

## Is Continuous PENG Block the New 3-in-1?

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### Abstract

Fascia iliaca or femoral nerve blocks are used frequently for hip fracture patients due to the opioid-sparing effects. However, these techniques prove to be insufficient in many cases. A recent anatomical study on hip innervation, led to the identification of relevant landmarks to target the hip articular branches, namely the Pericapsular Nerve Group (PENG), which allowed a novel ultrasound-guided approach. The aim of this case report is to show an anesthetic technique not described previously, that included an ultra-sound guided PENG block with perineural catheter.

**Keywords:** Peripheral nerve blocks; Hip surgery; Accessory obturator nerve

### Introduction

Peripheral nerve blocks are becoming increasingly popular for hip arthroplasty anesthesia. Modern regional anesthesia for major hip surgery includes the use of a single shot and continuous epidural or spinal injections, continuous lumbar plexus blockade and continuous peripheral blockade of the femoral nerve (FN), fascia iliaca (FI) block, 3-in-1 FN block and sciatic nerve [1,2]. The use of either single shot or continuous peripheral nerve blocks are becoming increasingly popular. These techniques have shown effective and safe postoperative pain control, resulting in lower opioid consumption, improved earlier rehabilitation and high patient satisfaction [2]. Taking into account previous anatomical studies, the anterior hip capsule is innervated by the obturator nerve (ON), accessory obturator nerve (AON) and FN1.

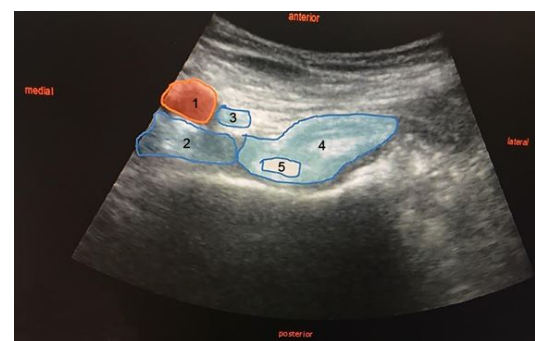
A recent anatomical study by Short et al confirmed the innervation of the anterior hip and also identified the relevant landmarks for those articular branches [3]. Ultrasound-guided techniques for blockade of these articular branches to the hip include the PENG block, which has been described in a recent paper with promising results [1]. We will be reporting on the anesthetic management of a patient proposed for a second left hip prosthesis revision. An ultra-sound guided PENG block with a perineural catheter was performed. Written informed consent for publication was obtained from the patient.

### Case Report

A 63-year-old male, with obstructive sleep apnea and a hereditary polyneuropathy diagnosed at the age of 36 was proposed for hip arthroplasty. Due to long-standing corticoid therapy, a bilateral aseptic femur necrosis has developed, requiring multiple hip replacement surgeries. Moreover, a lumbar spine surgery has also taken place some years ago. At the time of surgery, the patient presented with signs of skin infection in the lumbar surgical site. A combined general

anesthesia with an ultra-sound guided PENG block with a perineural catheter was proposed to the patient and fully accepted. The patient was monitored with American Society of Anesthesiologists (ASA) standards and invasive blood pressure.

The regional block was performed in the supine position. A curvilinear low-frequency (2-5 MHz) ultrasound probe was initially placed in a transverse plane over the left anterior inferior iliac spine and then aligned with the pubic ramus by rotating the probe counterclockwise approximately 45 degrees. In this view, with a 7.8 cm depth, the iliopubic eminence, the iliopsoas muscle and tendon, the femoral artery and pectineus muscle were observed (Figure 1). Local skin anesthesia with 4 ml of 2% lidocaine was administered and an 18-gauge 150 mm needle was inserted from lateral to medial in an in-plane approach. During the block, the tip was placed between the psoas tendon anteriorly and the pubic rami posteriorly, and following negative aspiration 20 ml of 0.5% ropivacaine and 4 mg of dexamethasone were injected (Figure 2).



**Figure 1:** Sonogram. 1-femoral artery; 2-pectineus muscle; 3-femoral Nerve; 4-psoas muscle; 5-Psoas tendon.



**Figure 2:** The figure shows the local anesthetic spread following injection. 1-femoral artery; 2-pectineus muscle; 3-femoral Nerve; 4-psoas muscle; 5-psoas tendon; 6-local anesthetic.

The catheter was inserted 3 cm beyond the tip of the needle without resistance, the needle was removed and the catheter secured in place. Sensory blockade was assessed using the pinprick test on the anterior and medial aspect of the thigh with a positive result after 15 minutes.

