Ultrasound Guided Regional Anaesthesia- Case series on 'Dual-View' technique for sciatic nerve block via the anterior approach

Azrin Mohd Azidin, Amiruddin Nik Mohamed Kamil,
Department of Anaesthesiology and Intensive Care,
Hospital Kuala Lumpur

Abstract

Background; Identifying sciatic nerve from anterior thigh is difficult due to its depth, inconsistent surface anatomy and its location posterior to the femur. In this study we evaluated the use of 'dual view' technique in identifiying the sciatic nerve.

Objective; To evaluate the use of 'dual view' technique in identifying the sciatic nerve for ultrasound guided regional block using the anterior approach.

Methods; After obtaining consent from patients, seventeen (17) cases of orthopaedic lower limb procedures were done under sciatic nerve block via anterior approach. 'Dual View' technique was used, as post operative analgesia or surgical anaesthesia. Data collected include demographics, use of peripheral nerve stimulator and its electrical responses, types and location of surgery, and Visual Analogue Scores (VAS) of patients before discharge from recovery.

Results; In all seventeen (17) patients, the sciatic nerve were successfully located using the 'Dual View' technique. The sciatic nerves of seven (7) patients were located without neurostimulation, while in ten (10) cases, peripheral nerve stimulation were used, with plantar response being the highest observed. Seven (7) cases were done under purely regional anaesthesia, while ten (10) cases were combined general anaesthesia with sciatic nerve block. In patients whom sciatic nerve block were given as post-operative analgesia, all but one (1) yielded good Visual Analogue Score (VAS) of less than 4 with minimal supplementary short acting opioids. All cases were orthopaedic below knee procedures.

Conclusion; Based on this small case series, we recommend the use of 'dual view' technique to visualize the sciatic nerve for regional block via the anterior approach.

Introduction

Anterior approach to the sciatic has several advantages over the posterior or lithotomy techniques. With the anterior approach the block can be performed with the patient in supine position, particularly beneficial in patients who have compromised mobility[1]. However, identifying sciatic nerve from anterior thigh is difficult due to its

depth, inconsistent surface anatomy and its location posterior to the femur, which has made this block one of the least popular compared to the other approaches[2].

Ultrasound guided technique to block the sciatic via the anterior approach has been previously described as the proximal thigh, and the mid-thigh short-axis view approaches[3,4]. We have recently observed in our sonographic survey of 52 anterior thighs, higher success rates in identifying the sciatic nerve with the anterior approach using 'Dual View' technique compared to the two conventional transverse view scans. This technique involves using both transverse and longitudinal axis views to pinpoint the sciatic nerve.

Sciatic nerve scans in its long-axis view[5], help to correctly identify the location of the nerve, especially if it is difficult to confirm in the transverse view. The probe is placed antero-medially to the femur, and the nerve will appear as a distinctly continuous hyper-echoic structure with a characteristic fascicular pattern. When the structure is followed distally, it will be seen to diverge to its two branches. This 'diverging highway' appearance will help indicate the point where the sciatic nerve gives its common peroneal and tibial branches. The probe can be brought back proximally before the point of divergence, and the nerve can be blocked at any point proximally throughout its course in the thigh, in its transverse view.

We have seen that with this 'dual view' technique, the sciatic nerve is easier to identify, and can act as a confirmatory maneuver in cases which the sciatic is not well defined.

Objective

To evaluate the use of 'dual view' technique in identifying the sciatic nerve for ultrasound guided regional block using the anterior approach.

Methodology

Ultrasound guided regional block of the sciatic nerve using 'dual view' technique were performed on seventeen patients for orthopaedic procedures of the lower limb, in General Operation Theatre of Hospital Kuala Lumpur. All blocks were done after explanation and consent as per clinical indication for either post operative analgesia or as the sole anaesthetic technique.

Inclusion criteria

Patients for orthopaedic lower limb procedures with American Society of Anaesthesiologist (ASA) Classification I - 3, without any relative or absolute contraindication to block technique or local anaesthetics, who consented for this procedure.

Exclusion criteria

All patients without consent for regional block, and those with relative and absolute contraindication for block procedure and local anaesthetics.

