

# Are PENG Blocks Preferable to Fascia Iliaca Blocks Post-hip Procedure?

## A Review of Evidence Based Literature

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### Background

Pain management is a crucial aspect of perioperative care. In hip fracture patients, regional anesthesia has been shown to improve outcomes compared to general anesthesia [1]. Effective postoperative pain management is crucial for optimizing patient outcomes and facilitating early mobilization. Historically, femoral nerve blocks and fascia iliaca compartment blocks (FICB) have been used. However, both blocks have major unwanted side effects of quadriceps weakness and a high incidence of incomplete coverage, causing a delay in both post-surgical mobility and inadequate analgesia.

The Pericapsular Nerve Group, or PENG block is a relatively new regional anesthesia technique which has gained popularity in recent years. First described by L Girón-Arango et al. [2], PENG blocks claim to provide sensory only, superior dermatome coverage while completely sparing motor function. PENG blocks theoretically offer a promising alternative to traditional analgesic methods, such as opioids, by providing effective pain relief with reduced systemic side effects.

### Methods

A systemic literature search was conducted using electronic databases such as PubMed and Scopus to identify relevant studies published between 2018 and 2023. We used the following search terms to narrow down our research: pericapsular nerve group block, PENG block, fascia iliaca compartment block, hip and surgery:

- Population: Any type of hip surgery patients
- Intervention: PENG block
- Comparison: FICB
- Outcomes: Any one of the following- pain scores, total analgesic consumption, or time to first analgesic request after surgery
- Study type: Randomized controlled trials (RCTs)

We excluded studies analyzing the efficacy of PENG for patient positioning after hip fractures. We furthermore did not incorporate studies not meeting the inclusion criteria or lacking sufficient methodological details.

### About Fascia Iliaca Blocks

The fascia iliaca is a fibrous sheath enveloping the iliacus muscle, and it plays a crucial role in stabilizing the hip joint. Using Ultrasound (US), local anesthetic is deposited deep to the iliacus, where it can spread underneath in a medial and lateral direction to reach the femoral nerve, and sometimes the LFCN. However, FICB's do not come without drawbacks. One of the main challenges of effective regional analgesia for hip pain is the complicated innervation of the hip joint by multiple nerves. The anterior hip capsule is shown to be supplied by articular branches of the femoral, accessory, and obturator nerves (Figure 3). This anterior capsule contains most of the sensory innervation of the joint and is the main source of postoperative hip pain. Novel anatomical studies have shown that the articular branches of the femoral and obturator nerve (both which innervate the anterior hip capsule) may not be optimally blocked by these techniques [3]. This block also causes a degree of motor blockade, delaying post-operative mobilization.

