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CASE REPORT

Ultrasound-Guided PENG Block for Analgesia in Early Pregnancy with Femoral Head Fracture and Hip Dislocation: A Case Report

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Abstract

Femoral head fracture accompanied by hip dislocation during pregnancy is an uncommon clinical event that presents significant challenges in maternal analgesia and fetal safety. Traumatic hip dislocations account for a small proportion of joint dislocations, while their occurrence during pregnancy is rarely reported, particularly when associated with femoral head fractures. Management becomes more complex because timely reduction and defenitive orthopedic fixation must be achieved while ensuring adequate analgesia and minimizing systemic drug exposure. We describe the case of a 32-year-old woman in early pregnancy (11 weeks of gestation) who presented with a posterior dislocation of the left hip accompanied by a Pipkin type I femoral head fracture following a traffic accident. To provide effective analgesia and reduce fetal risk, a pericapsular nerve group (PENG) block was selected as part of the anesthetic strategy. This regional technique enabled optimal positioning for reduction, minimized the requirement for systemic opioids, and supported early mobilization. Maternal hemodynamics and fetal parameters remained stable throughout the perioperative period. This case highlights the potential role of the PENG block as a focused regional analgesic technique in pregnant trauma patients, particularly during early gestation, where minimizing systemic drug exposure is a critical priority.

Keywords: Case Reports; Femoral Fractures; Hip Dislocation; Nerve Block; Pregnancy

Introduction

Pain control in pregnant trauma patients represents a complex clinical dilemma, particularly in the first trimester when fetal susceptibility to teratogenic influences is highest. Systemic analgesic such as opioids and NSAIDs have been associated with adverse fetal outcomes, making regional anesthesia techniques an attractive alternative.[1,2]

Hip dislocation occurring during pregnancy is an exceptionally uncommon orthopedic condition and poses substantial challenges in selecting safe and effective analgesic strategies.[3] Although hip dislocations constitute approximately 2–5% of all joint dislocations,[4] their incidence in pregnant patients is exceedingly rare and only sporadically documented in the literature.[5] The presence of a Pipkin type I femoral head fracture combined with a posterior hip dislocation further

complicates management, as prompt reduction and adequate analgesia are essential, yet must be achieved without compromising fetal safety.

In this report, we describe the case of a 32-year-old woman in early pregnancy (11 weeks of gestation) who sustained a Pipkin type I fracture of the femoral head associated with a posterior dislocation of the left hip following a traffic-related injury. Given the need to control severe pain while avoiding systemic medications with known teratogenic potential, PENG block was selected as the primary analgesic technique. The PENG block is a relatively recent regional anesthesia approach that targets the articular sensory branches of the femoral nerve and the accessory obturator nerve.[7] When performed under ultrasound (USG) guidance, this technique delivers localized analgesia with minimal systemic drug absorption, making it particularly suitable for trauma management in early pregnancy.[3] To our knowledge, reports describing the use of ultrasound-guided PENG block for analgesia in pregnant trauma patients remain extremely limited.

Case Presentation

A 32-year-old woman, gravida 3, was transferred from a secondary hospital to a tertiary referral center, after being involved in a traffic-related accident. She had been seated as a passenger in a car and was propelled forward during the collision, causing her left knee to impact the front passenger seat. The patient experienced acute, severe pain localized to the left groin, with onset seven hours prior to admission. There was no loss of consciousness, shortness of breath, chest pain, abdominal pain, or vaginal bleeding. There was no history of head, thoracic, or abdominal trauma.

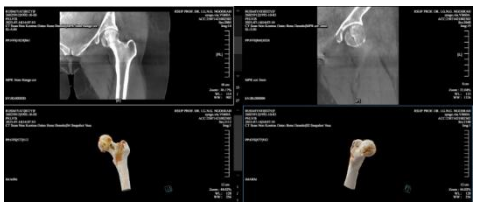
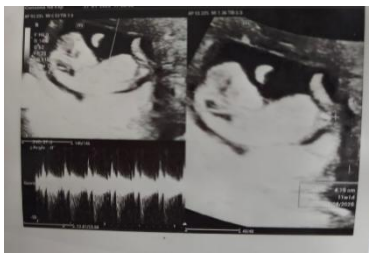
The patient was in her third pregnancy at 11–12 weeks of gestation and had been receiving routine antenatal care without prior complaints. She had no significant past medical or surgical history, no known drug or food allergies, smoking, or alcohol use. Preoperative examination showed a cooperative patient with stable vital signs and no signs of acute illness. On arrival, pain assessment using the Numerical Rating Scale (NRS) revealed severe pain (8/10). Following administration of 750 mg intravenous paracetamol, the pain partially improved to 3/10 at rest but remained significant during movement (6/10), limiting optimal positioning for reduction.

