RESEARCH PAPER

Pericapsular Nerve Group Block in Hip Fracture Surgery: A Review of Clinical Evidence, Motor-Sparing Effects, and Comparison with Suprainguinal Fascia Iliaca Block

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ABSTRACT

Background: Proximal femur fractures are among the most common orthopedic emergencies in older adults and carry a high risk of prolonged hospitalization, medical complications, and lasting functional decline. Adequate perioperative analgesia is central to enhanced-recovery pathways, since undertreated pain heightens physiological stress, delays mobilization, and predisposes patients to delirium and other complications. Established regional techniques such as the femoral nerve block and fascia iliaca compartment block provide reasonable pain relief but frequently cause quadriceps weakness, increasing fall risk and slowing rehabilitation. The pericapsular nerve group (PENG) block, described by Girón-Arango et al. in 2018, selectively targets the sensory articular branches supplying the anterior hip capsule while sparing motor function, and is increasingly compared with the suprainguinal fascia iliaca compartment block (SI-FICB), an established but motor-sparing-limited alternative.

Objective: To critically review and compare the anatomical basis, technique, analgesic efficacy, motor-sparing effect, and safety of the PENG block versus SI-FICB in patients undergoing proximal femur fracture surgery, and to identify gaps in the current evidence base.

Methods: This narrative review searched six databases (PubMed/MEDLINE, Scopus, Embase, Google Scholar, Cochrane Library, and Web of Science) for English-language randomized controlled trials, observational and comparative studies, systematic reviews/meta-analyses, and cadaveric or anatomical studies published between January 2018 and June 2026, using MeSH terms combined with free-text keywords and Boolean operators. Titles and abstracts were screened for relevance, duplicates were removed, and full texts were assessed against predefined inclusion and exclusion criteria. Data on study design, technique, pain scores, opioid consumption, quadriceps strength, positioning comfort, functional recovery, and adverse events were extracted and synthesized narratively, with greatest weight given to randomized trials and systematic reviews.

Result: Across the included literature, the PENG block consistently produced significantly less pain and greater comfort during spinal positioning than SI-FICB, and better preserved quadriceps strength, which translated into earlier mobilization and higher patient satisfaction. Resting pain scores were broadly comparable between the two techniques, but the PENG block showed an advantage for dynamic pain during movement and physiotherapy. Rescue opioid consumption trended lower with the PENG block, although the difference did not reach statistical significance in every trial. Both blocks demonstrated a favourable and broadly comparable safety profile under ultrasound guidance, with serious complications remaining rare. The overall evidence was limited by small sample sizes, heterogeneous outcome definitions, and short follow-up, mostly under 48 hours.

Conclusion: Current evidence indicates that the PENG block is an effective, motor-sparing alternative to SI-FICB for proximal femur fracture surgery, offering superior positioning comfort and quadriceps preservation while matching SI-FICB for overall analgesia and safety. These findings support incorporating the PENG block into multimodal analgesia and enhanced-recovery protocols, although larger, standardized, multicenter trials with longer follow-up are needed to confirm its long-term benefit.

Keywords: Pericapsular nerve group block; PENG block; Suprainguinal fascia iliaca block; Hip fracture; Proximal femur fracture; Regional anesthesia; Ultrasound-guided nerve block; Motor-sparing analgesia; Enhanced recovery; Quadriceps strength.

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INTRODUCTION

Population aging has pushed hip fractures to the front rank of orthopedic public-health concerns. They already rank among the most frequent injuries seen worldwide, with more than 1.6 million cases annually a number projected by some to exceed 6 million a year by 2050 as osteoporosis becomes more common and people live longer [47]. The subset called proximal femur fractures, spanning the femoral neck, intertrochanteric, and subtrochanteric regions, mostly strikes older adults after fairly trivial falls, whereas younger people usually need a higher-energy mechanism like Road Traffic Accident (R.T.A.), a fall from height to sustain the same injury [3].

These fractures hurt intensely, and the pain only worsens with movement, positioning, or surgical handling. Left inadequately controlled, it can trigger tachycardia, hypertension, higher oxygen demand, poor sleep, anxiety, delirium, breathing problems, and extended immobility that pushes rehabilitation further out[4]. It even complicates the anesthesia itself and getting a patient into position for a spinal block is harder, and more uncomfortable for them, when analgesia beforehand is inadequate. Part of why solid perioperative pain control is now treated as non-negotiable in hip fracture management is exactly this it underpins enhanced recovery after surgery (ERAS) pathways generally[16,17].