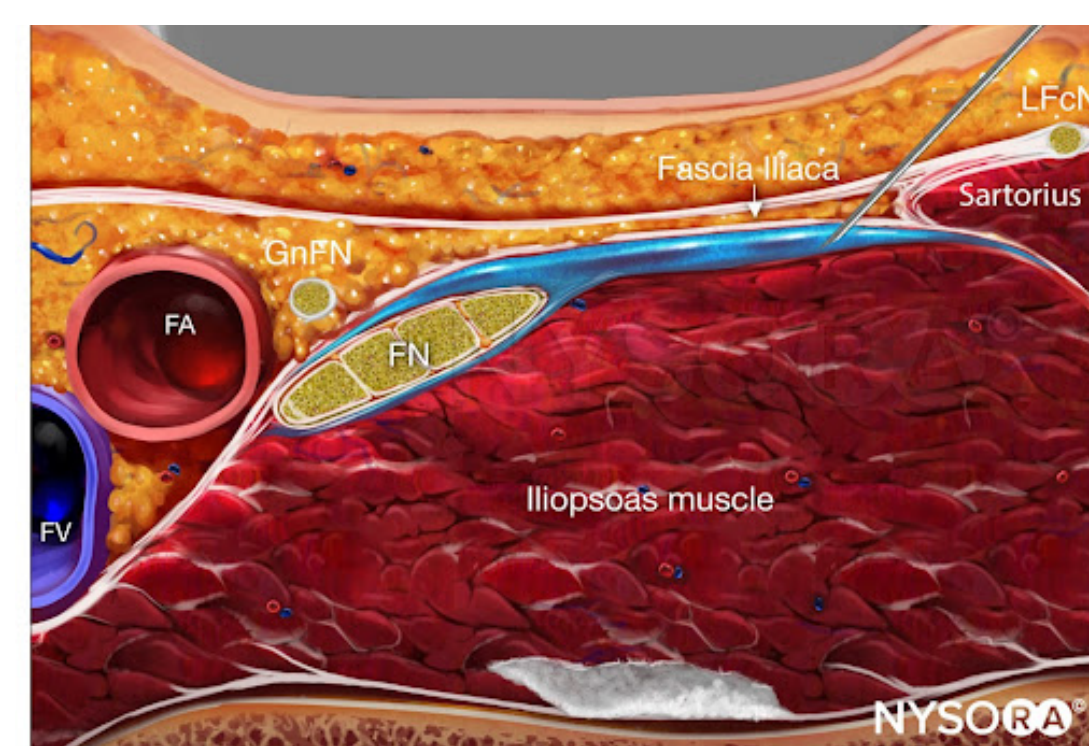


Figure 1. Drawing of a FICB. Source: NYSORAA©

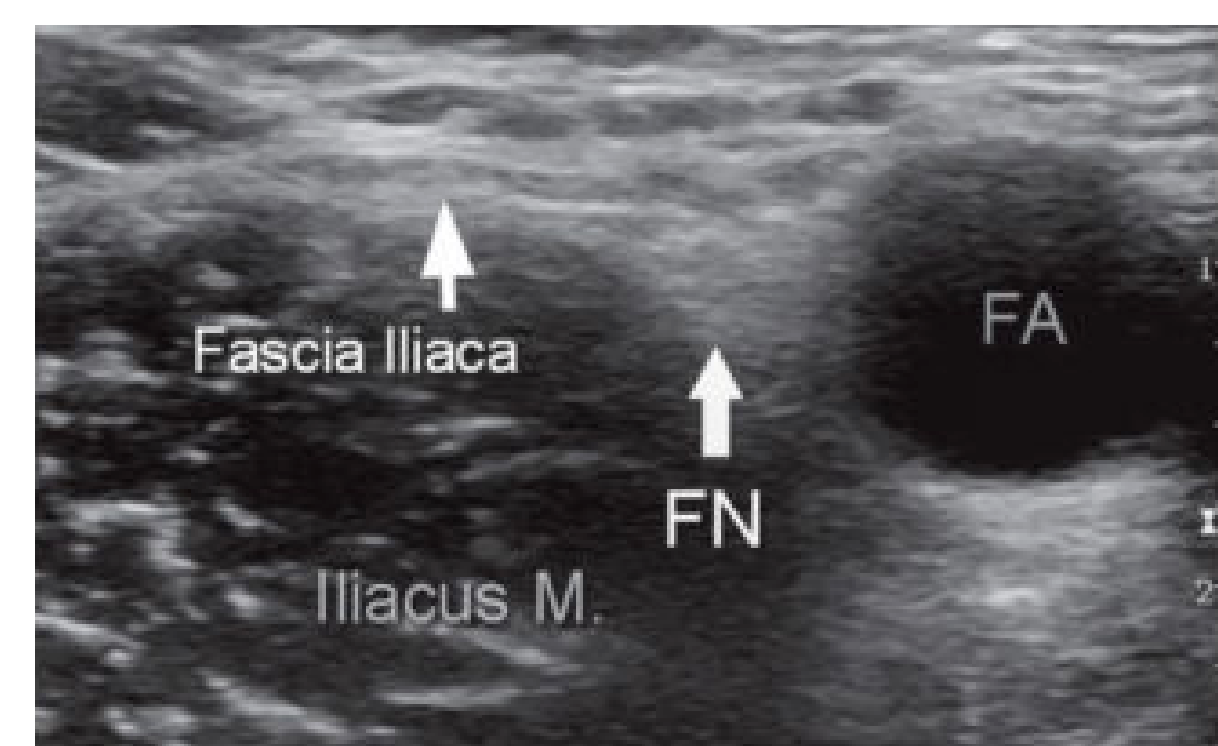


Figure 2. US image of a FICB. Source: NYSORAA©

### Significance/Aim

This poster aims to review the current evidence-based literature on the efficacy of PENG blocks compared to Fascia Iliaca Blocks for use in hip surgery. After analyzing five high quality randomized studies, we aim to provide a comprehensive overview of the effectiveness of these two techniques. By examining the time to first request of analgesia, overall opioid consumption, and the degree of motor block associated with each block (associated with time to discharge), we can gain insights into their relative effectiveness. The findings of the review will serve to better educate and inform anesthesia care professionals regarding pain management decision strategies.