Figure 1. USG Guided PENG Block

Routine laboratory tests, including complete blod count, clinical chemistry, and coagulation profile, were within acceptable limits (Table 1). Initial pelvic radiography did not demonstrate evidence of hip dislocation or fracture. However, due to persistent and unrelieved severe left groin pain despite initial management, further imaging was pursued. Pelvic CT scan was obtained, which revealed a displaced left femoral head fracture with surrounding soft tissue swelling. CT Scan imaging was carefully considered and justified following

multidisciplinary discussion; when performed, radiation exposure from pelvic CT imaging was minimized using shielding and optimized protocols, keeping exposure well below threshold associated with fetal harm.

Table 1. Laboratory Findings and Imaging Studies

Test	Result	Normal Range / Notes
Hemoglobin (Hb)	11.7 g/dL	12–16 g/dL (female)
Leukocytes	11.560/µL	4.000–11.000/µL
Platelets	237.000/µL	150.000–450.000/µL
SGOT (AST)	68 U/L	< 40 U/L
SGPT (ALT)	62 U/L	< 41 U/L
Creatinine	0.53 mg/dL	0.5–1.1 mg/dL (female)
eGFR	125 mL/min/1.73m²	≥ 90 mL/min/1.73m²
APTT	28.9 seconds	25–35 seconds
PT	13.6 seconds	10–13 seconds
INR	1.03	0.9–1.2
Radiology (X-ray)	No active dislocation observed 	Pre reduction pelvic condition (10 July 2025)
Pelvic CT Scan	Displaced left femoral head fracture 	Consistent with Pipkin Type I fracture (14 July 2025)
Obstetric USG	Single viable intrauterine pregnancy with an estimated gestational age of 11–12 weeks, consistent with biometric measurements 	No fetal abnormalities detected

The patient was scheduled for ORIF (Open Reduction Internal Fixation) Screwing of the left femoral head. This case was managed by using a combined approach, with an ultrasound-guided PENG block, followed by a subarachnoid block. A

unilateral left PENG Block was performed under ultrasound guidance low-frequency curvilinear probe. Local anesthetic (20 mL of 0.25% bupivacaine combined with 5 mg of dexamethasone) was injected into the pericapsular plane between the superior pubic ramus and the psoas tendon. Afterward, that the patient was placed in the left lateral decubitus position, spinal anesthesia was performed at L4–L5 using a 27G Quincke needle, injecting 10 mg of 0.5% hyperbaric bupivacaine, followed by lateral positioning for 15 minutes The procedure lasted 2 hours and 32 minutes, during which hemodynamic parameters remained stable, with an estimated blood loss of 50 mL; detailed intraoperative hemodynamic data are presented in Figure 2.

