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Comparision of 0.5% Ropivacaine with 0.5% Bupivacaine for sciatic nerve block in below knee surgeries

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ABSTRACT

Background and Aim: Sciatic nerve block is very useful in providing surgical anaesthesia and postoperative analgesia for various surgical procedures of the lower leg or foot but due to adverse effect like cardiotoxicity there is lot of research going on to find more cardio stable agent Ropivacaine is commonly tried now a days in place of bupivacaine for sciatic nerve block. We evaluated the comparative efficacy of sciatic nerve block with ropivacaine 5mg/ml and bupivacaine 5mg/ml for below knee surgeries. **Material and Methods:** Sixty patients of age 18-60 years of American Society of Anesthesiologists (ASA) grade I and II undergoing below knee surgeries under sciatic nerve block were randomly divided into two groups of 30 each in double blind fashion. Group R received 20ml ropivacaine 5mg/ml while Group B: received 20ml bupivacaine 5mg/ml after location of sciatic nerve with peripheral nerve locator. Time of onset of sensory and motor blockade, quality of anaesthesia and analgesia, duration of analgesia and side effects were recorded for each patient. The results were expressed as mean±SD. Statistical analysis consisted of Z test. ANOVA was used to analyze hemodynamic variations between two groups. $p<0.05$ considered as significant and $p<0.01$ considered as highly significant. Results: The two groups were comparable with respect of age, sex and weight. The time to onset of sensory, motor block and duration of analgesia was statistically non significant between the two groups though the time of onset of sensory blockade was less with ropivacaine. The quality of anaesthesia and analgesia was found to be adequate and good quality in both the groups. **Conclusion:** It can be concluded that equivalent doses of ropivacaine and bupivacaine provided sufficient anaesthesia and postoperative analgesia for surgeries below the knee and ropivacaine is a good alternative to bupivacaine for sciatic nerve block if cardiotoxicity is of concern.

Key words: Bupivacaine, Below Knee Surgeries, Ropivacaine, Sciatic Nerve Block

INTRODUCTION

Peripheral nerve blocks provide reliable and safe intra operative and post operative pain management in orthopedic limb surgeries. But still there is no evidence-based consensus regarding the best choice of anaesthesia modality for the procedures below knee, and the influence of this choice on the postoperative pain profile is poorly understood. Spinal Anaesthesia (SA) is most common, but Peripheral Nerve Blockade (PNB) are becoming widely implemented, as they provide long-lasting pain control and are regarded very safe in haemodynamically unstable patient[1]. There is some evidence that PNB used in elective surgical procedures on knee, ankle and foot are effective

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in reducing postoperative pain, opioid consumption and related side effects such as nausea and vomiting, as well as potentially reducing length of hospital stay and increasing patient satisfaction[2]. Sciatic nerve block is useful in providing anaesthesia for a variety of surgical procedures of the lower leg or foot including postoperative pain relief, for painful physical therapy following surgery and for treatment of complex regional pain syndrome affecting lower leg or foot[3].

Many drugs have been used in the recent past for providing reliable anaesthesia for lower limb surgeries and postoperative pain relief. A long acting local anaesthetic agent will provide prolonged postoperative analgesia. Bupivacaine is considered to be a good choice however due to cardiotoxicity a search for newer cardio stable agent is going on. Ropivacaine a newer agent with similar clinical profile but with less side effects can be used as an alternative[4–7]. Further Sciatic nerve block has several other advantages over central nerve block. It avoids the complications such as hypotension, bradycardia, urinary retention, and can be used in patients with minor degree of coagulopathy or head injury, Moreover it also improves post operative mobility of the patients[8–9].

Hence our study was designed to test the hypothesis that ropivacaine can be tried as an alternative to bupivacaine while administering sciatic nerve block for below knee surgeries. The primary aim of our study was to compare the efficacy and clinical characteristics of ropivacaine 0.5% and 0.5% bupivacaine for sciatic nerve block in surgeries on leg and feet while secondary outcome was to note the effects of these drugs on haemodynamics and complications if any.

MATERIAL AND METHODS

Before the commencement of study, approval from the ethical committee of our institute was taken and also the consent of the patients participating in the study was duly taken and recorded in the admission file. The present study was conducted on 60 patients of age 18-60 years of American Society of Anesthesiologists (ASA) grade I and II undergoing below knee surgeries, in department of Anaesthesia of our institute.

