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Peripheral Nerve Blocks for Hip Fractures

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Hip fractures, which predominantly occur in older adults (≥65 years), are associated with substantial pain and a 1-year mortality rate of 12% to 25%.[1] In the US, there were approximately 290 130 hospitalizations and 7731 deaths related to hip fractures in 2019.[1] Almost half of individuals hospitalized with hip fractures experience complications, such as delirium, pneumonia, acute kidney injury, urinary tract infection, and deep vein thrombosis.[1,2]

Multimedia

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Hip fracture pain has traditionally been treated with systemic opioids, which increase the risk of delirium and falls, and nonsteroidal anti-inflammatory drugs (NSAIDs), which increase the risk of gastrointestinal bleeding and acute kidney injury in older adults.[3] Now, peripheral nerve blocks are being increasingly used as an opioid-sparing pain strategy during acute management, interfacility transfer, and inpatient care of patients with hip fractures.

Peripheral Nerve Blocks for Hip Fractures

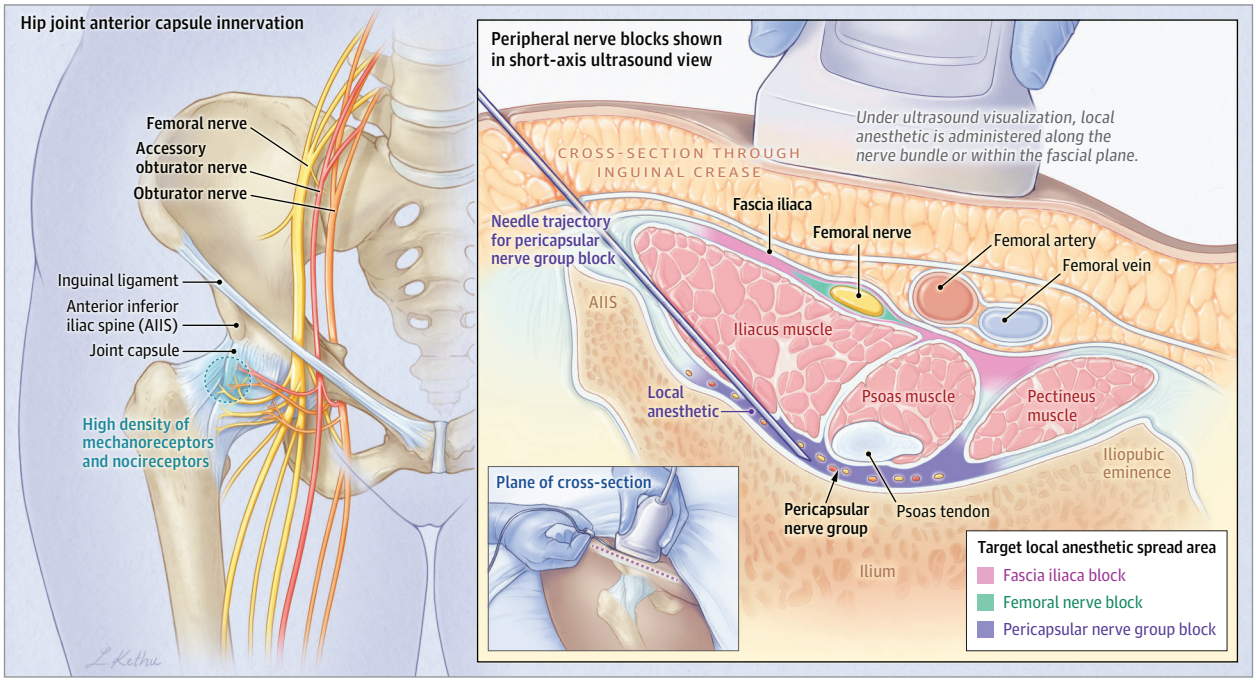
Peripheral nerve blockade for hip fractures, typically performed by anesthesiologists and pain specialists, involves injection of a local anesthetic close to the sensory nerves supplying the anterior capsule of the hip joint, which is the main source of postoperative pain. Key nerves involved in sensory innervation of the anterior capsule include the femoral, obturator, and accessory obturator nerves (**Figure**). For effective pain control, peripheral nerve blocks use local anesthetics with a prolonged duration of action (6-8 hours), such as bupivacaine (maximum dose, 2 mg/kg) and ropivacaine (maximum dose, 3 mg/kg).[4] Adjuvants, such as 4-mg dexamethasone applied perineurally, can be added to extend the block duration (by 5.4 hours).[5] The effectiveness of the peripheral anesthetic block can be assessed within 15 to 20 minutes after injection by determining the patient's pain level and evaluating sensory loss in the affected limb.

Potential complications of peripheral nerve blocks include vessel puncture and intravascular injection, which can cause the rare but serious condition of local anesthetic systemic toxicity,[4] associated with central nervous system symptoms, such as tinnitus, perioral paresthesia, and seizures, as well as arrhythmias, hypotension, and cardiac arrest.[4,6] Therefore, continuous cardiac monitoring is recommended throughout the procedure, and at least 1 hour afterward, to assess for cardiovascular signs of local anesthetic systemic toxicity.