Systemic opioids used to carry most of the load here, prized for how fast and how strongly they work, but the price is a long, familiar catalogue of unwanted effects breathing suppression, nausea, vomiting, urinary retention, constipation, itching, oversedation, cognitive fog, delirium and elderly patients with several comorbidities tend to bear that price hardest[49]. Regional anesthesia's appeal is largely a reaction to this: it targets pain locally, letting clinicians pull back on systemic opioid dosing.

Clinicians have tried a number of “Peripheral Nerve Blocks” for hip fracture surgery through the years, among them the “femoral nerve block (FNB)”, the “fascia iliaca compartment block (FICB)”, the “lumbar plexus block”, the “quadratus lumborum block”, and now the “Pericapsular Nerve Group (PENG) block”[7]. The suprainguinal fascia iliaca approach in particular took hold because injecting higher up gives better cephalad spread beneath the fascia iliaca, translating into more dependable coverage of the “femoral nerve and the lateral femoral cutaneous nerve”, plus occasional obturator involvement. Its downside is a familiar one: SI-FICB regularly catches the femoral nerve trunk too, weakening the quadriceps enough to slow mobilization and add to fall risk[8].

Exactly this issue was addressed by Girón-Arango's team in 2018, when they came up with the PENG block, a method that was designed to target the sensory nerves of the anterior capsule while leaving motor function unaffected. The block simply deposits anaesthetic into the fascial interval that separates the psoas tendon from the superior pubic ramus, precisely where those branches happen to run, thereby catching them while largely sparing the quadriceps' motor supply. Previous anatomical work had already mapped that sensory supply to “articular branches of the femoral, obturator, and accessory obturator nerves” by the time the block was performed[3].

A substantial body of work has since accumulated comparing PENG block with SI-FICB specifically in proximal femur fracture patients randomized trials, observational cohorts, systematic reviews, meta-analyses looking at resting and dynamic pain, comfort during spinal positioning, opioid use, how long analgesia lasts, quadriceps strength, time to first mobilization, hospital stay, satisfaction, and complications. The two look broadly similar on overall postoperative pain relief, but the trend across studies leans toward PENG block for sparing motor function and getting patients up sooner[10–15,38].

This review's aim is to critically weigh that literature anatomy, technique, efficacy, motor sparing, safety, and comparative outcomes for PENG block versus SI-FICB and to point out where the evidence still falls short, giving anesthesiologists a clearer basis for choosing between the two in everyday practice.

ANATOMY OF HIP JOINT INNERVATION

The success of contemporary regional procedures is not a coincidence; rather, they are a direct consequence of the knowledge that has been accumulated on the innervation of the hip joint. Located between the femoral head and the acetabulum, the joint is a large synovial articulation that takes the appearance of a ball and a socket. It is kept together by a thick capsule that is reinforced by the “iliofemoral, pubofemoral, and ischiofemoral ligaments”. This allows for a wide range of motion without compromising stability. Because the anterior part of that capsule carries such dense innervation, it is where most fracture- and surgery-related pain originates, and that is precisely the rationale for targeting its sensory supply selectively[1,2].

The lumbar and sacral plexuses both innervate the capsule, making it complicated. While going posteriorly, coverage is switched to the superior gluteal nerve, the sciatic nerve specifically, and the nerve to the quadratus femoris. Anteriorly, as the majority of the mechanoreceptors and nociceptive endings are located, the nervous supply is given by the “femoral, obturator and the auxiliary obturator nerves”. It is most likely that fracture pain is caused by the anterior capsule and so the newer regional techniques focus on these anterior branches specifically[3,4].

Consider the femoral nerve first: it is the biggest branch the lumbar plexus produces, formed from the posterior divisions of L2–L4. Just before it dives under the inguinal ligament, it throws off small articular branches that follow the iliopsoas muscle up toward the anterior capsule, supplying much of its superolateral sensation and making this one of the principal routes pain travels after a fracture. A femoral nerve block silences these branches effectively enough the catch is that it also numbs the motor fibers headed for the quadriceps femoris, leaving patients weaker and slower to mobilize afterward[5].