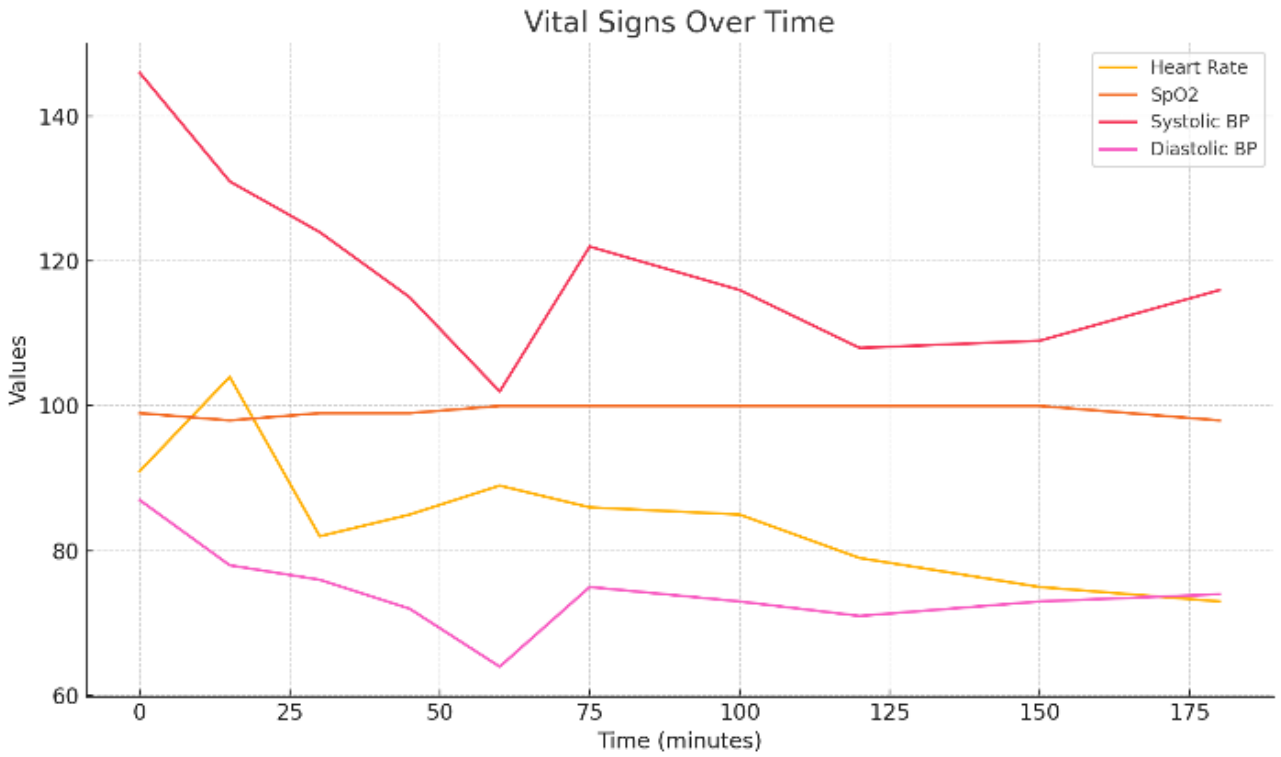


Figure 2. Intraoperative Hemodynamic

Figure 3. Postoperative NRS Score

Postoperatively, the patient remained hemodynamically stable and was transferred to the general ward for continued multidisciplinary monitoring. Analgesia was effective, with NRS scores of 1/10 at rest and 2/10 during movement, maintained with oral paracetamol 500 mg every 6 hours. Importantly, the patient was able to tolerate gentle passive and active-assisted hip flexion without significant pain, facilitating early sitting and bedside mobilization on the first postoperative day. No motor weakness of the quadriceps was observed. Maternal and fetal conditions remained stable throughout hospitalization. She was discharged 2 days after the surgery without any complications. The clinical course of the patient is summarized in Figure 4.

Discussion

The PENG block has recently gained recognition as a targeted regional anesthesia technique for managing pain in femoral head fractures and pelvic trauma. Since its introduction in 2018, clinical reports and observational studies have consistently demonstrated its ability to reduce hip-related pain while preserving motor function.[7]

Evidence on the use of PENG block in pregnant patients remains scarce. Nonetheless, within the broader context of regional anesthesia and concerns about systemic drug exposure in early pregnancy, its application appears justified.

