

Anterior Approach to Intra-Psoas Injection for Analgesia After Hip Surgery

Brian Potocnik, M.D., Monika Nanda, M.D., Daniel Morgenstern, M.D., Samantha Gottlieb, D.O.,
Stuart Grant, MB. Ch.B.



Introduction

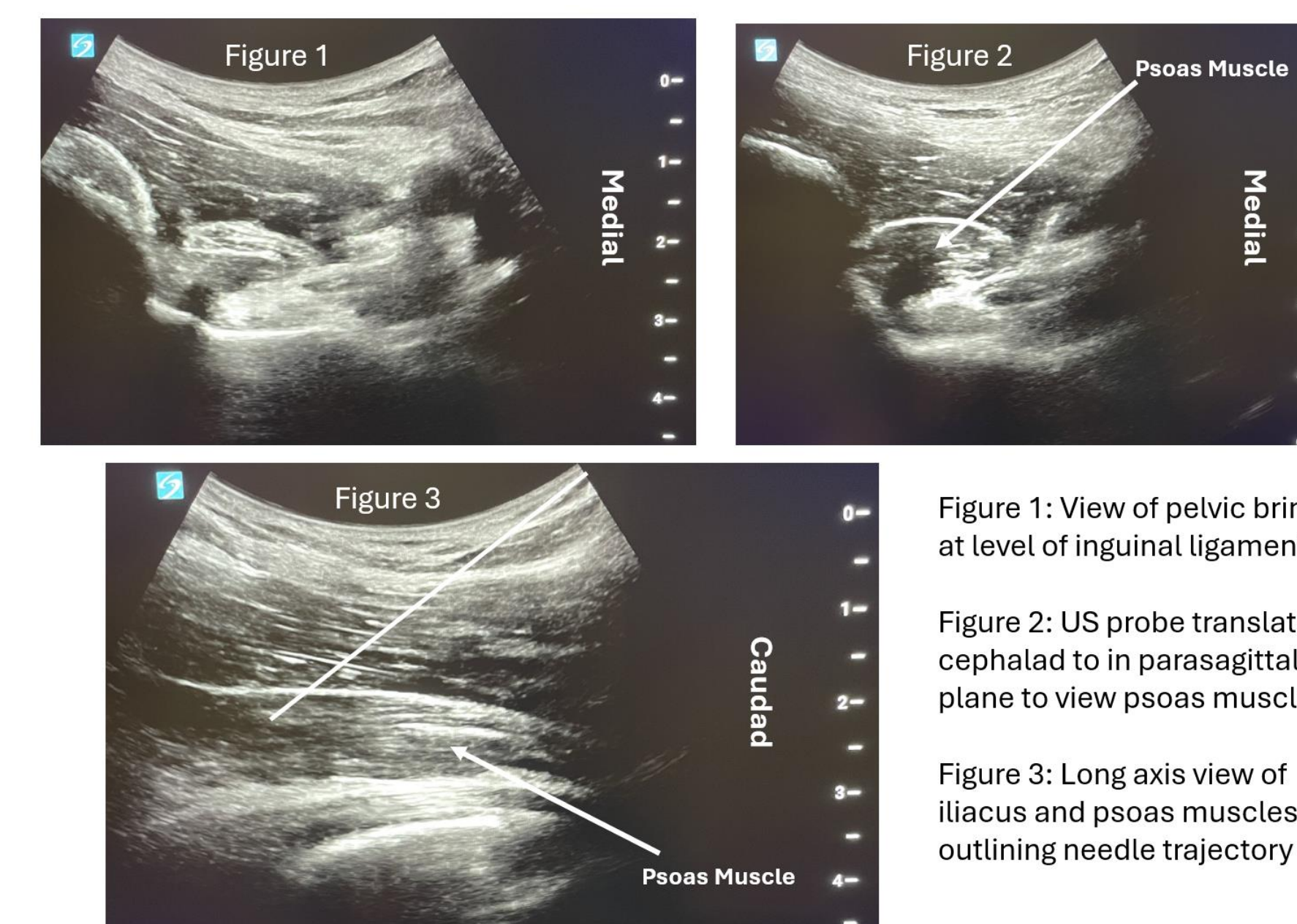
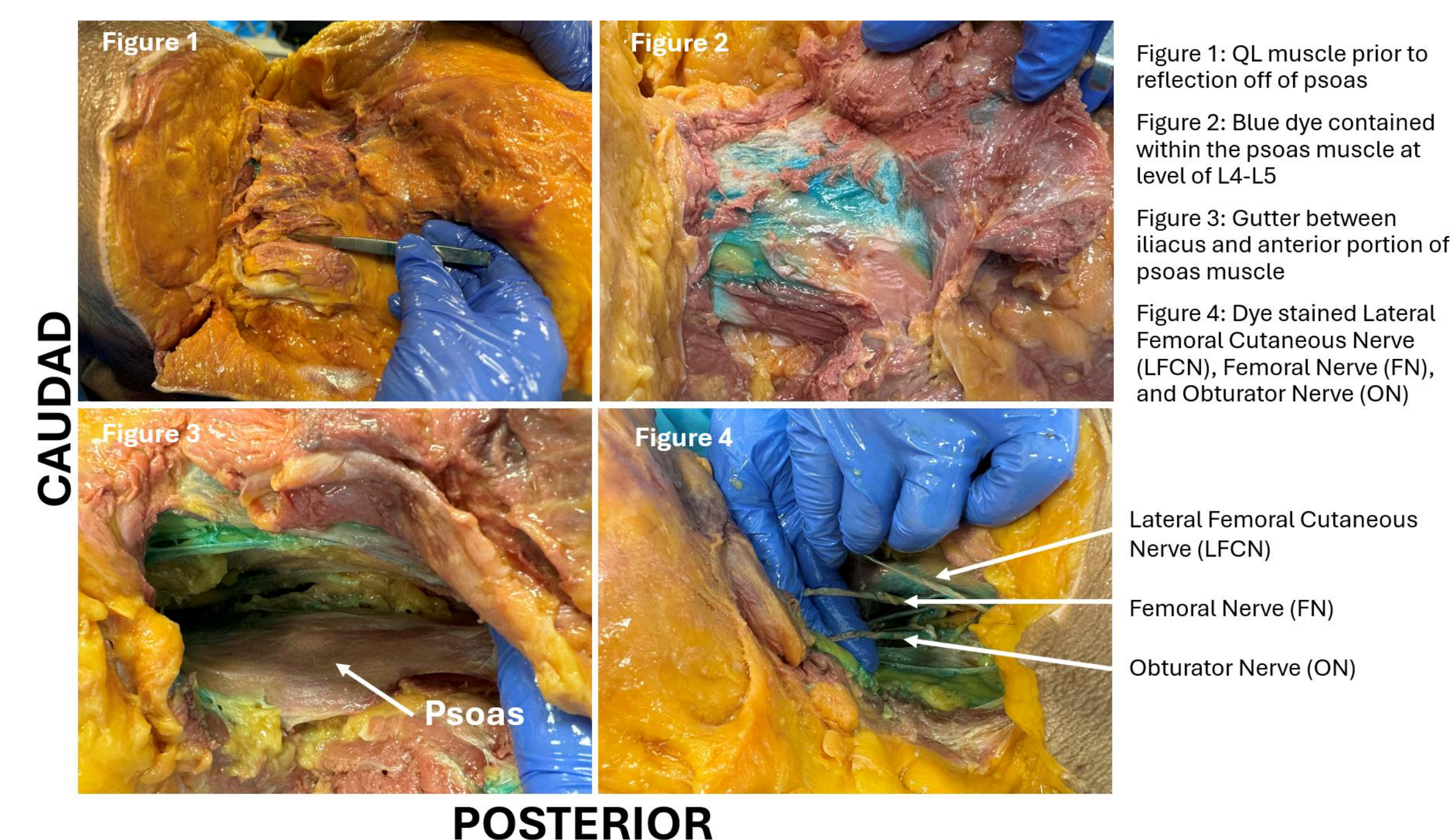
Sensory innervation of the hip joint and surrounding structures is complex, making regional anesthesia for hip surgery particularly challenging. The anterior hip is mainly innervated by articular and cutaneous branches of the Femoral Nerve (FN), Lateral Femoral Cutaneous Nerve (LFCN), and Obturator Nerve (ON). The Fascia Iliaca Compartment Block (FICB) has been studied extensively using radiographic cadaveric imaging techniques to assess dye spread as well as using clinical testing of sensation and motor function following injection of local anesthetic in patients. The FICB never blocks the obturator nerve. The Peri-capsular Nerve Group (PENG) block was developed with the goal of blocking the ON branches supplying the anterior hip joint. However, this technique fails to block the LFCN. Anatomically, all three of these nerves reside within the psoas muscle as the nerve roots exit between the lumbar vertebrae. Therefore, the psoas muscle is an attractive target for local anesthetic infiltration. This novel cadaveric dye study evaluates the potential local anesthetic spread from an anterior injection in the psoas at the level of the inguinal ligament to anesthetize the ON, FN, and LFCN for hip surgery.