The obturator nerve has a comparable path, though it starts from the "anterior divisions of L2–L4 instead", descending the pelvic sidewall, threading through the obturator canal, and splitting into anterior and posterior branches. Small articular twigs peel off before that split and climb toward the inferomedial anterior capsule, contributing real sensory input during hip motion. Because it runs deeper than the femoral nerve, standard fascia iliaca or femoral nerve blocks pick it up only sporadically[6].

The accessory obturator nerve, by contrast, only shows up in an estimated 10 to 30 percent of individuals. When it exists, it comes off the lumbar plexus (usually L3–L4), runs medial to psoas major, crosses the superior pubic ramus, and supplies the anteromedial capsule. Cadaveric studies suggest it matters more for hip fracture pain than its inconsistent presence might imply, and because it sits so close to the iliopubic eminence, the PENG block, which targets exactly that landmark, reliably picks it up[7,8].

Histology adds one more piece: nociceptive receptors cluster more densely in the anterior capsule than the posterior one, with free nerve endings concentrated up front and proprioceptive mechanoreceptors spread more evenly throughout. That imbalance is the reason a selective anterior block can achieve strong analgesia without needing to touch the entire lumbar plexus[50].

These discoveries served as the only inspiration for the creation of the PENG block. The local anaesthetic is injected into the "fascial interval between the psoas tendon and the superior pubic ramus, right at the iliopubic eminence". This is the precise location where the "articular branches of the femoral, obturator, and accessory obturator nerves pass before entering the capsule". The operator is guided by ultrasound during the procedure. Because that is the target rather than the femoral nerve trunk itself, quadriceps strength usually comes through intact, earning the block its motor-sparing reputation[10,11].

SI-FICB takes a different route entirely, relying on anesthetic spreading beneath the fascia iliaca itself. Going in above the inguinal ligament rather than below it lets the injectate travel further toward the lumbar plexus than the older infrainguinal technique managed, which raises the chances of reaching the "femoral nerve, the lateral femoral cutaneous nerve", and sometimes the "obturator nerve" as well. The trade-off is that the femoral nerve trunk gets caught often enough that quadriceps weakness is a fairly common side effect, one that can hamper early mobilization and slow rehabilitation[12].

Dye studies done on cadavers make that contrast vivid: PENG injectate reliably marks the articular branches feeding the anterior capsule while leaving the main femoral nerve trunk largely untouched, whereas SI-FICB spreads more diffusely through the fascia iliaca compartment, catching sensory and motor branches without much discrimination. That anatomical gap is the reason randomized trials keep finding better motor preservation with PENG block[13,14].

This more granular anatomical picture has changed how orthopedic regional anesthesia gets practiced generally. Large-volume blocks that numb everything indiscriminately are giving way to more surgical targeting of the pain-carrying branches specifically, a shift that lines up neatly with what ERAS protocols are trying to achieve faster mobilization, less opioid use, happier patients, shorter admissions[15].

Put another way, the PENG block's rationale comes down to deliberately targeting the "femoral, obturator, and accessory obturator branches" that supply the anterior capsule, while SI-FICB catches the femoral nerve further upstream and more often costs patients some quadriceps function. That distinction focused sensory coverage with minimal motor cost is what has driven the PENG block's growing popularity in this patient population.

EVOLUTION OF REGIONAL ANALGESIA FOR HIP FRACTURE SURGERY

Pain management for these fractures looks nothing like it did a few decades ago. Opioids were the default once, chosen for speed and potency, but the same elderly patients who need hip fracture surgery are also the ones least able to tolerate the familiar roster of opioid side effects trouble breathing, nausea, vomiting, constipation, urinary retention, oversedation, delirium, longer hospital stays. That mismatch is largely what pushed the field toward regional techniques offering comparable pain relief with a lighter opioid load[16,17].

Neuraxial anesthesia, spinal and epidural blocks, came first among the regional options, and it works well both intraoperatively and postoperatively but not everyone qualifies. Anticoagulant therapy, coagulopathy, local infection, severe hypovolemia, or spinal deformity can all rule it out, and it does not necessarily fix the hardest part: getting a patient with a displaced fracture into position for the block itself, which stays uncomfortable regardless[48].