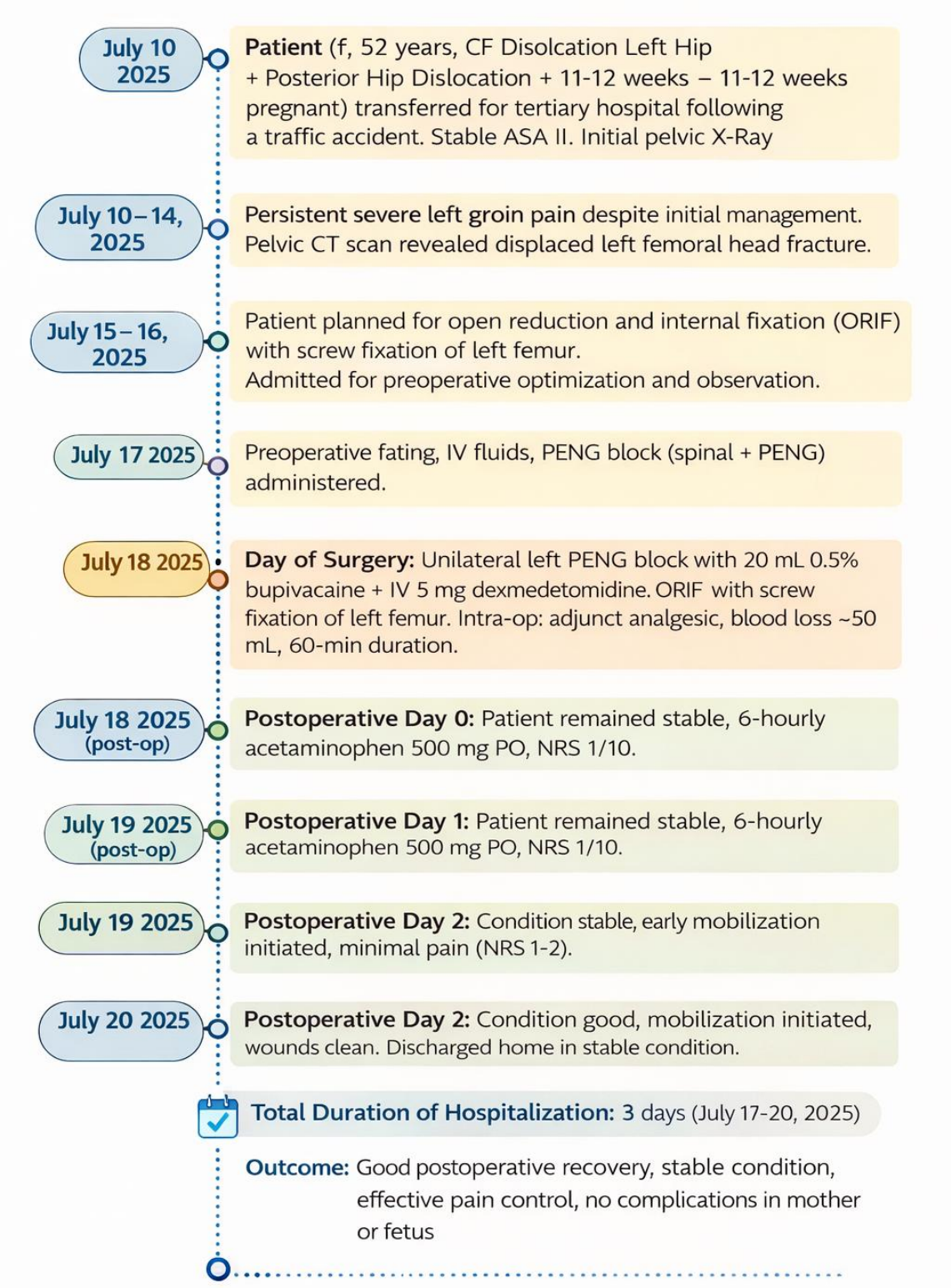


Figure 4. Case Timeline

Observational studies have linked first-trimester NSAID use to increased miscarriage risk, while data suggest opioid exposure may negatively affect fetal neurodevelopment.[1,2] These findings reinforce the importance of minimizing systemic analgesics during this critical stage. Bupivacaine is commonly used in regional anesthesia during pregnancy due to its relatively limited placental transfer when administered in appropriate doses.[8]

Studies in non-pregnant populations further support these benefits. In elderly patients with femoral neck fractures, the PENG block provided faster analgesia, longer pain-free intervals, and reduced opioid use compared with the fascia iliaca compartment block.[9] Similarly, a randomized trial in hip fracture patients showed that ultrasound-guided PENG block with ropivacaine reduced morphine consumption compared with standard care, though analgesia was limited to the early post-block period.[10] In contrast, the present case achieved prolonged pain control with bupivacaine plus dexamethasone, suggesting that adjuvant use may extend block duration—a particularly valuable effect in pregnancy, where systemic drug avoidance is paramount Mechanistically, femoral head fracture pain arises from sensory input via the femoral, obturator, and quadratus femoris nerves. The PENG block targets the interfascial plane between the psoas tendon and superior pubic ramus, and ultrasound-guided deposition of local anesthetic in this space effectively interrupts nociceptive transmission while minimizing systemic absorption. This makes the technique especially suitable for vulnerable populations such as pregnant women.[7] The advantages of this approach include effective analgesia with minimal fetal drug exposure, avoidance of general anesthesia, and facilitation of early mobilization, which reduces postoperative complications such as aspiration pneumonia and thromboembolism.[11] However, limitations include the need for advanced operator skill and ultrasound equipment, as well as the lack of high-quality evidence specifically in pregnant patients. Multidisciplinary collaboration and close fetal monitoring were essential to the favorable outcome in this case.

Supporting evidence from a randomized clinical trial further reinforces the utility of the PENG block. In geriatric patients with proximal femoral fractures, this technique was associated with superior analgesia compared with femoral nerve block during positioning for spinal anesthesia, reflected by significantly lower pain scores and improved patient comfort. Although pregnant individuals were not included, these findings highlight the practical advantage of the PENG block in facilitating regional anesthesia in orthopedic trauma settings.[12]

In conclusion, the PENG block represents a highly effective and appropriate analgesic strategy for pregnant patients with pelvic or hip trauma. Its opioid-sparing and motor-sparing properties, combined with its role in supporting early mobilization, make it particularly valuable when systemic analgesics pose significant fetal risks.

This report has several limitations. As a single case report, the findings cannot be generalized. In addition, long-term maternal and neonatal outcomes were not evaluated.

Acknowledgement

None.

Declaration of Patient Consent

The authors confirm that all necessary patient consent forms have been obtained.

In these forms, the patient(s) provided informed consent for the publication of their images and relevant clinical information in the journal. The patients have been informed that while their names and initials will not be published and reasonable efforts will be made to protect their identity, complete anonymity cannot be guaranteed.

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Conflict of Interest

The author(s) report no conflict of interest.

Data Availability Statement

Deidentified patient data from this case report/series will be made available upon reasonable request to the corresponding author following publication, subject to institutional data-sharing policies and ethics approval.

Author's Contributions

Conceptualization: MAC., IGAGUH. Data curation: MAC. Investigation: MAC. Writing – original draft: MAC. Writing – review & editing: MAC. Supervision: IGAGUH. All authors have read and approved the final version of the manuscript.

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