Use of ultrasound guidance has enabled other credentialed clinicians, such as emergency medicine physicians, to perform peripheral nerve blocks for pain control in patients with hip fractures. The American College of Emergency Physicians recognizes ultrasound-guided nerve blocks as a core skill essential for implementing an effective multimodal pain management program.

For hip fractures, the femoral nerve and fascia iliaca compartment blocks, performed via suprainguinal or infrainguinal approaches, have the most robust evidence supporting their clinical use.[7] The pericapsular nerve group block may be useful to facilitate patient mobilization due to its motor-sparing effects. Quadratus

Figure. Common Hip Fracture Nerve Blocks and Ultrasound Anatomy



lumborum and erector spinae plane blocks have recently been used for hip fractures, but evidence is limited to case reports and series.

The ultrasound-guided peripheral nerve block procedure uses an ultrasound probe, sheathed in a sterile cover, to identify the target nerve bundle or fascial plane and evaluate the proximity of blood vessels. The needle's path is continuously visualized with ultrasound and needle tip placement is confirmed with direct visualization. Aspiration is performed before injection of anesthetic to avoid injection into a blood vessel. An initial injection of saline (typically <5 mL) can open the fascial plane (hydrodissection) to facilitate precise anesthetic placement. The full dose of local anesthetic is administered slowly in 1- to 3-mL aliquots, with ultrasound visualization to ensure it spreads along the targeted nerve bundle or fascial plane. When increased volumes are required for proper anatomical distribution, the anesthetic may be diluted with saline to achieve a larger volume while maintaining the same total dose of anesthetic.

In 3 systematic reviews of randomized clinical trials (RCTs),[7-9] only 1 complication (temporary neurologic deficit) was reported among patients receiving ultrasound-guided nerve blockade for hip fracture. Similarly, in a retrospective multicenter observational registry study involving 11 emergency departments in the US from 2022 to 2023, among nearly 1100 patients who underwent ultrasound-guided fascia iliaca compartment, femoral nerve, or pericapsular nerve group blocks, only 1 minor complication (hypotension, likely vasovagal) was reported.[6]

Clinical Trial Evidence

A 2022 systematic review included 12 trials of 976 patients randomized to undergo ultrasound-guided nerve blocks for hip fracture (femoral nerve block and/or fascia iliaca compartment block) vs conventional systemic analgesia (use of opioids or an NSAID/paracetamol, with or without a sham block [injection of saline]).[8] The study reported use of ultrasound-guided nerve blocks significantly reduced pain measured 2 hours after injection (mean difference, −2.26; visual analog scale [VAS], 0-10 [95% CI, −2.97 to −1.55]; $P < .001$), decreased preoperative intravenous morphine equivalents (−5.34 mg [95% CI, −8.11 to −2.58]; $P = .003$), and decreased delirium (risk ratio [RR], 0.6 [95% CI, 0.38 to 0.94]; $P = .03$). There were fewer serious adverse events, such as respiratory depression and excessive sedation, with ultrasound-guided nerve blockade compared with conventional analgesia (RR, 0.33 [95% CI, 0.15 to 0.73]; $P = .006$) and higher patient satisfaction scores (mean difference, 25.9; VAS, 0-100 [95% CI, 19.74 to 32.07]; $P < .001$). However, the quality of evidence was low or very low, so conclusions should be tempered.[8]

A 2020 Cochrane systematic review of 49 RCTs included 1553 patients with hip fracture randomized to undergo peripheral nerve blocks (with or without ultrasound guidance) and 1508 randomized to undergo no nerve block or sham block.[7] Based on 11 trials (n = 503), peripheral nerve blocks reduced pain on movement within 30 minutes of injection (standardized mean difference [SMD], −1.05 [95% CI, −1.25 to −0.86]; equivalent to −2.5 on a scale from 0-10; high-certainty evidence). Based on 13 trials (n = 1072), peripheral nerve blocks reduced acute confusional state (RR, 0.67 [95% CI, 0.50-0.90]; number needed to treat [NNT], 12 [95% CI, 7-47]; high-certainty evidence). Based on 3 trials (n = 131), peripheral nerve blocks probably reduced the risk of chest infection (RR, 0.41 [95% CI, 0.19-0.89]; NNT, 7 [95% CI, 5-72]; moderate-certainty evidence).

A 2024 systematic review and network meta-analysis of 63 trials of preoperative pain management of hip fractures compared the effectiveness of different peripheral nerve blocks (with or without ultrasound guidance). The nerve blocks studied included femoral nerve, 3-in-1 (single injection that blocks the femoral, lateral femoral cutaneous, and obturator nerves), fascia iliaca compartment, and pericapsular nerve group (only performed with ultrasound guidance).[9] Similar to prior reviews,[7,8] pain scores at 2 hours were lower with all nerve blocks compared with no block, but the pericapsular nerve group block provided superior pain reduction compared to femoral nerve block (SMD, −1.21 [95% CI, −2.18 to −0.23]; very low confidence rating) and fascia iliaca compartment block (SMD, −0.92 [95% CI, −1.70 to −0.16]; low confidence rating).[9]

Conclusions

Peripheral nerve blockade is a safe and effective pain management strategy for patients with hip fracture and can be performed by credentialed clinicians outside of the operating room.

ARTICLE INFORMATION

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