Peripheral nerve blocks were the next real advance, with the "Femoral Nerve Block (FNB)" among the earliest to catch on widely for hip fracture patients. Blocking the femoral nerve below the inguinal ligament reliably dulled anterior-capsule pain and eased positioning for spinal anesthesia, and study after study reported less opioid use, lower pain scores, and greater satisfaction as a result[19]. Its weakness is structural, though: the femoral nerve carries motor fibers along with sensory ones, so FNB routinely leaves the quadriceps weaker, with the attendant fall risk and slower mobilization that implies.

One answer arrived in the late 1980s with the "Fascia Iliaca Compartment Block (FICB): a bigger volume of anesthetic deposited beneath the fascia iliaca so it could reach the femoral nerve, the lateral femoral cutaneous nerve, and, on occasion, the obturator nerve". It is simpler to perform than a femoral nerve block, carries a lower risk of nerve injury, and works either by landmark technique or under ultrasound, which is why it became such a common choice for hip fracture analgesia[20].

Ultrasound guidance itself was arguably a bigger milestone still. Seeing the relevant anatomy in real time made blocks more accurate, pushed up success rates, cut down how much anesthetic was needed, reduced vascular puncture, and generally raised the safety bar, while also enabling an entirely new category of interfascial plane blocks aimed at sensory nerves specifically and sparing motor fibers[21].

Since the infrainguinal fascia iliaca route caught the obturator nerve only by chance, anesthesiologists shifted the injection site above the inguinal ligament, creating the suprainguinal variant, SI-FICB, which spreads more reliably toward the lumbar plexus. Cadaveric and imaging data confirmed better femoral and lateral femoral cutaneous coverage this way, with at least partial obturator involvement too, and clinical trials followed with reports of better analgesia and easier spinal positioning[22,23].

Even so, clinicians kept noticing the same pattern: both femoral nerve block and SI-FICB caught the femoral nerve trunk often enough to leave patients weaker, which matters enormously in an elderly population where muscle strength underpins ambulation, fall prevention, physiotherapy, and ERAS protocols generally. That recurring gap is what drove the hunt for something that could numb sensation selectively while sparing motor function outright[24].

The payoff came in 2018: The group led by Girón-Arango published a description of the PENG block, which was based on a comprehensive map of the innervation of the hip joint. The PENG block was designed to target the articular branches of the femoral, obturator, and accessory obturator nerves at the precise point where they pass between the psoas tendon and the superior pubic ramus, just before they enter the capsule. This block provides effective pain relief while sparing the motor fibres of the femoral nerve almost entirely[4,25].

Adoption was fast. Case reports, prospective studies, randomized trials, and systematic reviews piled up quickly, all pointing the same direction: excellent analgesia during spinal positioning, less opioid use, higher satisfaction, preserved quadriceps strength, earlier mobilization. That consistency is what cemented the PENG block's reputation as one of the more promising motor-sparing options for hip fracture surgery[26–28].

More recently, researchers have gone straight for head-to-head trials of PENG block against SI-FICB. Both deliver solid perioperative analgesia, but PENG block increasingly comes out ahead for quadriceps preservation, dynamic pain scores, and early recovery, while opioid use, analgesia duration, and complications look roughly comparable between the two. Larger multicenter trials in progress should help settle exactly how much of an edge PENG block really has over SI-FICB[29–31].

Step back and the whole arc becomes clear: from broad, indiscriminate nerve blockade toward selective, ultrasound-guided, motor-sparing technique a trajectory that mirrors what modern perioperative medicine is trying to achieve across the board, namely less opioid use, faster rehabilitation, preserved function, and better recovery. The PENG block sits near the front of that trajectory right now, and it shows no sign of losing research or clinical interest.

ANATOMICAL BASIS, ULTRASOUND-GUIDED TECHNIQUE, MECHANISM OF ACTION, INDICATIONS AND ADVANTAGES

Girón-Arango's team put the PENG block forward in 2018 specifically as an ultrasound-guided option for hip fracture and hip surgery analgesia[4]. What separates it from older peripheral nerve blocks, which numb whole nerve trunks indiscriminately, is precision: it aims only at the articular sensory branches of the "femoral, obturator, and accessory obturator nerves" feeding the anterior capsule, sparing the motor fibers those same nerves also carry. That precision is what makes strong analgesia and preserved quadriceps strength possible together a combination especially valuable in older patients for whom rapid mobilization is often the whole point of treatment[8,32].

