Evaluation of Ultrasound-Guided Popliteal Sciatic Nerve Blockade in the Severely and Morbidly Obese Populations: A Prospective, Randomized, and Blinded Study

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Introduction

Obesity, defined as a body mass index (BMI) greater than 30 kg/m^2, is quickly becoming the greatest health threat in the United States. Many regional anesthesia studies are limited to patients of normal weight, and obese subjects are frequently excluded. Even less data exist in the severely (BMI ≥ 35) and morbidly (BMI ≥ 40) obese populations. Multiple factors predispose difficulties in performing blocks in obese patients. Traditionally, the sciatic nerve has been blocked proximal to its bifurcation into the common peroneal and tibial nerves under ultrasound guidance. In obese and morbidly obese patients, however, the nerve-to-skin distance is greatly increased (compared to lean individuals), and a poor image of the nerve may be obtained. We hypothesized that performing a popliteal nerve block distal to the sciatic nerve's bifurcation would result in improved visualization of the neural structures, faster block onset, and improved visual analog scale (VAS) scores in the post anesthesia care unit (PACU) with no difference in block performance times.

Methods

Patients with a body mass index ≥ 35 scheduled for unilateral foot surgery with a popliteal block were randomized to receive an ultrasound-guided popliteal block proximal or distal to the bifurcation of the sciatic nerve. The primary endpoint was visual analog scale (VAS) scores in the post anesthesia care unit (PACU); onset of sensorimotor block characteristics, need for conversion to general anesthesia, block procedural times, and narcotic analgesic consumption were secondary outcomes.

Results

Thirty patients were enrolled in each group for a total of 60 participants. Patients in the distal group had lower VAS scores in the PACU at one hour, had a faster onset of sensorimotor blockade and were less likely to require a repeat block procedure, conversion to general anesthesia, or local anesthetic supplementation by the surgical team. There was no difference in block procedure times or incidence of nerve injury between the two groups.

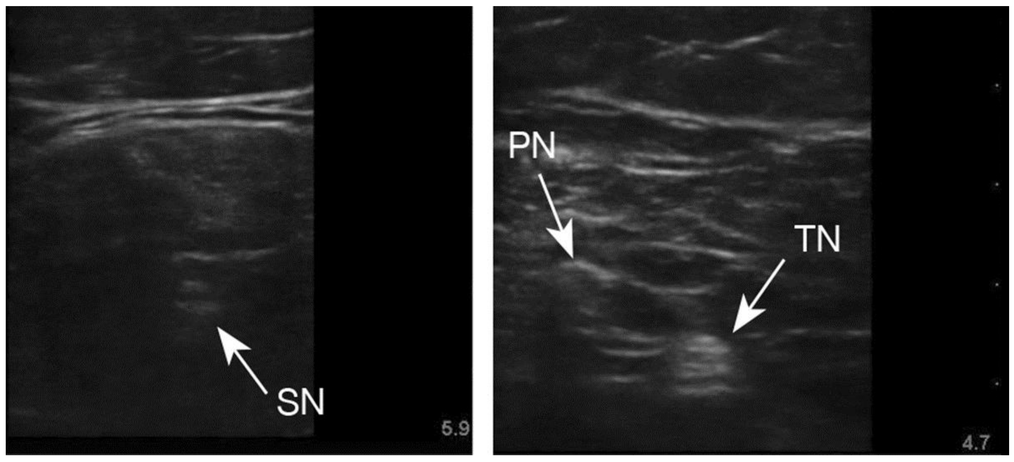

Figure One: Ultrasound images of the popliteal fossa on a study participant. Note the improved visualization as the probe is moved distally. SN: sciatic nerve; PN: peroneal nerve; TN: tibial nerve

Variable	Proximal Approach	Distal Approach	p value
Female (n, %)	23 (76.67%)	37 (90%)	0.1609
Age (years, mean ± sd)	54.47 ± 12.17	49.07 ± 8.94	0.0550
BMI (mean ± sd)	40.12 ± 3.84	41.09 ± 6.74	0.4984
Thigh circumference (inches, mean ± sd)	49.90 ± 8.06	46.86 ± 6.32	0.1137
Skin to nerve distance (inches, mean ± sd)	3.69 ± 0.98	2.48 ± 0.77	**<0.0001**
Total block time (minutes, mean ± sd)	11.33 ± 12.41	10.83 ± 12.29	0.8759
Distance to insertion site (cm, mean ± sd)	6.11 ± 1.83	1.29 ± 1.18	**<0.0001**
Length of PACU stay (minutes, mean ± sd)	108.70 ± 59.04	98.46 ± 56.48	0.5021

Table One: Patient Demographics and Measurements

Variable	Proximal Approach	Distal Approach	p value
VAS upon arrival (Proximal group: n = 28 Distal group: n = 30)	2.17 ± 3.37	0.70 ± 1.91	**0.0211**
VAS at 1 hour (Proximal group: n = 28 Distal group: n = 28)	1.04 ± 1.95	1.07 ± 2.46	0.3003
VAS at 2 hours (Proximal group: n = 12 Distal group: n = 7)	1.00 ± 1.73	2.28 ± 2.98	0.1651

Table Two: Visual Analog Scale (VAS) Pain Measures

Figure Two: Foot and ankle region of a morbidly obese patient enrolled in our study. Note the absence of landmarks that could preclude a traditional ankle block.

Discussion

In this prospective, randomized, and blinded investigation, we found the distal approach to popliteal block superior to the traditional approach in the severely and morbidly obese for a variety of reasons. Previous studies have documented the efficacy of blocking the individual nerves distal to their bifurcation in both the prone and supine position with ultrasound guidance, with faster onset of sensorimotor blockade compared to the more proximal technique reported and our results are consistent with these previous findings. In addition, patients in the proximal group experienced more difficulties during the operative period. Six required conversion to a general anesthetic and another required additional local anesthetic infiltration by the surgical team after patient complaints of pain or withdrawal of the extremity during incision. Another two patients in the proximal group had repeat block procedures using the distal technique after noting intact or near-intact sensorimotor function 30 minutes after the block procedure. No such issues occurred in patients who received the distal technique. The superficial nature of the nerves in the distal location may allow for better ultrasonographic visualization and ease of block performance, improving the likelihood of success.

Conclusions

In this prospective, randomized, and blinded study, the distal approach to the popliteal block provided a faster onset of surgical sensorimotor blockade, with a lower incidence of repeat blockade or need for local anesthetic supplementation, unexpected conversion to general anesthesia, as well as lower VAS scores in PACU without a difference in procedural times in the severely and morbidly obese population.

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