

## Combined pericapsular nerve group and lumbosacral erector spinae plane blocks for hip hemiarthroplasty in a high-risk elderly patient

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### Abstract

Elderly patients with hip fractures frequently present with severe comorbidities that substantially increase the risks associated with general or neuraxial anesthesia. In particular, severe cardiovascular disease and ongoing anticoagulation may limit anesthetic options. We report the successful use of a multimodal regional anesthesia strategy combining pericapsular nerve group (PENG) block and lumbosacral erector spinae plane (LS-ESP) block to provide surgical anesthesia and analgesia for hip hemiarthroplasty in a highly complex, frail patient. An 87-year-old woman with chronic atrial fibrillation and double mechanical heart valves underwent hip surgery under spontaneous breathing. Effective intraoperative analgesia was achieved with minimal sedation, without respiratory or hemodynamic instability. At the end of surgery, the patient reported complete pain control and remained clinically stable. This case supports the feasibility of combining extended fascial plane blocks as an alternative strategy in selected high-risk patients undergoing major orthopedic surgery.

**Key words:** pericapsular nerve group block; lumbosacral erector spinae plane block; analgesia; pain.

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### Introduction

Severe cardiovascular or respiratory diseases frequently complicate hip fracture surgery in elderly patients. These factors may significantly increase the risks of general anesthesia and may contraindicate neuraxial techniques, particularly when anticoagulation/antiaggregation therapy cannot be safely interrupted.<sup>1</sup>

Nowadays, regional anesthesia techniques preserving spontaneous ventilation and hemodynamic stability are of increasing interest. Fascial plane blocks have emerged as valuable tools for providing perioperative analgesia in orthopedic surgery, due to their favorable safety profile and distance from the neuraxis.<sup>2</sup>

Among these, the pericapsular nerve group (PENG) block provides motor-sparing analgesia to the anterior hip capsule, while the lumbosacral extension of the ESP (LS-ESP) block may allow coverage of both lumbar (approaching by proxy lumbar plexus) and sacral components relevant to covering both anterior and posterior hip structures.<sup>3,4</sup>

We describe a case in which a regional anesthesia-based technique (combined PENG and LS-ESP block) with minimal sedation enabled hip hemiarthroplasty surgery under spontaneous breathing in a highly complex patient.

The patients' written consent was obtained for the preoperative placement of a combination of PENG block and LS-ESP block to provide intraoperative and postoperative pain control.

### Case Report

An 87-year-old woman (weight 70 Kg, height 160 cm, body mass index [BMI] 27 Kg/m<sup>2</sup>) was admitted for surgical treatment of a proximal femoral fracture. Her medical history was significant for cerebrovascular disease, non-Hodgkin's lymphoma, chronic obstructive pulmonary disease, chronic atrial fibrillation, permanent pacemaker implantation, and double mechanical heart valve replacement involving both the aortic and mitral valves. The patient was receiving long-term anticoagulation with warfarin, which was discontinued only two days prior to surgery, with bridging anticoagulation using enoxaparin.

Given the patient's severe cardiovascular comorbidities and the ongoing anticoagulation, an anesthetic strategy based on peripheral and fascial plane regional anesthesia was planned. Standard monitoring was applied on arrival in the operating room. Premedication consisted of intravenous midazolam 1 mg. An ultrasound-guided PENG block was performed using an in-plane approach and injecting 20 mL of plain 0.3% ropivacaine to provide analgesia of the anterior hip capsule. Subsequently, the patient was positioned on lateral decubitus on the contralateral side, and an LS-ESP block was performed at the L1 and S1 levels. At each level, 20 mL of plain 0.3% ropivacaine was injected. A convex ultrasound probe was used for the blocks. Surgical incision was made 30 minutes after completion of the regional anesthesia techniques. Sensory assessment demonstrated unilateral dermatomal coverage ranging from T12 to

S3 level. Additional local analgesia was provided by subcutaneous infiltration at the surgical incision site with 5 mL of 1% mepivacaine. The procedure was conducted with the patient under spontaneous breathing with supplemental oxygen delivered via nasal cannulae at 4 L·min<sup>-1</sup>. Intraoperative sedation was required only during limb dislocation and was achieved using intravenous ketamine administered in three different 10 mg boluses (total dose 30 mg). No intraoperative opioids were administered. The surgical procedure lasted 75 minutes and was completed without clinically relevant respiratory or hemodynamic instability. At the end of surgery, the patient was transferred to the ward with a visual analogue scale (VAS) pain score of 3 and with an Aldrete score of 10. Postoperatively, pain was assessed at predefined intervals (6, 12, 24, and 48 hours) using a VAS pain score <3. Only intravenous paracetamol 1 g 3 times a day was administered, without perioperative complications.

## Discussion

Hip fracture surgery in frail elderly patients represents a significant anesthetic challenge, particularly in the presence of multiple comorbidities. This case highlights the potential role of combined fascial plane blocks in providing not only analgesia but also as a component of surgical anesthesia in carefully selected patients.<sup>5,6</sup> Fascial plane blocks are more often used in orthopedics and in combination to cover more consistently anatomic regions subject to many nerves.

The rationale for the association of PENG and LS-ESP blocks lies in their potential complementary anatomical targets.<sup>7</sup> The PENG primarily addresses the antero-lateral aspect of the hip capsule (articular rami of femoral and obturator nerves), while the dual-level (lumbosacral) ESP block is intended to gain extensive analgesic coverage involving the lumbar plexus and sacral roots. Performing the ESP block at both L1 and S1 levels may enhance longitudinal cranio-caudal spread, facilitating overlap between lumbar and sacral territories relevant to hip innervation.<sup>4</sup> PENG block also facilitated the lateral positioning of the patient, considering that surgery was conducted in the same lateral position. This approach allowed avoidance of neuraxial anesthesia in an anticoagulated patient and minimized the need for systemic sedatives or opioids. The preservation of spontaneous ventilation and hemodynamic stability is particularly relevant in elderly patients with severe cardiovascular disease.<sup>8</sup>

## Conclusions

This combined regional anesthesia strategy using PENG and LS-ESP blocks cannot yet be considered a standard technique for

hip surgery. It may represent an option in exceptional circumstances and should not replace established anesthetic approaches. Nevertheless, this case adds to the growing body of evidence supporting the expanding role of the LS-ESP block beyond postoperative analgesia. We found the combination of LS-ESP and PENG blocks to be highly successful in our case, overcoming the limitations of neuraxial techniques and the risks of general anesthesia and providing long-lasting postoperative analgesia (up to 48 hours). Further studies are required to define the reliability and reproducibility of this strategy, along with optimal dosing strategies of combined fascial plane blocks for major orthopedic procedures.

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