Anatomical Basis

The anatomical rationale for the PENG block is based on detailed cadaveric and radiological studies demonstrating that the anterior hip capsule contains the highest density of nociceptive fibers and receives its principal sensory innervation from the femoral, obturator, and accessory obturator nerves. These articular branches travel close to the iliopubic

eminence, passing between the psoas tendon anteriorly and the superior pubic ramus posteriorly before entering the hip capsule.

This anatomical plane forms the target site of the PENG block. Deposition of local anesthetic at this location allows blockade of the sensory branches before they enter the capsule while avoiding significant spread to the motor branches of the femoral nerve. Consequently, patients experience effective analgesia without substantial impairment of quadriceps muscle strength.

Cadaveric dye studies have demonstrated consistent spread of injectate around the articular branches of the femoral and accessory obturator nerves with minimal involvement of the femoral nerve trunk when appropriate volumes are used. These findings explain the motor-sparing characteristics observed in clinical studies.

Ultrasound-Guided Technique

The PENG block is performed under ultrasound guidance, typically employing a low-frequency curvilinear transducer in adult patients, although a high-frequency linear probe may be suitable in lean individuals.

The patient is positioned supine with the affected limb in neutral rotation. Following skin asepsis and sterile preparation, the ultrasound probe is placed transversely over the anterior inferior iliac spine (AIIS) and then rotated medially until the following anatomical landmarks are identified:

- Anterior inferior iliac spine (AIIS)
- Iliopubic eminence (IPE)
- Superior pubic ramus
- Psoas tendon
- Iliopsoas muscle
- Femoral artery and vein

The needle is introduced using an in-plane lateral-to-medial approach under continuous ultrasound visualization. The needle tip is advanced to the fascial plane deep to the psoas tendon at the level of the iliopubic eminence, between the tendon and the superior pubic ramus. Following careful aspiration to exclude intravascular placement, local anesthetic is injected slowly while observing hydrodissection of the fascial plane beneath the psoas tendon[9].

Ultrasound guidance significantly enhances procedural safety by permitting real-time visualization of adjacent vascular structures and confirming appropriate spread of local anesthetic. Compared with landmark-based techniques, ultrasound-guided PENG block is associated with higher success rates and fewer complications.

Mechanism of Action

The PENG block produces analgesia through selective interruption of sensory transmission from the anterior hip capsule. Local anesthetic deposited adjacent to the iliopubic eminence blocks the articular branches of the:

- Femoral nerve
- Obturator nerve
- Accessory obturator nerve

Because the injection is directed toward distal articular branches rather than the main femoral nerve trunk, motor fibers supplying the quadriceps muscle are largely preserved. This selective sensory blockade distinguishes the PENG block from femoral nerve block and fascia iliaca compartment block, both of which frequently produce motor blockade.

The preservation of quadriceps function permits earlier participation in postoperative physiotherapy, reduces fall risk, and facilitates implementation of Enhanced Recovery After Surgery (ERAS) protocols.

Clinical Indications

The PENG block has gained increasing acceptance in orthopedic anesthesia. Current indications include:

- Proximal femur fractures
- Femoral neck fractures
- Intertrochanteric fractures
- Subtrochanteric fractures
- Total hip arthroplasty
- Hemiarthroplasty
- Hip arthroscopy
- Acetabular surgery
- Hip dislocation reduction
- Analgesia prior to positioning for spinal anesthesia
- Multimodal postoperative analgesia

Clinical Advantages

Randomized trial data back up several concrete advantages for the PENG block, covered one by one below.

Superior Analgesia During Positioning

Sitting up for spinal anesthesia hurts noticeably less after PENG block than after conventional fascia iliaca block, and that lower pain translates directly into faster, easier neuraxial placement[(40)].

Motor-Sparing Effect

Quadriceps preservation may be the single biggest reason clinicians reach for this block with the femoral nerve trunk generally spared, patients can still actively extend the knee and get moving sooner after surgery[(8)].

Reduced Opioid Requirement

Opioid use drops too: less rescue analgesia is needed, and fewer of the associated side effects nausea, vomiting, sedation turn up in trial after trial[(41)].

Early Functional Recovery
Intact motor function means patients walk sooner, do more in physiotherapy, rehabilitate faster, and potentially leave hospital earlier[42].

Improved Patient Satisfaction
Satisfaction scores run higher too, and patients consistently point to the same three reasons: better pain control, easier positioning, and quicker return of mobility[43].