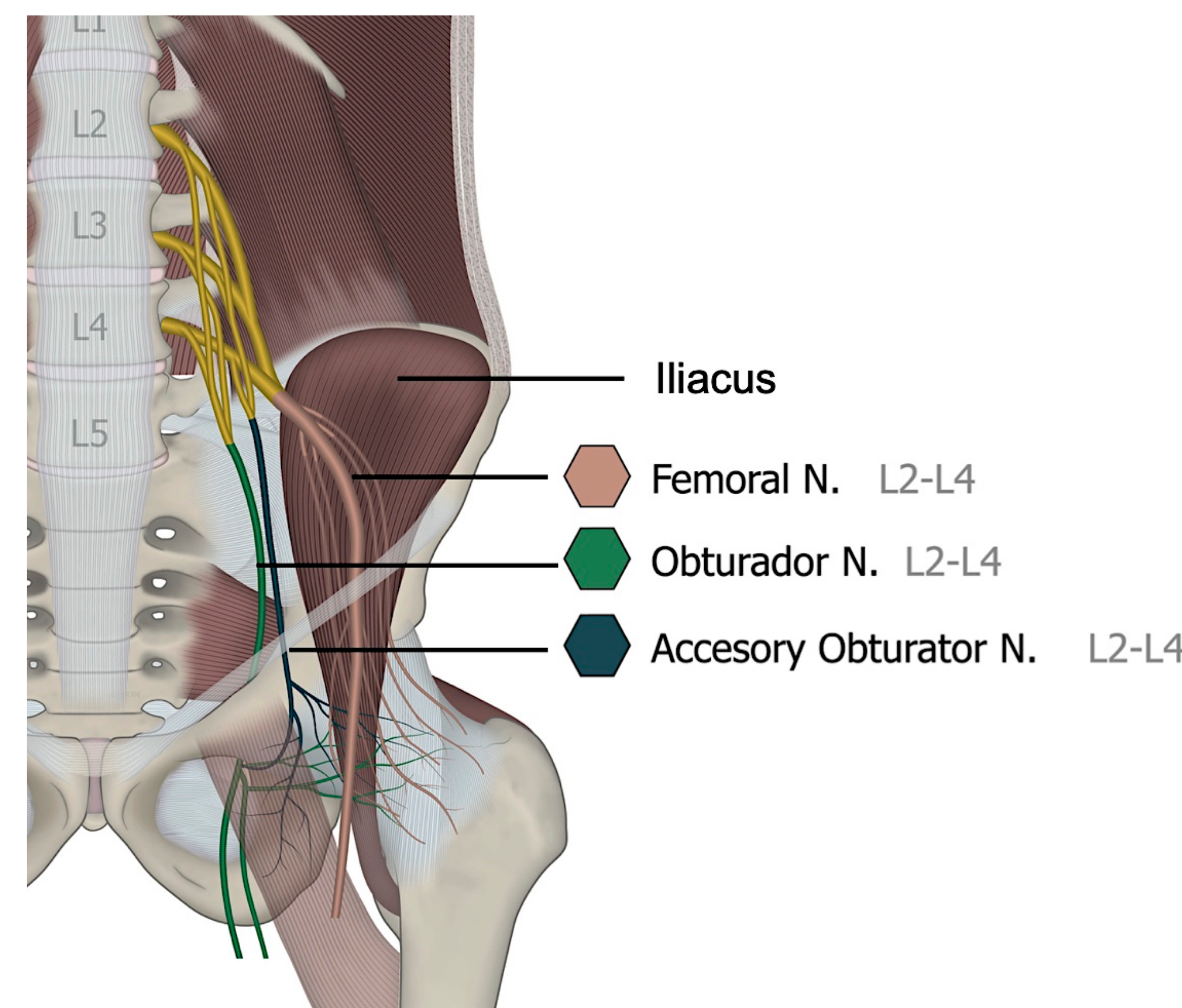


Figure 3. Anterior Innervation of Hip Capsule. Source: ASRA©

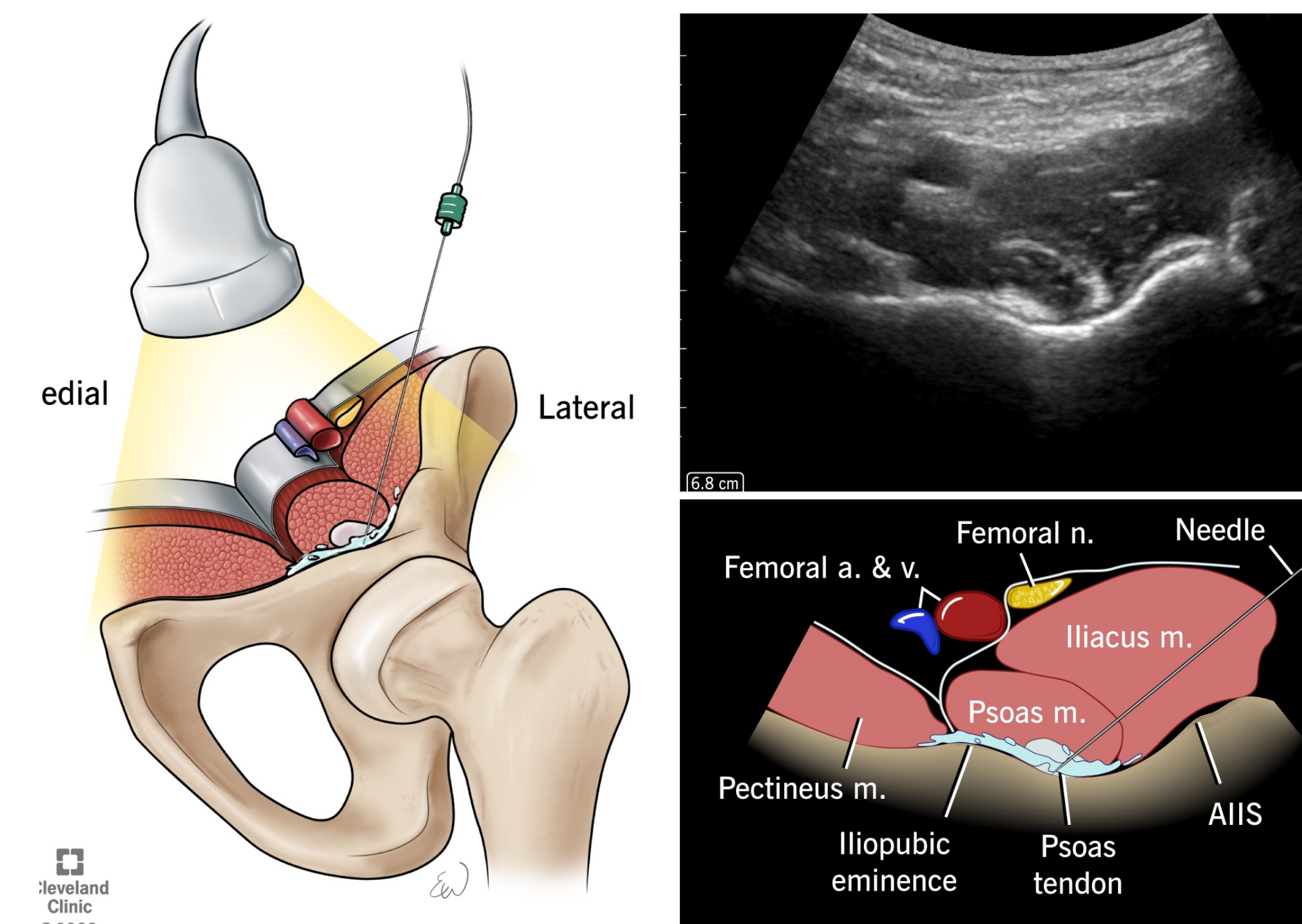


Figure 4. US image and drawings of a PENG Block. Source: Cleveland Clinic ©

### About PENG Blocks

Whereas FICB's provide analgesia to a couple nerves within the anterior hip capsule, PENG blocks involve almost the entire anterior capsule. When performing PENG blocks, a low frequency US probe is placed in a transverse plane over the anterior inferior iliac spine. The probe is then aligned with the pubic ramus by rotating the probe 45 degrees counterclockwise. The iliopsoas muscle tendon, iliopubic eminence, femoral artery, and femoral nerve should all be identified prior to needle insertion. A needle should be inserted from lateral to medial using an in-plane approach, ultimately guiding the tip to rest within the musculofascial plane between the psoas tendon anteriorly and the pubic ramus posteriorly. After