperative anesthesia was assessed using "four-grade scale" which is defined as: Excellent: No supplementary sedative or analgesia required. Good: Only sedative required. Fair: Both sedative and analgesic required. Poor: General anesthesia and tracheal intubation required. Outcome was compared. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. **Results:** Mean age of the patients of the ropivacaine group and bupivacaine group was 41.2 years and 40.9 years respectively. Mean time of onset of sensory block was significantly lower among patients of the bupivacaine group in comparison to the patients of the ropivacaine group. Mean onset of motor block was significantly lower in bupivacaine group. Bupivacaine was associated with a higher incidence of complications. **Conclusion:** Bupivacaine was associated with shorter onset of motor and sensory block but higher incidence of complications.

INTRODUCTION

During the past few years, several advances in joint arthroplasty have been reported. During the last few years, there has been a great deal of interest in conventional cementless and ultrashort stems. Conventional cementless femoral stems demonstrated a good rate of clinical and radiographic performance at long-term follow-up. To provide intraoperative options of femoral neck length and offset and maximize mechanics and stability during hip arthroplasty, the concept of neck modularity was introduced. For people with symptomatic hip or knee osteoarthritis, undergoing joint replacement is a proven and effective treatment. However, the presence of concomitant lower limb amputation poses a unique challenge to both the patient and surgeon.[1-3]

Total joint arthroplasty, including total hip arthroplasty (THA) and total knee arthroplasty (TKA), is a popular surgical option for elderly patients with advanced joint disease. Unlike TKA, THA is not an operation that is commonly known to control the lower limb alignment.[4] Recent studies demonstrated that bupivacaine, the local anesthetic most commonly used for spinal, epidural, and caudal anesthesia, inhibits NMDA receptor currents, thus raising the possibility that this inhibition may account for some of its specific clinical effects.[5] Ropivacaine is a long-acting regional anaesthetic that is structurally related to Bupivacaine. It is a pure S (-) enantiomer, unlike Bupivacaine, which is a racemate, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles.[6] Hence; the present study was conducted for comparing Hyperbaric spinal

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ropivacaine with hyperbaric bupivacaine in lower limb and hip surgery.

MATERIALS AND METHODS

The present study was conducted for comparing Hyperbaric spinal ropivacaine with hyperbaric bupivacaine in lower limb and hip surgery. A total of 100 patients of ASA Grade I/II scheduled to undergo lower limb and hip surgery were enrolled. Complete demographic and clinical details of all the patients were obtained. A Performa was made and detailed medical profile of all the patients was recorded. All the patients were randomized into two study groups: Ropivacaine group and bupivacaine group; with 50 patients in each group. Pre-anesthetic evaluation was done. Under all aseptic precautions, the subarachnoid blocks were performed. Hemodynamic variables were evaluated in all the patients. Outcome was compared. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

RESULTS

The mean age of the patients of the ropivacaine group and bupivacaine group was 41.2 years and 40.9 years respectively. Mean time of onset of sensory block was significantly lower among patients of the bupivacaine group in comparison to the patients of the ropivacaine group. Mean onset of motor block was significantly lower in bupivacaine group. Bupivacaine was associated with a higher incidence of complications.

Table 1: Comparison of sensory block

Sensory block	Ropivacaine group	Bupivacaine group	p-value
Total duration (mins)	185.3	229.5	0.001*
Onset time at T10 (mins)	8.2	4.2	0.000*

*: Significant

Table 2: Comparison of motor block

Motor block	Ropivacaine group	Bupivacaine group	p-value
Total duration (mins)	118.3	162.9	0.001*
Onset time (mins)	14.2	7.5	0.000*

*: Significant

Table 3: Complications

Complications	Ropivacaine group	Bupivacaine group
Hypotension	3	12
Bradycardia	5	13
Nausea/vomiting	2	10