Excellent Safety Profile
Complication rates stay low under ultrasound guidance vascular puncture, nerve injury, and local anesthetic toxicity are all uncommon, and most published series report only minor issues at most[44,45].

Table 1. Comparative Summary: PENG Block versus SI-FICB

Parameter	PENG Block	SI-FICB
Anatomical target	Articular sensory branches of the femoral, obturator, and accessory obturator nerves, blocked between the psoas tendon and superior pubic ramus	Femoral nerve and lateral femoral cutaneous nerve, with variable obturator nerve involvement, via cephalad spread beneath the fascia iliaca
Technique	Ultrasound-guided injection into the interfascial plane at the anterior hip capsule	Ultrasound-guided suprainguinal injection beneath the fascia iliaca
Comfort during spinal positioning	Significantly better; lower VAS/NRS pain scores	Comparatively less comfortable
Motor (quadriceps) sparing	Motor function largely preserved	Femoral nerve trunk frequently affected; quadriceps weakness more common
Resting pain control	Comparable to SI-FICB	Comparable to PENG block
Dynamic pain (movement/rehab)	Generally superior	Relatively higher
Opioid consumption	Trend toward lower rescue opioid use (not always statistically significant)	Similar or slightly higher in some trials
Time to first mobilization	Earlier ambulation	Delayed relative to PENG block
Patient satisfaction	Higher	Lower relative to PENG block
Safety profile	Low complication rate under ultrasound guidance	Low complication rate under ultrasound guidance; comparable to PENG block
Key limitation	Technically demanding target; less familiar to some operators	Higher risk of quadriceps weakness and slower mobilization

MATERIALS AND METHODS

Study Design

This is a narrative review, built to pull together published evidence on how the PENG block and SI-FICB compare for efficacy, safety, motor sparing, and clinical outcomes specifically in proximal femur fracture surgery.

Literature Search Strategy

The study was carried out using six reputed databases, which includes "PubMed/MEDLINE, Scopus, Embase, Google Scholar, the Cochrane Library, and Web of Science". The databases were restricted to papers that were published between January 2018 and June 2026. This was done since nothing on the PENG block was older than 2018. In order to refine the results, the search was conducted using MeSH subject headings in conjunction with free-text keywords that included "pericapsular nerve group block, PENG block, suprainguinal fascia iliaca block, fascia iliaca compartment block, hip fracture, proximal femur fracture, regional anesthesia, hip surgery, motor-sparing analgesia, quadriceps weakness, and ultrasound-guided nerve block". The search was then joined together using standard Boolean connectors.

Inclusion Criteria

The following studies were included:

- Randomized controlled trials
- Prospective and retrospective observational studies
- Comparative clinical studies
- Systematic reviews and meta-analyses
- Cadaveric and anatomical studies relevant to hip joint innervation
- English-language articles evaluating PENG block and/or SI-FICB in proximal femur fracture or hip surgery

