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Original Research Article

Combined femoral and sciatic nerve blocks for lower limb surgeries

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ABSTRACT

Background and Aim: The peripheral nerve blocks can be used to interrupt the nerve pathways at multiple locations without undue sedation or loss of consciousness. Low incidence of pre and postoperative complications, good postoperative analgesia and increased operating room efficiency, all have accounted for the resurgence of interest in these techniques. The main aim of this study was to assess the suitability of this simple and safe technique for various unilateral lower limb surgeries and to assess the hemodynamic stability of the patients after this procedure.
Materials and Methods: This prospective randomized study involved 50 patients, in the age group of 20-80 years, scheduled to undergo elective and emergency lower limb surgeries under combined femoral and sciatic nerve blocks. A sciatic nerve block was given by the posterior approach of Labat, and a femoral (3 in 1) block was given by Winnie's inguinal perivascular approach using a mixture of lidocaine, ropivicaine, and saline.
Results: Complete block was achieved in 92% of the patients. None of the patients had any complications and there was no significant difference between the pre-operative and post- operative vitals (pulse and blood pressure). 84% of the patients preferred to undergo the same anesthetic technique, if required in the future.
Conclusion: Combined femoral(3-in-1) and sciatic nerve block is a simple, safe, and efficient technique with very low incidence of sideeffects and a negligible failure rate.

1. Introduction

Peripheral nerve blockade has gained popularity as a suitable analgesic technique across a range of surgical specialties.[1] Several authors have reported the importance of postoperative pain management and their benefits of functional rehabilitation.[1–3] Surgical anesthesia of the entire lower extremity can be obtained with various techniques of regional or central neuraxial blocks.[1–4] The regional blocks like femoral nerve block along with sciatic nerve block can be one of the alternative techniques to provide surgical anesthesia.[2–4] Blockade of the femoral nerve provides sensory anesthesia of the anterior thigh, knee, medial aspect of the calf, ankle, and foot.[2] Sciatic nerve has been blocked via different approaches and can be used for postoperative pain control following foot and ankle surgery.[3–6]

Peripheral nerve blocks are ideally suited for lower limb surgeries because of the peripheral location of the surgical site and the potential to block pain pathways at multiple levels.[4] In contrast to other anesthetic techniques such as general or spinal anesthesia, properly conducted PNBs avoid hemodynamic instability and, facilitate postoperativepain management, and assure a timely discharge of the patient.[5] This study was therefore done to assess the suitability of this simple and safe technique for various unilateral lower limb surgeries and also to assess the hemodynamic stability of the patients after

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the block was given.

2. Materials and Methods

Fifty subjects were included in this randomized prospective study.

2.1. Inclusion criteria

Patients in the age group of 20-80 years, scheduled to undergo elective and emergency lower limb surgeries under combined femoral and sciatic nerve blocks.

2.2. Exclusion criteria

Allergies, bleeding disorders, localized infection, neurological disease and morbid obesity.

Informed consent was taken from all the subjects and ethical clearance was obtained from hospital ethical committee.

Before starting the procedure, Inj. Glycopyrolate 0.2mg iv was given to all patients. Furthermore, they were given inj. Midazolam 0.2mg/kg iv and inj. Fentanyl 1mcg/kg iv for sedation. Following this, a sciatic nerve block by the posterior approach of Labat was given using a 27mL mixture of 15mL 1% Lignocaine with adrenaline, 10mL 0.375% Ropivicaine, and 2mL soda bicarbonate. As the needle is advanced, twitches of the gluteal muscles are observed first. These twitches merely indicate that the needle position is still too shallow. Once the gluteal twitches disappear, brisk response of the sciatic nerve to stimulation is observed (hamstrings, calf, foot, or toe twitches). After the initial stimulation of the sciatic nerve is obtained, the stimulating current is gradually decreased until twitches are still seen or felt at 0.2 - 0.5 mA. This typically occurs at a depth of 5-8 cm. After negative aspiration for blood, 15-20 mL of local anesthetic is slowly injected. Any resistance to the injection of local anesthetic should prompt needle withdrawal by 1mm. The injection is then reattempted. Persistent resistance to injections should prompt complete needle withdrawal and flushing to assure its patency before the needle is reintroduced.

A femoral (3 in1) block was given by Winnie's inguinal perivascular approach using a 22mL mixture containing 10ml of 1% Lignocaine with adrenaline, 10ml of 0.375% Ropivicaine and 2mL soda bicarbonate. A standard 10cm insulated needle, connected to a nerve stimulator, was inserted to elicit the response to nerve stimulation. Visible or palpable twitches of the hamstrings, calf muscles, foot, or toes, or a palpable twitch of the quadriceps muscle at 0.2-0.5mA current were looked for. Precautions to avoid arterial or venous puncture were taken. An assessment was done every 30 seconds for the initial 10 minutes and then every minute till the onset of block. Postoperatively, all the patients were followed up until complete recovery of sensory and motor function of the limb was regained.