Methods

This study was conducted at the University of North Carolina and was considered exempt from Institution Review Board (ID#19-2218). One GreenMBalmed donor cadaver was obtained through Carolina Body Donation Program and ethical guidelines were followed. Using a curvilinear 5-1 MHz ultrasound probe (Fujifilm Bothwell US), the inguinal crease was scanned to identify the psoas muscle cephalad to the pelvic brim in the oblique parasagittal plane. The probe was then rotated vertically with the psoas muscle in long axis. Using a 100mm, twenty-one gauge, short-bevel echogenic needle, thirty mL of 0.1% methylene blue dye was injected into the posterior aspect of the psoas muscle in a cranial direction. Following injection, the cadaver was turned laterally and all muscle groups dissected above the iliac crest and lateral to the spine. The latissimus dorsi was first reflected followed by the quadratus lumborum to expose the psoas muscle. The psoas muscle and surrounding tissues were evaluated for blue dye staining. The psoas muscle was then reflected and the LFCN, FN, and ON were all identified and gently dissected away from surrounding structures.

Results

The methylene blue dye was seen to spread cranially within the psoas muscle and all three nerves of interest (ON, FN, and LFCN) contained dye staining to various degrees. Images were captured outlining the degree of dye spread.



Conclusions

This novel dye study outlines an anterior approach to adequately anesthetizing the lateral femoral cutaneous nerve, femoral nerve, and obturator nerve via a single injection into the psoas muscle from the superior aspect of the pelvic brim. This study outlines a unique approach to blocking all three nerves of interest in a single injection as it pertains to adequate post-operative analgesia for hip surgery. Further cadaveric, imaging, and clinical studies are required to assess the adequacy and feasibility of this approach in clinical practice.

References

1. Kaur G, Saikia P, Dey S, Kashyap N. Pericapsular nervegroup (PENG) block—a scoping review. *Ain-Shams J Anesthesiol.* 2022;14(1):29. doi: 10.1186/s42077-022-00227-0. Epub 2022 Mar 14. PMID: PMC8919174.
2. Bouaziz, Hervé MD, PhD*, Vial, Florence MD*, Jochum, Denis MD†, Macalou, Dioukamaly MD*, Heck, Michel MD*, Meuret, Pascal MD*, Braun, Marc MD, PhD‡, Laxenaire, Marie-Claire MD*. An Evaluation of the Cutaneous Distribution After Obturator Nerve Block. *Anesthesia & Analgesia* 94(2):p 445-449, February 2002. | DOI: 10.1213/00000539-200202000-00041
3. Ten Hoope W, Smulders PSH, Baumann HM, Hermanides J, Beenen LFM, Oostera RJ, Marhofer P, Lirk P, Hollmann MW. A radiological cadaveric study of obturator nerve involvement and cranial injectate spread after different approaches to the fascia iliaca compartment block. *Sci Rep.* 2023 Jul 26;13(1):12070. doi: 10.1038/s41598-023-39041-5. PMID: 37495606; PMCID: PMC10372149.
4. Nanda M, Rojas A, Stander S, Armbruster J, Anumudu C, Jolly M, Schoenher J, Maquoit G, Grant SA. Single-pass needle trajectory for lateral femoral cutaneous nerve and PENG blocks, and caution to avoid injury. *Reg Anesth Pain Med.* 2022 Jun 9:rapm-2022-103782. doi: 10.1136/rapm-2022-103782. Epub ahead of print. PMID: 35680176.