After preparation of anaesthetic equipments and resuscitative drugs, the patients were put supine under standard monitoring. Intravenous Midazolam 1-2 milligrams were given as sedation before the block procedure. Patients were placed with the thigh to be imaged exposed up to the inguinal region. After sterile preparation of the block field and

placement of sterile cover for the transducer and cable, a curvi-linear low-frequency ultrasound probe was placed in its long axis view on the antero-medial aspect of the thigh. Confirmation was by the appearance of continuous longitudinal hyper-echoic structure with a characteristic fascicular pattern, which diverges as the probe was moved distally. (Diverging highway sign) Once this was seen, the probe was moved back to the point before this divergence, traced until the most proximal point where the image can be identified clearly, and was then rotated back to visualize the sciatic nerve in its transverse axis (Dual View Technique).

Blocks were then performed with 100mm Stimuplex insulated stimulating peripheral nerve block needle (BBraun, Germany) using In-Plane approach either with or without the aid of a peripheral nerve stimulator (Stimuplex DIG BBraun, Germany). In cases whereby the nerve stimulator technique was used, a starting current of 1.2 milli Amperes and a frequency of 2 Hertz were used initially. Block needle was advanced and visualized under real time, close to the sciatic nerve, until muscle twitches in its motor distribution was seen. The block needle will then be maneuvered to maintain the same twitch response while stimulating current was reduced gradually to 0.5 milliAmperes. Ropivacaine at a concentration of 0.375% (for analgesia)or 0.5% (for surgical anaesthesia) were then deposited around the sciatic nerve, Confirmation of successful block were done clinically under real time ultrasound visualization of local anaesthetic spread, and subsequent testing of dermatomal distribution of sensory loss before the surgical procedure was allowed to proceed. In the event of clinical

suggestion of unsuccessful block, the surgery was then converted to general anaesthesia at the discretion of the attending anaesthetist. Unsuccessful block is defined as, no reduction in sensation in dermatomal distribution of the sciatic nerve to ice pack after 20 minutes of block, or conditions in which the procedure was not able to be done under regional block alone after 20 minutes of block completion. Post-operatively, all patients were then observed in the recovery area as per standard block protocol and were allowed to be discharged to the wards once a Post Operative Recovery Score of 6 were achieved.

In patients whom the purpose of the regional block was for postoperative analgesia, standard monitoring was put in place prior to induction of anaesthesia. Intravenous Fentanyl (2ug/kg) and Propofol (2 mg/kg) were given at anaesthetic induction with or without muscle relaxant, as determined by individual case requirement at the discretion of the attending anaesthesiologist. Airway was secured either by using Laryngeal Mask Airway or through endotracheal tube. Ultrasound image of the sciatic nerve, and the block procedure was performed using the same technique as described earlier. In patients whom muscle relaxant were not administered, confirmation of the sciatic nerve required the use of peripheral nerve stimulation before deposition of local anaesthetic. In patients whom muscle relaxant were given, perineural spread of local anaesthetics were guided by real time visualization alone. Intraoperative rescue analgesic were given at the discretion of the attending anaesthesiologist as required. Postoperative patients were then observed in the recovery area as per

standard block protocol and Postoperative Visual Analogue Scores were recorded at 10 minutes after arrival in the recovery area. All patients were allowed discharge to the wards once achieving Post Operative Recovery Score of 6. Block was considered successful if the VAS score in the recovery area is less than 4. If VAS score was more than 4, intravenous rescue analgesia (fentanyl 2ug/kg) was given and a proper postoperative analgesia plan was formulated.

Other data recorded were demographics, weight, ASA classification, use of nerve stimulation with distribution of response and post operative pain scores at recovery area before discharge.

Results

12 were sonograms of male thighs and 5 were female. 12 patients were Malay, while 2, 2 and 1 were Chinese, Indian and other races respectively (chart 1). Mean age, weight and ASA classification are as illustrated in Table 1.

Table 1: Table showing age, weight and ASA classification of patients

Age (years)	37.0
Weight (kg)	63.23
ASA Classification : ASA 1 ASA 2 ASA 3	 12 5 0

As shown in Table 2, All 17 sciatic nerves were identified based on ultrasonic appearance using 'Dual View' technique. Out of those 17 cases, 10 were done in combination of general anaesthesia, and 7 cases were done under pure regional block. In 10 patients, sonographic appearances of the sciatic nerve were validated with the use of neurostimulation. As for the other 7 cases, confirmation of successful block were done under real time ultrasound visualization of local anaesthetic spread, and further testing of dermatomal distribution of sensory loss.