DISCUSSION

Ropivacaine is a versatile local anaesthetic drug to use in otorhinolaryngology practice, compared to other routinely used drugs like bupivacaine and lidocaine for local infiltration and nerve blocks. By itself it has a significant vasoconstrictive property, long duration of action and in case of overdose central nervous system (CNS) & cardiac complications of ropivacaine are the least because of its pure (S)-enantiomer property. By using additives, the duration of analgesia may be prolonged. Ropivacaine has been used routinely in our otorhinolaryngology procedures since 2010 (10 years).[7,8] Bupivacaine is the most commonly-used local anesthetic in spinal anesthesia for cesarean section. It is a long-acting local anesthetic and, compared to other local anesthetics, it has a limited transfer to the placenta. Administration of a single intrathecal low dose of bupivacaine for labor analgesia has been demonstrated and found to be effective. Various adjuvants such as fentanyl, sufentanil, morphine, clonidine, and dexmedetomidine have been added to intrathecal bupivacaine in local anesthesia to provide a prolonged duration of sensory block and reduce the dose of intrathecal local anesthetic, which can subsequently decrease the incidence of spinal-induced hypotension.[9-11] Hence; the present study was conducted for comparing Hyperbaric spinal ropivacaine with hyperbaric bupivacaine in lower limb and hip surgery.

The mean age of the patients of the ropivacaine group and bupivacaine group was 41.2 years and 40.9 years respectively. Mean time of onset of sensory block was significantly lower among patients of the bupivacaine group in comparison to the patients of the ropivacaine group. Mean onset of motor block was significantly lower in bupivacaine group. Bupivacaine was associated with a higher incidence of complications. Kulkarni, K. R et al compared the clinical efficacy of equal doses of hyperbaric 0.5% ropivacaine with 0.5% bupivacaine for SA. Eighty American Society of Anesthesiologists grade I-II patients undergoing elective infraumbilical surgeries under SA were recruited and randomized to receive 3ml of hyperbaric ropivacaine 5mg/ml containing dextrose 83 mg/ml (by the addition of desired dose of 25% dextrose) in Group R or 3ml of hyperbaric bupivacaine 5mg/ml containing dextrose 80 mg/ml in Group B. Monitoring of vitals and observation for the block parameters were carried out. Ropivacaine produced a slower onset of sensory block

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(ropivacaine 4.5 min; bupivacaine 3.2 min; P < 0.05) and the mean total duration of sensory block was significantly lesser (ropivacaine 155 min; bupivacaine 190.5 min; P < 0.05). Patients in the ropivacaine Group R had significantly more rapid recovery from the motor blockade (ropivacaine120 min; bupivacaine 190 min; P < 0.05) and passed urine sooner than the patients in bupivacaine Group B (ropivacaine 257 min; bupivacaine 358 min; P < 0.05). Ropivacaine 15 mg in dextrose 8.3% provides reliable SA of shorter duration than bupivacaine 15 mg in 8% dextrose.[11]

Kharat PA, et al compare the onset of action, intensity and duration of motor block of 0.5% hyperbaric ropivacaine with 0.5% hyperbaric bupivacaine for elective lower abdominal, perineal and lower-limb surgeries. 70 patients undergoing elective lower abdominal, perineal and lower limb surgery receiving spinal anesthesia were divided randomly into two groups, Group B, (bupivacaine 5 mg/ml with glucose 80 mg/ml;4 ml, and Group R, (ropivacaine 5 mg/ml with glucose 80 mg/ml; 4 ml). The results were analyzed and compared using Chi-square test, student 's t-test and Fisher's exact tests. The onset of sensory block was more rapid with bupivacaine (p<0.05). The maximum cephalad spread was similar in both groups. However, the time required to maximum extent of cephalic spread was less in Group B (p<0.05). Motor block 3 according to modified bromage scale was obtained in both groups and the time to achieve the same was not significant. The duration of motor blockade i.e., time to complete regression of motor block was significantly greater with Group B than with Group R (0.0001). They found that there was no significant difference in the time taken to achieve grade 3 motor block but ropivacaine gave a lesser degree of motor block which regressed faster than bupivacaine (118 min versus 156 min; p<0.0001). There was no significant difference in hemodynamic parameters except that diastolic and mean pressures remained on lower side in group B (p<0.05). They conclude that 0.5% hyperbaric ropivacaine provides a sensory block of similar onset and extent, shorter duration of action and less frequency of hypotension as compared to 0.5% hyperbaric bupivacaine.[12]

CONCLUSION

Bupivacaine was associated with shorter onset of motor and sensory block but higher incidence of complications.

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