negative aspiration, local anesthetic is injected, observing for displacement of the psoas muscle tendon secondary to fluid spread within this facial plane. Specifically targeted nerves including the articular branches of the femoral nerve, the obturator nerve, and sometimes the accessory obturator nerve [4].

### Results

- Reddy, et al. (2022)** - 30ml of 0.25% Bupivacaine and 4mg of Dexamethasone for PENG/FICB. PENG significantly decreased pain scores, fentanyl consumption within 24 hours, and motor block.
- Duan, et al. (2023)** - 20ml of 0.25% ropivacaine for PENG block and 30 ml of 0.25% ropivacaine for FICB. Significantly decreased initial (30min) and final (24/48hr) pain scores, reduced opioid consumption, and earlier ambulation/muscle strength were seen with PENG blocks.
- Mosaffa, et al. (2022)** - double-blinded; 3mL/kg of 0.5% ropivacaine for FICB and PENG blocks. No difference between initial pain scores. Significant decrease in 12hr pain scores, longer time until request of initial post-surgical analgesia, and decreased 24hr morphine consumption in PENG block group.
- Lin, et al. (2022)** - double-blinded; 20mL 0.75% ropivacaine for both FICB and PENG blocks. PENG blocks had a significantly longer duration of action. They also exhibited a decreased period of muscle weakness, leading to significantly faster discharge.
- Aliste, et al. (2021)** - double-blinded; PENG group had 20 mL of adrenalized levobupivacaine 0.50%, FICB received 40 mL of adrenalized levobupivacaine 0.25%. PENG resulted in a significantly lower incidence of quadriceps motor block at 3 hours and 6 hours. PENG also provided better preservation of hip adduction at 3 hours, as well as decreased sensory block. No clinically significant differences were found in terms of postoperative pain scores, cumulative opioid consumption at 24 and 48 hours, ability to perform physiotherapy, opioid-related side effects, and length of hospital stay.