A balanced general anesthesia with tracheal intubation was uneventfully performed. Postoperative analgesia was 100 mg tramadol intravenously and 1 g of paracetamol bolus, in addition to a 15 ml of 0.5% ropivacaine bolus by the perineural catheter. Using the Numeric Rating Scale (NRS), pain assessment completed in the post anesthesia care unit showed a score of zero, with movement or rest. After 8 hours, a pain score of 2 was rated at rest and with movement. A continuous elastomeric pump perfusion of 0.2% ropivacaine was started at fixed rate of 5 ml/h, for the next 48 hours.

A control x-ray was performed to confirm perineural catheter placement using 4 ml of non-ionic contrast (Ioversol) in addition to 4 ml of saline.

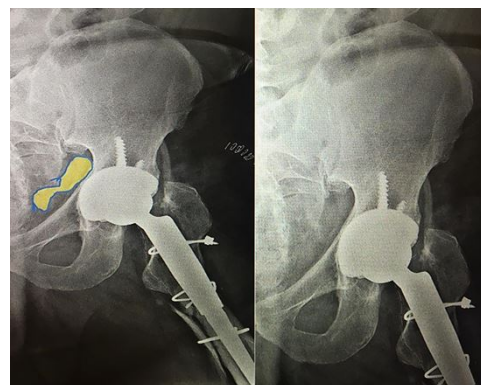
At 24 and 48 hours follow-up the patient had NRS pain score of 0 at rest and with movement, therefore further analgesia was not required.

## Discussion

Given the previous spinal manipulation and signs of skin infection in the lower back, the option of an epidural or a lumbar block was set aside. Thus, a PENG block was performed based on recent studies regarding its usefulness and the promising results in previous cases. Given the fact that analgesia accomplished by single shot blocks is time limited, it was decided to perform a continuous PENG block to provide longer analgesia, a technique not described previously. Analgesia beyond the femoral and obturator nerves territories was observed, namely in the lateral femoral cutaneous nerve (LFCN) which was unexpected. This clinical finding needs to be taken into consideration since several publications regarding the FI block, found results comparable to the 3-in-1 block, although the three nerves are infrequently blocked [4-6].

Taking this evidence into account, the option was to perform a control X-ray to inject a contrast medium and confirm its cranial/

lateral dispersion (involving the LFCN). This was not obvious, in this case, maybe due to the volume injected or the dilution used (Figure 3). The sciatic nerve contributes to the hip innervation (posterolateral capsule area), and as this was a revision arthroplasty, we point out that the mentioned area is removed in the primary arthroplasty, hence the complete analgesia.



**Figure 3:** X-ray after injection of non-ionic contrast diluted through the perineural catheter.

## Conclusion

The authors believe that larger studies need to be conducted in order to assess the clinical efficacy of this novel approach. In addition, radiological documentation of contrast medium diffusion with the continuous PENG block in hip arthroplasty is mandatory to confirm local anesthetic coverage of the area.

## References

1. Girón-Arango L, Peng PWH, Chin KJ, Brull R, Perlas A (2018) Pericapsular nerve group (PENG) block for hip fracture. *Reg Anesth Pain Med* 43: 859-863.
2. Indelli PF, Grant SA, Nielsen K, Vail TP (2005) Regional anesthesia in hip surgery. *Clin Orthop Relat Res* 441: 250-255.
3. Short AJ, Barnett JGG, Gofeld M, Baig E, Lam K, et al. (2018) Anatomic study of innervation of the anterior hip capsule: Implication for image-guided intervention. *Reg Anesth Pain Med* 43: 186-192.
4. Marhofer P, Nasel C, Sitzwohl C, Kapral S (2000) Magnetic resonance imaging of the distribution of local anesthetic during the three-in-one block. *Anesth Analg* 90: 119-124.
5. Morau D, Lopez S, Biboulet P, Bernard N, Amar J, et al. (2003) Comparison of continuous 3-in-1 and fascia Iliaca compartment blocks for postoperative analgesia: feasibility, catheter migration, distribution of sensory block, and analgesic efficacy. *Reg Anesth Pain Med* 28: 309-314.
6. Nielsen TD, Moriggl B, Søballe K, Kolsen-Petersen JA, Borglum J, et al. (2017) A cadaveric study of ultrasound-guided subpectineal injectate spread around the obturator nerve and its hip articular branches. *Reg Anesth Pain Med* 42: 357-361.