3. Observations and Results

Fifty patients, of either sex, 20-80 years of age and ASA risk grade of I-IV who were undergoing either an elective or an emergency lower limb surgery, were selected for this study. 56% were emergency surgeries and so the patients could not be prepared for general or spinal anesthesia.

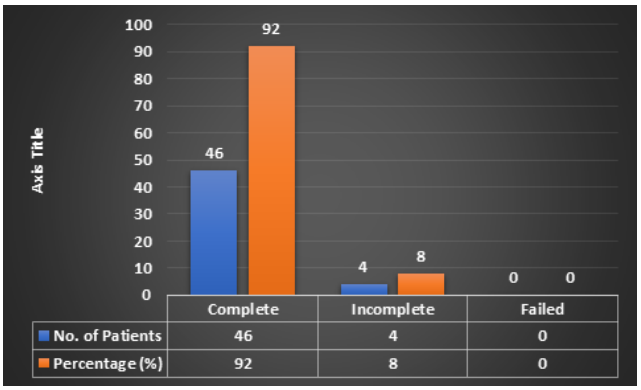

Fig. 1: Quality of block

46 patients (92%) of the patients achieved complete block and only 4 patients (8%) had an incomplete effect in whom surgeries were proceeded with general anesthesia.

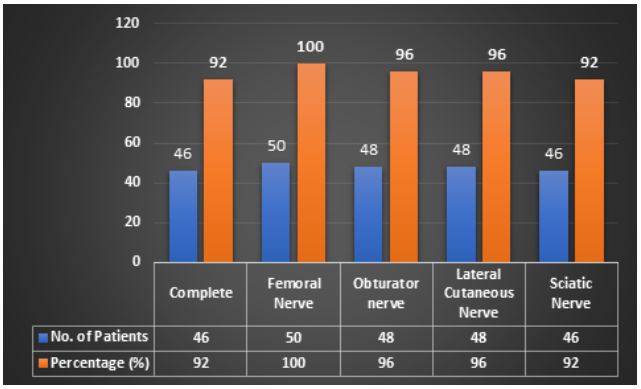

Fig. 2: Sensory block of different nerves

In 1 patient sciatic and obturator nerve was spared while in another patient one sciatic and lateral cutaneous nerve was spared.

Table 1 shows that there is nosignificant difference between preoperative and post-operative vitals (pulse and blood pressure) of patients in our study (p>0.05)

The mean duration of surgery was 72.2 min. In one patient the surgery lasted for 140 min without any complaint of pain and discomfort.

The minimum and maximum age groups were between 20-30years and 71-80years respectively. The mean age was 52.84+/-14.51years. 80% of the patients were males and 20% were females in the study with male: female ratio of 4:1.

Table 1: Hemodynamic parameters

Parameters	Pre-Op		Post-Op	
	Range	Mean	Range	Mean
Heart Rate (per min)	64-122	88.84 +/- 12.82	68-98	85.24 +/-8
Systolic Pressure (mmHg)	110-190	146.88 +/- 20.61	112-170	143.28 +/- 13.58
Diastolic Pressure (mmHg)	70-110	88.48 +/- 10.42	76-98	86.88 +/- 6.11

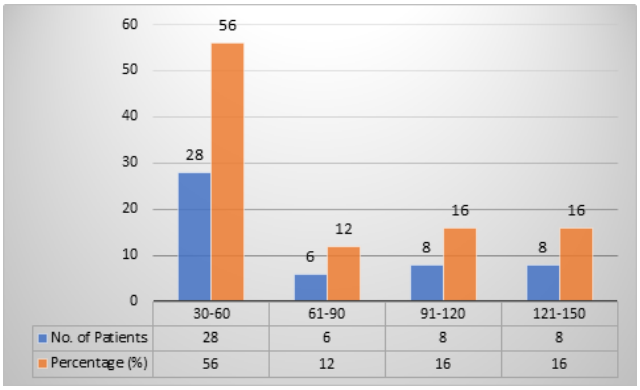

Fig. 3: Duration of surgery

The minimum and maximum weight groups were between 61- 70 kg and 91-100 kg respectively. The mean weight was77.08+/-7.35kg.

In our study, 40 patients were of ASA risk grade III and IV (64%and16% respectively) out of which 26 patients were taken as an emergency surgery who could not have tolerated the adverse effects of general or spinal anesthesia.

None of the 50 patients in the study had any cardiovascular or neurological complications. There was neither a vascular puncture nor did any patient have pain at the injection site.

4. Discussion

The primary aim of this study was to assess the combined femoral (3-in-1) and sciatic nerve block for lower limb surgeries unilaterally and to determine the onset of time for sensory and motor blockade, result of the block, complications and hemodynamic stability.

Historically, sciatic nerve blocks have been least studied and not mentioned in the literature in great detail. Davies and Mcglade concluded in their study that sciatic nerve blocks are unsuccessful without localization of nerve by nerve stimulation.[2] That is the reason, majority of blocks of sciatic nerve are done by using insulated needles and nerve stimulators. In current study, every nerve block was performed with the help of a nerve stimulator. The success rate was 92%.