Exclusion Criteria

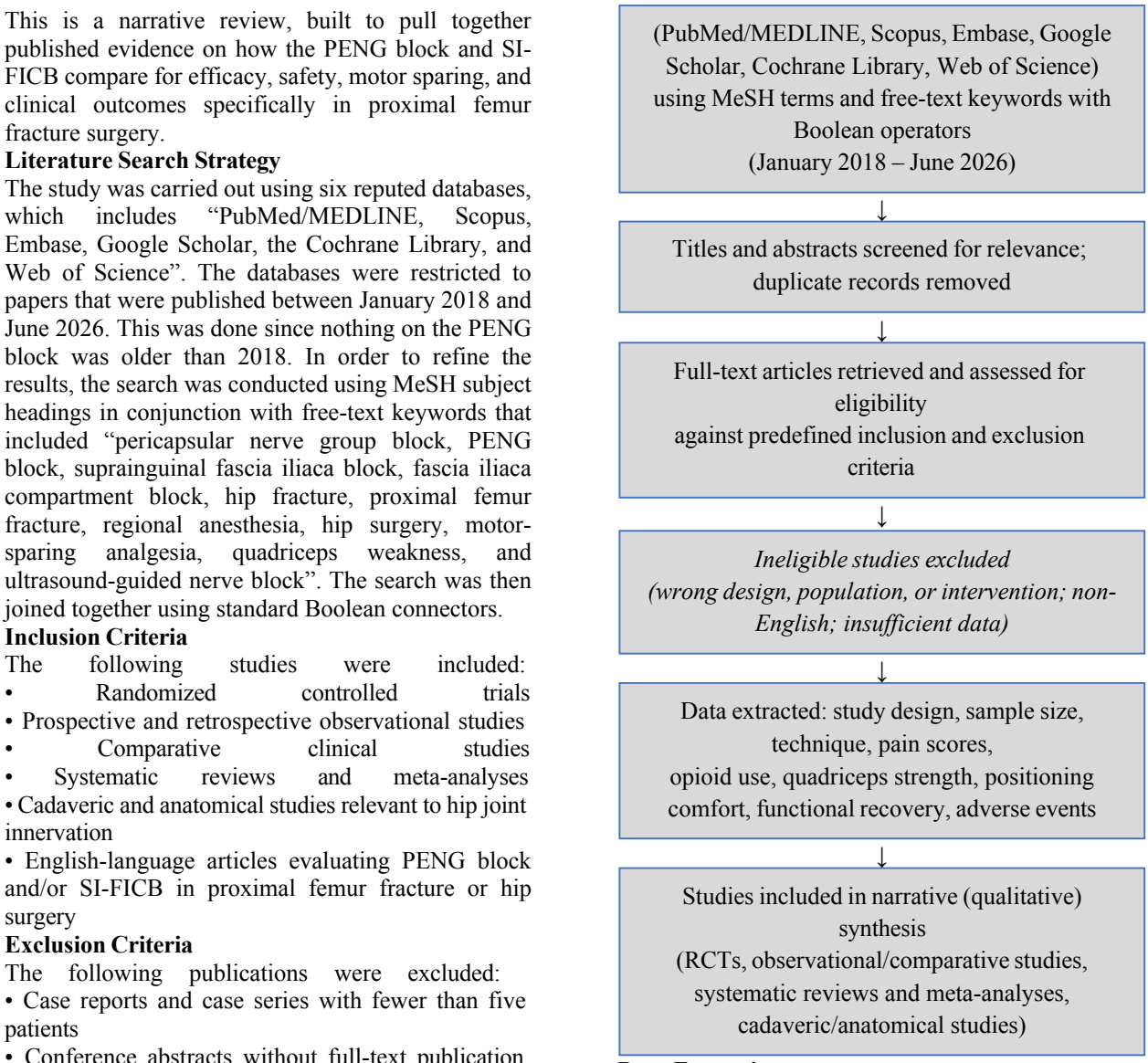
The following publications were excluded:

- Case reports and case series with fewer than five patients
- Conference abstracts without full-text publication
- Editorials, letters to the editor, and expert opinions lacking original clinical data
- Duplicate studies
- Studies unrelated to hip fracture surgery or not involving PENG or SI-FICB

Study Selection

Every title and abstract the search returned was screened for relevance first; full-text review then applied the inclusion criteria independently to whatever passed that initial screen. Duplicates were removed, ineligible studies were dropped, and what remained went forward for qualitative synthesis.

Figure 1. Literature Search and Study Selection Process



Data Extraction

For each study, the team logged the first author and year, country, study design, and sample size, then went on to record patient characteristics, surgery type, the regional technique and local anesthetic used, pain scores, opioid consumption, time to first rescue analgesia, quadriceps strength, ease of spinal positioning, functional recovery, adverse events, and the study's main conclusions.

Data Synthesis

The synthesis itself was narrative rather than statistical, giving the most weight to randomized trials, systematic reviews, and meta-analyses. PENG block and SI-FICB were compared directly on analgesic efficacy, motor sparing, postoperative rehabilitation, and safety, with the findings read against current ERAS thinking.

DISCUSSION

Bringing this evidence together, one thing stands out clearly: pain control genuinely shapes outcomes after proximal femur fracture surgery. Poorly managed pain means later mobilization, longer admissions, more complications, and worse functional recovery, and because most of these patients are elderly, they are also the ones least able to absorb those consequences delirium, respiratory trouble, clotting risk, and reduced quality of life follow close behind poor analgesia[18].

Perhaps the single most clinically useful finding in this literature concerns positioning for spinal anesthesia. Sitting or lying on the side is often agonizing for these patients, which makes neuraxial technique harder to execute well. Multiple randomized trials report significantly lower VAS or NRS pain scores during positioning after PENG block than after SI-FICB or conventional fascia iliaca block[40], and that comfort pays off directly through easier neuraxial placement, faster anesthesia setup, and less procedural stress all around.