Table 2: Number of identified sciatic nerve with block done with and without validation with nerve stimulator

	Number of cases
Sciatic nerve identified based on ultrasound appearance	17
Block done without neurostimulation	7
Block done with neurostimulation Hamstring stimulation Foot dorsiflexion plantar flexion	10 2 3 5

Table 3: Post Operative Visual Analogue Scores (VAS) for patients undergoing orthopaedic procedures under combined General Anaesthesia with Sciatic block

Visual Analogue Scores (VAS)	Number of patients
1-2	6
3-4	3
>5	1
Surgical anaesthesia	7

Table 4: Number of patients and the type of surgery done under sciatic nerve block (performed using ultrasound guided anterior approach with the 'Dual View' technique)

Surgical Procedure		Number of cases
Patella	Knee arthrotomy	1
Tibia	Interlocking	2
	Removal of Inplant	4
	Plating	2
	Below knee amputation	1
Ankle	Open reduction Internal fixation	6
Foot	Disarticulation of toes	1
Total		17

Discussion

Our small series have demonstrated a high success rate in identifying and producing successful blocks of the sciatic nerve using 'Dual View' technique. Problems in identifying the nerve from the anterior thigh have led to this approach being the least popular technique among the other approaches[2]. With the advent of ultrasound, the sciatic nerve can now be visualized from the anterior thigh making this approach feasible in certain situations[3,4,6,7]. High block success rates comparable to the

more commonly used posterior approach has also been documented[8].

Our previous survey of 52 sonograms of the anterior thigh, showed that 'dual view' technique yielded the highest percentage of identification of the sciatic nerve, compared to the short axis views at the mid-thigh and the proximal thigh. Comparing short axis views at both locations, mid-thigh approach appears to have higher success rates of identification. However, blocking the sciatic nerve at this point may be inadequate for certain number of procedures because of missed proximal branches. With this approach, the depth of the nerve can be identified along its course, and injectate can be deposited as proximal as possible covering a larger sensory block distribution.

Time to onset of block for sciatic nerve varies from 20 minutes to an hour depending on the volume, concentration and the type of local anaesthetic used. We used 20 minutes as our cut off point for onset of block for practical purposes. In cases wherby there was still no surgical anaesthesia beyond this point, we proceeded with conversion to general anaesthesia, and analgesia was assessed postoperatively. A successful block was defined by a VAS score of less than 4, with minimal opioids usage intraoperatively (defined as intravenous morphine less than 0.05 mg/kg or last intravenous fentanyl of more than 45 minutes). All patients had successful blocks of the sciatic nerve based on those criteria in this series. All patients with combined general anaesthesia and sciatic block had used minimal intravenous fentanyl. All (10) had 100-150 micrograms of intravenous fentanyl only at

induction. Another 2 (two) patients had a total of 200 microgram of intravenous fentanyl for a procedure of two hours duration. One patient had only 2 mg of intravenous morphine for a procedure of 2.5 hours duration. All patients except for 1, had a VAS of less than 4. The patient that had a VAS of 5, was clinically relatively comfortable. One patient for screw fixation of lateral malleolus done under pure femoral and sciatic nerve block had tourniquet pain over the back of the thigh but not any other region. This corresponds to the area supplied by the posterior cutaneous nerve of the thigh which comes directly from the lumbar plexus. If the sciatic nerve can be traced more proximally to an area which corresponds to the subgluteal region posteriorly, with adequate volume, the block of posterior cutaneous nerve of the thigh may be achieved.

During this survey, 10 (58.82%) of the sciatic nerve identified based on ultrasound appearance, were actually validated with the use of a nerve stimulator. All target images that appeared to be the sciatic, was electrically identified as responses in the distribution of sciatic nerve supply. This suggests that the structure targeted was the sciatic nerve, with highest response being twitches of the hamstring muscles. When the stimulating needle was brought to an area close to the inferior surface of the nerve, responses in the foot was seen. In another 7 (seven) cases, block was done with local anaesthetic deposition and spread visualized in real time without neurostimulation. Successful block was ensured before start of procedure.