Labat first proposed in 1930's, a posterior approach to sciatic nerve block.[3] In the current study, the classical posterior approach of Labat was used in all patients as it is simple, easy to perform, less painful and more convenient.[3]

Femoral nerve block, a basic nerve block technique is easy to master and carries low risk of complications. Winnie proposed the femoral (3-in-1) nerve block with the help of a single injection of a local anesthetic solution which anesthetizes the femoral, lateral cutaneous and obturator nerves.[4] When this block is combined with sciatic nerve block, anesthesia of almost the entire lower limb from the mid-thigh level can be achieved.

In the present study, we used a 27mL mixture of 15mL 1% Lignocaine with adrenaline, 10mL 0.5% Ropivicaine, 2mL soda bicarbonate for the sciatic nerve block, and a 22mL mixture containing of 10ml of 1% Lignocaine with adrenaline, 10ml of 0.5% Ropivicaine and 2mL soda bicarbonate for the femoral block. Most of the cases in this study were from 51 to 70 years of age with a mean age of 52.84 +/- 14.51 years because we wanted to see the effectiveness of the peripheral nerve block by avoiding the risk and disadvantages of general anesthesia (GA)/ central nerve block (CNB) in patients with cardiac, respiratory and renal diseases.

Rajkumar et al. have studied nerve block (sciatic and femoral blocks) in high-risk elderly patients for lower limb amputations 70.71 +/- 8.73 years.[5]

Amongst the cases, ASA risk of grade III was seen in 64% and 16% had an ASA risk of grade IV. This means that most of the patients had a high risk of anesthesia in whom we used a peripheral nerve block without any consequent complications or significant hemodynamic changes. A. Singh et al. also concluded that combined block can be given in critically ill patients and hemodynamically unstable patients.[6] Gligorijevic and Brown also reported that in emergency cases and high-risk patients, a combined block can be given in lower limb surgeries.[7]

The time from injection of the LA to point 1 scale of sensory block is defined as the onset time for sensory block in any area supplied by femoral, obturator, lateral cutaneous and sciatic nerves. In present study, it was found to be 8.04 +/– 6.77 min which was similar to the study done by A. Singh et al who concluded the onset of time for sensory block was 12.56+/-5.36 min.

In other studies, V. Chakrvarthy et al reported that the onset of time for analgesia was 2.03+/–4.7min but they have used 50ml of 1% lignocaine and B. Urbanek reported sensory onset time of 27min in the bupivacaine group.[8,9]

The onset time for motor block was defined as the time from injection of a LA to point 1 scale Bromage. In present study, it was 14.41+/–3.11min. While A. Singh et al. found

that onset time for motor block was 21.3+/–9.94min with 1% lignocaine and 0.25% bupivacaine in their study.[6] The difference could be due to the use of different amount of drug mixtures. The onset of sensory block precedes onset of motor block. The reason is due to motor fibers being thick and located in the center of the nerve.

Sensory block was defined as the time from the onset of sensory block to the first analgesic dem and by the patient. In the present study it was 274.87 +/– 13.25 min. Our study results are comparable with studies by V. Chakravarthy et al and Fournier et al.[8,10]

Duration of the motor blockade was 387.45+/-14.42min. V. Chakravarthy et al. 42 reported that motor block regression time was 180 +/- 22.5 min with 50 mL 1% Lignocaine for the combined sciatic and femoral 3-in-1 block.[8] Whereas, we used 25mL 1% Lignocaine with Adrenaline 1:2,00,000 and 20 mL 0.5% Ropivicaine. In our study, the pulse, systolic BP and diastolic BP were recorded during the pre-operative, intra-operative and post-operative periods. All these parameters did not change significantly ($p>0.05$). Our are in agreement of that of Raj al, Gligorijevic et al., Zaric et al., Barton et al., Cassati at al., Fanelli et al. and Singelyn et al.[5–15]

Out of the 50 patients, 92% patients had a complete block while 8% patients had an incomplete effect (success rate of 92%).

A. Singh et al. also reported the high reliability and relatively low failure rate (4%) in their study.[6] Raj Kumar et al. also reported 99.44% success rate in their study. Our study results are comparable with both of them.

In this study, none of the patients had any complications either intraoperative or postoperative. This study was similar to other studies: Zaric et al. described that incidence of side effects was very low ($p<0.05$) in the peripheral nerve block group compared to the epidural group; Singelyn et al. reported that continuous 3-in-1 block induces nearly 4 times fewer side effects than epidural analgesia; Fowler et al. concluded that peripheral nerve block may provide effective unilateral analgesia with lower incidence of opioid related and autonomic side effects; Raj Kumar et al. found no complication intraoperative or postoperative.

5. Conclusion

92% of the patients had complete anaesthetic blockade and surgery went un-eventfully without any complaints of pain or discomfort. Combined block (femoral and sciatic nerve) is a simple and safe, and efficiently provides the desired anaesthesia with minimal incidence of side effects and very low failure rate. It is possible in the future that this regional block by skilled clinicians may be a viable alternative to general ana and central neuraxial blockade for lower limb surgeries.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

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