Resident-Performed Popliteal Blocks for Foot and Ankle Surgery

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Introduction

Foot and ankle surgery is often associated with moderate to severe post-operative pain that can persist for prolonged periods of time, requiring large doses of parenteral opioids.1,2 The popliteal femoral nerve block, originally described by Labat in 1923, has well documented safety and efficacy for post operative lower extremity pain control.3-5 The block involves distributing local anesthetic around the common sciatic nerve targeting specifically the tibial and common peroneal nerves within the popliteal fossa either from a lateral or posterior approach. It has shown higher level of success than other forms of lower extremity regional anesthesia techniques allowing for reduced post-operative narcotic usage and shorter hospital stay.6-7

Most literature regarding regional anesthesia reports on procedures performed by anesthetists or nurse anesthetists. The unique protocol at our institution allows podiatric surgical residents in various stages of training, and separately targeted the common and tibial nerves at the fibular head. All blocks were performed using one of two approaches.

The lateral approach was performed using the technique outlined by Herr using a single injection at a level 7cm proximal to the knee joint to block the common sciatic nerve.

The modified posterior approach utilized a double-injection technique. Blocking the posterior tibial nerve at the popliteal fossa, as well as the common peroneal nerve at the fibular head. All blocks were performed with use of a nerve stimulator and insulated needle; injecting when visual stimulations disappeared between 0.6mA and 0.0mA of current. Local anesthetic used in all cases was 20cc of 0.5% Bupivacaine with epinephrine 1:1000.

Methods

One-Hundred Forty-Three popliteal nerve blocks were consecutively performed by first- and second-year podiatric surgery residents from August 2009 through August 2011. Blocks were performed using one of two approaches. The lateral approach was performed using the technique outlined by Herr using a single injection at a level 7cm proximal to the knee joint to block the common sciatic nerve.

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Data was collected retrospectively from resident procedural logs, cross-referenced with hospital chart review. The main outcome measure was mean visual analog scale (VAS) pain score assessed in the PACU.

Patients with mean VAS pain scores of 4 and below were allocated to a “success” group, while those with scores of 5 and above were allocated to a “failure” group. Independent variables of patient age, body mass index, block approach, timing of block, months of resident training, and cumulative number of blocks performed were examined using a two-tailed Student’s t-test to assess for differences between groups (p < 0.05). (Microsoft Excel, Redmond WA). Variables showing significant differences were then plotted versus mean VAS pain score on a scatterplot.

Results

Mean patient age was 48 and BMI was 32.4 kg/m². Residents had a mean of 13.82 months of training at time of block performance. Ten blocks had been performed immediately post-operatively, while 133 blocks were performed pre-operatively. Mean PACU VAS pain score across all patients was 2.35. A total of 109 patients were allocated to the success group and 34 to the failure group, giving an overall success rate of 78.2%.

Mean Success and Failure groups were found to be significantly different with regards to BMI (p =0.0004) and age (p=0.01). Mean BMI for the success group was 30.83kg/m² (p = 7.16) and for the failure group was 37.43kg/m² (p = 10.94). Increased BMI was found to be positively correlated with a higher VAS Pain score as shown below. Mean age for the success group was 49.44 (σ = 15.97) and for the failure group was 42.47 (σ = 10.81). Increased age was found to be inversely correlated with VAS pain score as shown below. No significant differences were found between groups for variables of foot approach, timing of block, months of resident training, and cumulative number of blocks performed (p > 0.05).

No events of neuroysis or adverse systemic reaction were encountered during the study period.

Discussion

Increased BMI was identified as the variable best correlated with block failure. A study by Nelson et al9 showed that regional blocks were 1.6 times more likely to fail with BMI over 30. Furthermore, elevated BMI and ASA IV status have been shown to be independent risk factors (p < .001) for block failure in ambulatory surgery patients.10 These results also show a correlation of block success with increased age. Franko, et al11 showed a longer time for complete return of sensory and motor function in an older patient group after sciatic nerve block. A separate study by Perez-A, et al12 showed brachial plexus block to last approximately 2-5 times longer in older patients. Advanced age-related alterations in phrystonic function may include reduction in conduction velocity and distal sensory discrimination and endoneurial blood flow. All these changes may be associated with the altered response to local anesthetic agents in older patients.

Our results show an overall success rate of the PFNB to be 75%, which is similar to published results on PFNB.13,14,15,16,18 We did not find significant correlation of block success with months of resident training, or with number of blocks previously performed, leading to the conclusion that PFNB is a technique easily to learn and accurately perform. The current study used a modified multi-injection technique that targeted the tibial nerve in the popliteal fossa and separately targeted the common peroneal nerve at the level of the fibular head. This technique eliminates the need for multiple injections of the needle within the popliteal fossa, possibly increasing chances of neuromuscular injury.

Overall, the PFNB as performed by podiatric surgical residents is a safe and effective procedure for post-operative analgesia in foot and ankle surgery.

References

Available in print and online.