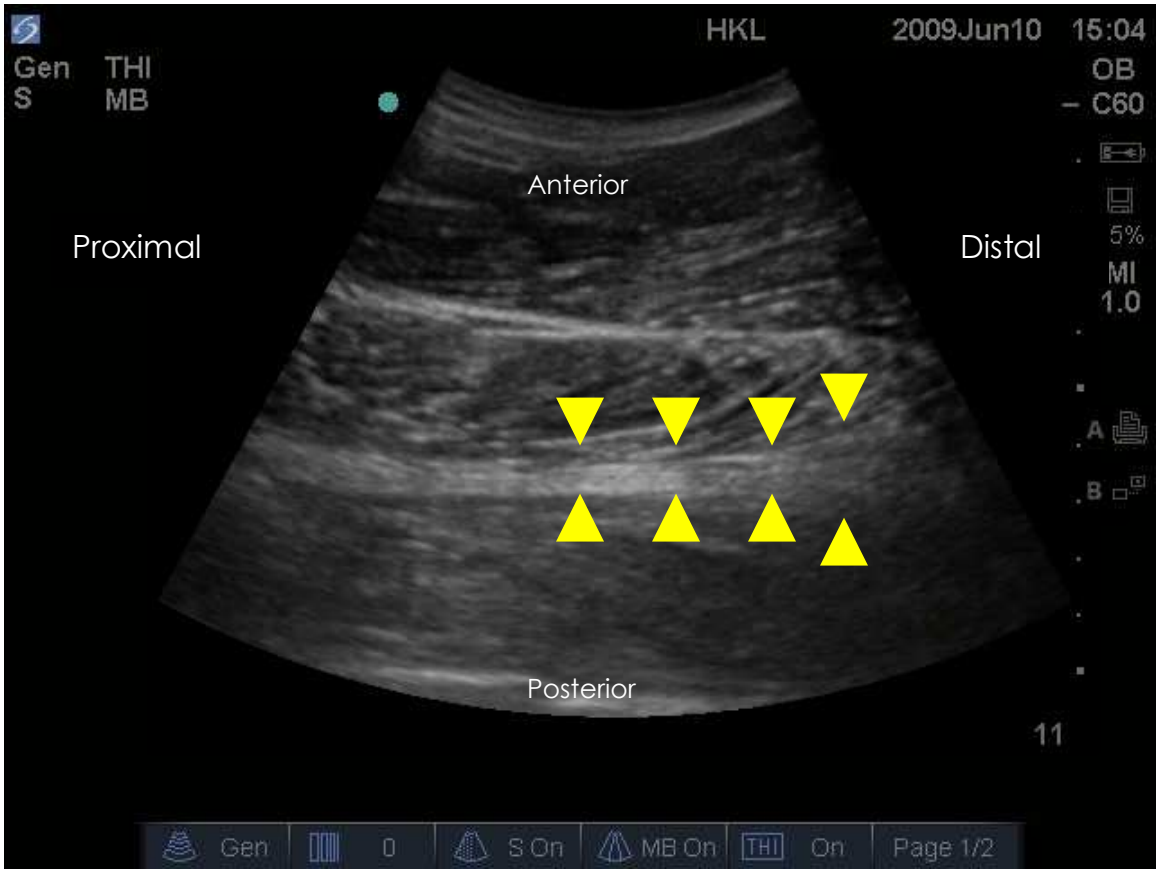

Figure 1. A longitudinal view of the sciatic nerve with the transducer over the antero-medial aspect of the thigh. Distally, the sciatic nerve can be seen to diverge to its branches ('Diverging highway' sign)