A day before surgery, all the patients were examined and thoroughly investigated as per proforma attached. The procedure to be performed was explained to each patient .Patients with a history of respiratory, cardiac, hepatic or renal disease, convulsions, pregnant women, history of bleeding disorders, local infection at the site of injection, sensitive or allergic to ropivacaine or bupivacaine were excluded from the study. After taking informed consent, patients were randomly divided into two groups of 30 each in double blind fashion. Patients in Group R received 20ml ropivacaine 5mg/ml while Group B patients received 20ml bupivacaine 5mg/ml. All patients were premedicated with Inj. Glycopyrrolate 0.2 mg per Kg of body weight intramuscularly half an hour before shifting to operation theatre. On arrival in the operating room 20G cannula was placed intravenously for administration of fluids and drugs. In addition to routine clinical monitoring a separate temperature probe was applied on the foot to record the changes in temperature. Inj Midazolam 1mg was administered intravenously before the block. After the infiltration of skin and subcutaneous tissue with 2% lidocaine, sciatic nerve block was performed using posterior approach (labat). The nerve was located using short beveled insulated needle attached to peripheral nerve locator and the needle placement was considered optimal when maximum gastrocnemius contraction and plantar flexion of foot was attained at current of 0.5mA. After careful aspiration study drug was injected over 2 minutes and the end of injection was assigned as time zero. During surgery pulse, systolic blood pressure, diastolic blood pressure, oxygen saturation and ECG were monitored. Oxygen was routinely administered via oxygen face mask at the rate of 4 liter per min. Maximum duration of all the surgeries was up to 60 mins.

The development and progression of block was assessed in the following ways. The sensory response was assessed by pin prick method on dorsal and plantar aspects of the foot. Sensory blockade was assessed by a 3 point sensory score: 0-Sharp pain on pinprick, 1-Touch sensation on pinprick, 2-Not even touch sensation on pinprick. Onset of sensory blockade was taken as the time between injection and the complete ablation of pinprick test (sensory score-2).). If a sensory score of 2 was not achieved even after 20 minutes or if there was sparing in any segment, the sensory analgesia was not found to be satisfactory and these patients were excluded from the study.

Motor blockade was accessed by a 3 point motor score described by Bromage: 0-Full flexion and full extension of leg and feet, 1-just able to flex knees with free movements of feet, 2-unable to flex knee but with free movements of feet, 4-unable to move legs or feet. Onset of motor blockade was considered as the time from performance of

block to the time when a complete inability to move toes (score-2) was achieved.

The time of onset of increase in temperature of foot was used to indicate the onset of sympathetic nerve block.

Patients was asked to provide the verbal rating of the quality (excellent ,good ,fair ,poor) of anaesthesia after 10 minutes of start of surgery and again at the end.

Duration of analgesia was assessed by observing the time that elapsed until the patient first requested for postoperative analgesia. .Postoperative analgesia was assessed by the 10 point visual analogue scale: No pain = 0, Mild pain = 1-3, Moderate pain = 4-7, Severe = more than 7

Analgesic injection Diclofenac Sodium (1.5 mg/kg intramuscularly) was given when VAS > 5.

The results were expressed as mean±SD. Statistical analysis consisted of Z test. ANOVA was used to analyze hemodynamic variations between two groups. $p<0.05$ considered as significant and $p<0.01$ considered as highly significant.

RESULTS

The two groups were comparable with respect of age, sex and weight. The time to onset of sensory block was 10±1.2 minutes in group ropivacaine and 14±0.8 minutes in group bupivacaine and was statistically non significant (Table 1).

Table 1: Demographic characteristics of patient

Variables	Group R (Ropivacaine)	Group B (Bupivacaine)
Age (Yrs)	50 ±2.5	55 ±3
Sex (M/F)	14/16	‘18/12
Weight (Kg)	60 ±2	62 ±3

(p>0.05)

The time to onset of sensory block was 10±1.2 minutes in group R and 14±0.8 minutes in group B but on inter group comparison results were statistically non significant.

The time to onset of motor block was 20±1.6 minutes and 18±1.2 minutes in group R and group B respectively. These results were statistically non significant.

The time to onset of rise in temperature was 8±1.2 minutes in group ropivacaine and 9+0.8 minutes in group bupivacaine which was statistically non significant.