### Conclusion

Based on the reviewed literature for patients undergoing hip surgery, PENG block use appears to be loosely associated with a longer duration block, a decrease in opioid consumption {in other words, providing better pain management}, and increased motor function vs FICB. The significance of these results is further supported by Huda et al. [10], who conducted a statistical meta-analysis of some of our selected studies. Based on the available evidence, PENG blocks appear to offer significant advantages over FICB in terms of pain control, opioid consumption, and functional surgical outcomes. However, further research is needed to validate these findings and explore potential complications or adverse events associated with PENG blocks. Ultimately, the choice between performing a PENG block vs FICB should be based upon clinical judgment and all available clinical evidence.

### References

- Neuman MD, Silber JH, Elkassabany NM, Ludwig JM, Fleisher LA. Comparative effectiveness of regional versus general anesthesia for hip fracture surgery in adults. *Anesthesiology*. 2012 Jul;117(1):72-92.
- Girón-Arango L, Peng PWH, Chin KJ, Brull R, Perlas A. Pericapsular Nerve Group (PENG) Block for Hip Fracture. *Reg Anesth Pain Med*. 2018 Nov;43(8):859-863.
- Short AJ, Barnett JJG, Gofeld M, Baig E, Lam K, Agur AMR, Peng PWH. Anatomic Study of Innervation of the Anterior Hip Capsule: Implication for Image-Guided Intervention. *Reg Anesth Pain Med*. 2018 Feb;43(2):186-192.
- Kolli S, Nimma SR, Kukreja P, et al How I do it: pericapsular nerve group (PENG) block. *ASRA Pain Medicine News* 2023;48.
- Reddy MD, Mounika SS, Sahithi B, Ahmeduddin M, Khan A. Comparison of Pericapsular Nerve Group Block (PENG) Versus Fascia Iliaca Compartment Block (FICB) as Postoperative Pain Management in Hip Fracture Surgeries. *Journal of Cardiovascular Disease Research*. 2022; 13(8): 1916-1921
- Duan L, Zhang L, Shi CG, Huang LG, Ao H, Wang ZP, Deng Y, Sun ML. Comparison of continuous pericapsular nerve group (PENG) block versus continuous fascia iliaca compartment block on pain management and quadriceps muscle strength after total hip arthroplasty: a prospective, randomized controlled study. *BMC Anesthesiol*. 2023 Jul 11;23(1):233.
- Mosaffa F, Taheri M, Manafi Rasi A, Samadpour H, Memary E, Mirkheshti A. Comparison of pericapsular nerve group (PENG) block with fascia iliaca compartment block (FICB) for pain control in hip fractures: A double-blind prospective randomized controlled clinical trial. *Orthop Traumatol Surg Res*. 2022 Feb;108(1):103135.
- Lin DY, Brown B, Morrison C, Kroon HM, Jaarsma RL. Pericapsular nerve group block results in a longer analgesic effect and shorter time to discharge than femoral nerve block in patients after hip fracture surgery: a single-center double-blinded randomized trial. *J Int Med Res*. 2022 Mar;50(3):3000605221085073.
- Aliste J, Layera S, Bravo D, Jara Á, Muñoz G, Barrientos C, Wulf R, Brañez J, Finlayson RJ, Tran Q. Randomized comparison between pericapsular nerve group (PENG) block and suprainguinal fascia iliaca block for total hip arthroplasty. *Reg Anesth Pain Med*. 2021 Oct;46(10):874-878.
- Huda AU, Ghafoor H. The Use of Pericapsular Nerve Group (PENG) Block in Hip Surgeries Is Associated With a Reduction in Opioid Consumption, Less Motor Block, and Better Patient Satisfaction: A Meta-Analysis. *Cureus*. 2022 Sep 6;14(9):e28872.