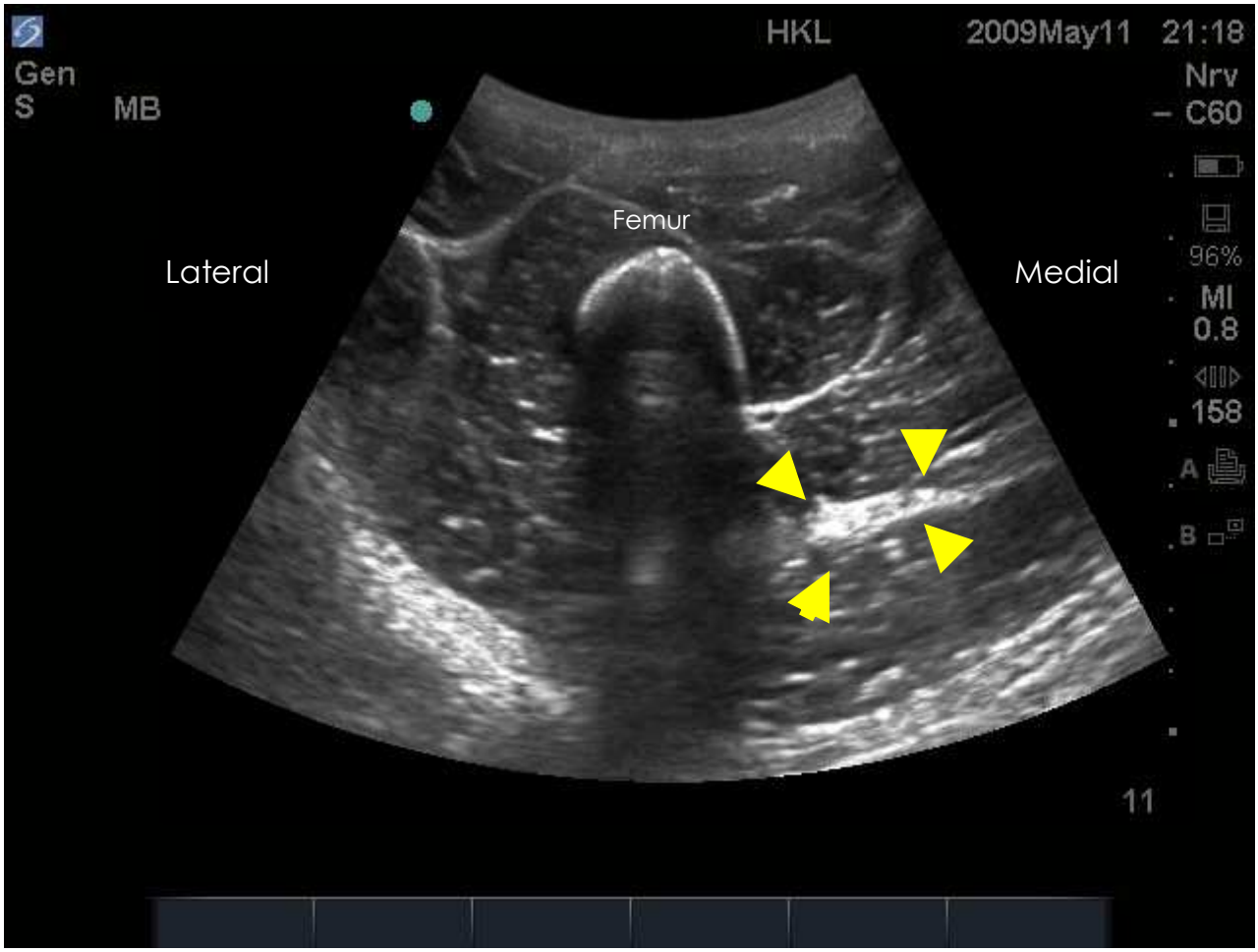

Figure 2. A transverse view of the sciatic nerve in the anterior thigh scans at the proximal thigh using 'dual view' technique. The sciatic nerve was viewed in a longitudinal axis first before having the transducer rotated to view the sciatic nerve in its transverse axis

Conclusion

Based on our findings, we recommend the use of 'dual view' technique to visualize the sciatic nerve for regional block via the anterior approach.

References:

1. Chelley JE, Delaunay L. A new anterior approach to the sciatic nerve block. *Anesthesiology* 1999; 91:1655-60

2. Hadzic A, Vlodka JD, Kuroda MM, Koorn R, Birnbach DJ; The practice of peripheral nerve blocks I the United States: A national survey. *Reg Anesth Pain Med* 1998; 23:241-6
3. Alon YBA, Bigeleissen P, Chelly JE. Ultrasound guided antero-medial sciatic approach. *Anesthesiology* 2008; 109A340
4. Barrington MJ, Lai SL, Briggs CA, Ivanusic JJ, Gledhill SR. Ultrasound –guided midthigh sciatic nerve block- a clinical and anatomical study. *Reg Anesth Pain Med*. 2008 Jul-Aug; 33 (4): 369-76.
5. Tsui BCH, Ozelsel TJP. Ultrasound-Guided Anterior Sciatic nerve Block Using a Longitudinal Approach: "Expanding the View". *Reg Anesth Pain Med*. 2008 May-June; 3 (33):275-6
6. Chan VW, Nova H, Abbas S, McCartney CJL, Perlas A, Xu DQ. Ultrasound examination and localization of the sciatic nerve: A volunteer study. *Anesthesiology* 2006; 104:309-314
7. Alon Y. Ben-Ari, Bigeleissen P, Chelly JE. Ultrasound Guided Antero-Medial Sciatic Approach. *Anesthesiology* 2008; 109 A340
8. Ota J, Sakura S, Hara K, Saito Y. Ultrasound-guided anterior approach to sciatic nerve block: a comparison with the posterior approach. *Anesth Analg*. 2009 Feb; 108(2): 660-5