Motor preservation is the second big advantage. When "femoral nerve block or fascia iliaca block" leaves the quadriceps weak, mobilization gets delayed and fall risk climbs, especially in frail elderly patients, and comparative trials consistently find stronger quadriceps after PENG block than after SI-FICB[8]. That strength translates into earlier walking, fuller physiotherapy participation, and faster return to independence, outcomes tied to ERAS success and separately linked to fewer pulmonary complications, less deep vein thrombosis, less muscle wasting, and shorter admissions[24,42].

Resting pain scores look similar between the two blocks across several trials, but PENG block pulls ahead specifically for dynamic pain during movement and rehabilitation exercises, which matters because weight-bearing exercise and early physiotherapy are exactly what drive successful recovery after these fractures[40,42].

Opioid reduction remains its own goal given how badly elderly patients tolerate opioid-related problems trouble breathing, nausea, vomiting, difficulty urinating, constipation, oversedation, delirium. Most included studies found lower rescue opioid use and fewer related adverse events after PENG block[41], though not every trial found a statistically significant gap in total 24-hour consumption between the two techniques, suggesting both work reasonably well within a broader multimodal plan. Even without a consistent opioid-sparing edge, the comfort advantage during positioning and movement stands on its own clinically.

None of this makes SI-FICB obsolete. Its suprainguinal, ultrasound-guided route dependably reaches the femoral and lateral femoral cutaneous nerves, and picks up the obturator nerve to some degree[22,23]; it stays easy to learn and carries a long track record most anesthesiologists already trust. Its weakness is that injectate keeps reaching the femoral trunk, so quadriceps weakness turns up more often a real limitation for ERAS pathways built around fast mobilization[12,8].

Safety-wise, both blocks do well under ultrasound, which lets the operator track the needle, nearby vessels, fascial planes, and anesthetic spread continuously, cutting the risk of vascular puncture, nerve trauma, and systemic toxicity[35,36,44]. Serious complications stay rare in the literature, most adverse events are minor and self-resolving, and strict asepsis, sensible patient selection, and careful monitoring remain what keeps it that way.

The evidence base still has real gaps. Small sample sizes limit statistical power across many published trials, and studies vary considerably in patient demographics, fracture type, surgical approach, anesthetic choice and volume, block timing, and postoperative protocol[45]. Motor function gets measured inconsistently too manual testing in some studies, functional mobility scores in others and follow-up rarely extends past 24–48 hours, leaving longer-term outcomes like quality of life, chronic pain, and functional independence largely unstudied.

Larger multicenter trials with standardized ultrasound technique and consistent outcomes would help close these gaps, along with comparative work on anesthetic volume, continuous catheter approaches, cost-effectiveness, patient-reported outcomes, and long-term rehabilitation trajectories. Whether formally folding the PENG block into ERAS protocols changes hospital stay, complications, cost, or long-term recovery is also worth studying directly[29–31,45]. One trial illustrates this well: sixty-six patients were divided evenly between SI-FICB and PENG arms, and while both groups saw a significant drop in pain scores, the PENG arm came out significantly ahead for pain relief and ease of spinal positioning ($P < 0.0001$); rescue analgesic use, time to first request, satisfaction, and complications were all comparable between groups, with no block-related complications in either arm[46].

Put simply, both blocks work for proximal femur fracture surgery, but PENG block carries real advantages better positioning comfort, stronger quadriceps preservation, earlier ambulation, higher satisfaction, and a lighter reliance on opioids. Confirming its long-term value and settling on standardized protocols still needs bigger, better multicenter trials, but it has already earned a place as a promising motor-sparing option in contemporary perioperative care and ERAS pathways for hip fracture surgery[45].

Conclusion

This review's overall read is that the PENG block is an effective, safe, motor-sparing choice for proximal femur fracture surgery, offering better positioning comfort than SI-FICB, stronger quadriceps preservation, and earlier mobilization qualities that together make it a genuinely useful addition to multimodal analgesia and enhanced recovery pathways.

Limitations

Small trial sizes and inconsistent study design, anesthetic regimens, and outcome measures still limit this evidence base. Bigger multicenter trials, run with standardized technique and longer follow-up on functional outcomes, are what is needed to move it forward.

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