The duration of analgesia was 440±5.2 minutes and 460±8.9 minutes in group ropivacaine and group bupivacaine respectively but on inter group comparison results were statistically non significant (Figure 1).

Table 2: Clinical characteristics

Variables (min)	Group R (Ropivacaine)	Group B (Bupivacaine)	p-value
Time to onset of sensory block	10 ± 1.2	14 ± 0.8	>0.05
Time to onset of motor block	20 ± 1.6	18 ± 1.2	>0.05
Time to onset of rise in temperature	8 ± 1.2	9 ± 0.8	>0.05

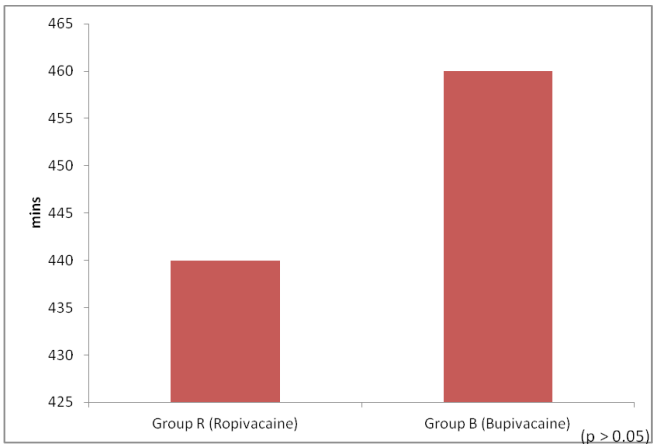

Figure 1: Duration of analgesia.

The quality of anaesthesia and analgesia was found to be adequate and good quality in both the groups.

There was no statistical significant difference in intraoperative parameters namely pulse, systolic blood pressure and diastolic blood pressure between two groups (p>0.05).

In our study, no patient had any incidence of nausea, vomiting in either of groups.

DISCUSSION

In our prospective randomized clinical study we compared 30 patients (group R) received 20ml ropivacaine 5mg/ml versus 30 patients(group B) received 20ml bupivacaine 5mg/ml during administration of sciatic nerve block for below knee surgeries. There was no statistical significant difference regarding age, weight and sex distribution between two groups.

The onset of sensory block in group R was 10±1.2 mins while in group B was 14±0.8 mins. Although sensory

onset was little delayed in group B but there was no statistical significant difference between two groups. (p>0.05). Caseti et al.,[10] in their study also found delay onset of sensory block with 0.5% levobupivacaine as compared to 0.75% ropivacaine and data was statistically nonsignificant.

The time of onset of motor block in our study was 20 minutes in group R and 18 minutes in group B but the data was statistically non-significant (p>0,05).

Caseti et al.,[10] in their study also compared 0.75% ropivacaine with 0.5% levobupivacaine and concluded the onset of motor block in ropivacaine group to be 20 minutes and in levobupivacaine group was 30 minutes but the data on inter group comparison was statistically nonsignificant. The disparity of results from our study may be due to the fact that they had used 0,75% ropivacaine instead of 0.5% ropivacaine during administration of sciatic nerve block.

Duration of anaigesia in our study was shorter in group R (440±5.2) mins than group B (460±8.9) mins but results were statistically comparable between the two groups. In a similar double blind study by Conolli et al[11] found that duration of analgesia was found to be 8.6 hours in ropivacaine group and 9.1 hours in bupivacaine group which was statistically insignificant.

We found that equivalent doses of ropivacaine and bupivacaine provided adequate and efficient analgesia in the post operative period. The quality of analgesia was also adequate in both the groups. Hence ropivacaine is good alternative during administration of sciatic nerve block where risk of cardiac toxicity is of concern. Sciatic nerve blockade is also a very good alternative for central neuraxial blockade for surgeries of leg, ankle and foot. This is particularly useful for patients with co-morbodities like cardiac risk factors, coagulopathy and elderly patients. Supplementation of sciatic nerve blocks with saphenous nerve block can be done in some studies when the surgical wound required proximal extension[12].

CONCLUSION

We concluded in our study that equivalent doses of ropivacaine and bupivacaine provided efficient and adequate surgical anaesthesia and analgesia in the post operative period and so ropivacaine can be used as an alternative for sciatic nerve block in cardiac patients for below knee surgeries.

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