Combined Fascia Iliaca Catheter and Transgluteal Sciatic Block with Liposomal Bupivacaine for Below-Knee Amputation

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Introduction

Regional anesthesia is central to multimodal analgesia for lower-extremity amputation. Altered anatomy following prior vascular interventions may preclude standard femoral, adductor canal, or popliteal sciatic approaches. Liposomal bupivacaine (LB) received FDA approval for adductor canal and popliteal sciatic blocks in 2023, yet its utility in other lower extremity blocks remains undefined. We present a medically challenging case where a fascia iliaca (FI) catheter and transgluteal sciatic block with LB provided surgical anesthesia and prolonged analgesia.

Case Report

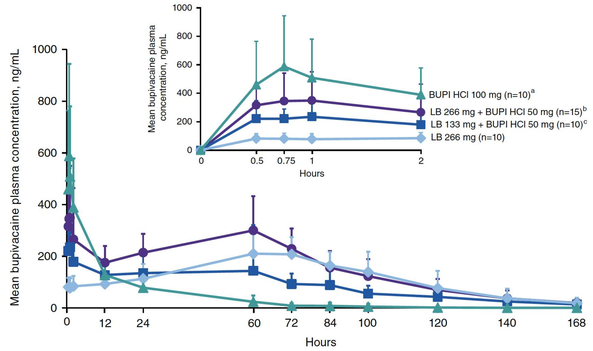
A 59-year-old male with advanced peripheral arterial disease presented for below-knee amputation (BKA). Extensive scarring and distorted anatomy from prior revascularization precluded safe performance of popliteal sciatic, femoral, or adductor canal blocks.

- **Fascia Iliaca block using 30 mL of 0.25% ropivacaine with indwelling catheter for femoral nerve coverage**
- **Transgluteal sciatic nerve block with 15 mL of 0.5% bupivacaine and 10 mL of 1.33% liposomal bupivacaine.**

The combined approach produced adequate surgical anesthesia, allowing the patient to undergo BKA with moderate-to-deep sedation using a propofol infusion and without general anesthesia or airway instrumentation. The patient reported no pain in the post-anesthesia care unit and did not require systemic opioids immediately postoperatively.

- Postoperative Day 1 (POD 1), patient had worsening pain that improved by increasing the dose of local anesthetic through the FI catheter + multimodal analgesics.
- The FI catheter remained in place for several days, delivering intermittent boluses of dilute local anesthetic, and multimodal analgesia was continued.
- The catheter was removed on POD 3 and the patient had adequate analgesia until discharge. The patient maintained acceptable pain control throughout the inpatient course.
- No complications occurred, including no signs of local anesthetic systemic toxicity (LAST), catheter malfunction, or block failure. The patient's sensory and motor exams returned to preoperative baseline.

Figures and Tables



Reference Toxic Plasma Threshold
Bupivacaine ≈ **2000 ng/mL**.[4]

Figure 1. Mean plasma bupivacaine concentration following popliteal sciatic nerve block with liposomal bupivacaine (LB) compared with bupivacaine HCl alone. Plasma concentrations remained well below the systemic toxicity threshold. Adapted from Sessler et al.[1]

Observed mean plasma bupivacaine concentration profiles—population pharmacokinetic modeling. Error bars are the standard deviation.
Inset shows mean plasma concentration from 0 to 2 h. an = 9 at 72 and 96 h. bn = 14 at 0, 0.5, and 96 h; n = 12 at 12 and 84 h; n = 11 at 24 h; and n = 10 at 60 and 72 h. cn = 9 at 0.75, 1, 72, and 96 h; n = 8 at 144 and 168 h; and n = 7 at 24 h. BUPI HCl, bupivacaine hydrochloride; LB, liposomal bupivacaine.

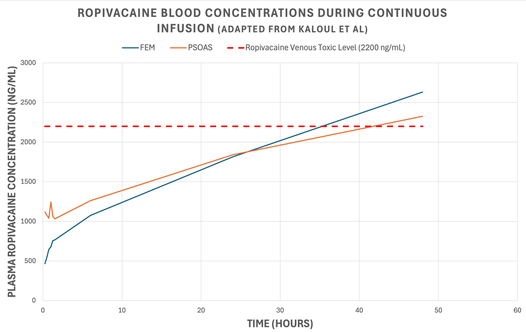


Figure 2. Mean plasma ropivacaine concentration during continuous infusion of 0.2% ropivacaine at 12 mL/hr for continuous lumbar plexus blockade using anterior and posterior psoas compartment techniques. Adapted using data from Table 2 in Kaloul et al.[2] Toxic venous levels adapted from Muller et al.[3] and Knudsen et al.[4]

TABLE II Ropivacaine blood concentrations during continuous infusion

	FEM (n = 11)	*PSOAS (n = 11)*
Plasma concentrations (ng·mL^{-1}) *		
15 min	465.8 ± 420.3	1,119.6 ± 531.3†
30 min	547.3 ± 422.6	1,077.4 ± 491.7‡
45 min	645.9 ± 393.9	1,039.9 ± 416.7
60 min	679.1 ± 407.2	1,244.4 ± 607.6§
75 min	755.7 ± 481.6	1,063.4 ± 373.1
90 min	766.2 ± 449.7	1,032 ± 339.1
Six hours	1,074.4 ± 500.2	1,261 ± 308.8
24 hr	1,815.5 ± 1034.3	1,840 ± 366.8
48 hr	2,630.9 ± 1470.3	2,325.1 ± 604.2
AUC (mg·hr^{-1}·L^{-1})	452.4 ± 253.6	433.4 ± 99.0

*$P < 0.0001$, two-way analysis of variance for plasma concentrations between groups over 48 hr; †$P = 0.0125$; ‡$P = 0.039$; §$P = 0.0357$. AUC = area under the curve for 48 hr; FEM = group receiving continuous femoral three-in-one infusion; PSOAS = group receiving continuous posterior lumbar plexus (psoas compartment) infusion. All values are expressed as mean ± standard deviation.

Figure 3. Mean blood ropivacaine concentration during continuous infusion of 0.2% ropivacaine at 12 mL/hr over 48 hours. Adapted from Kaloul et al. [2]

Discussion

1. Liposomal bupivacaine provides prolonged analgesia with lower systemic plasma concentrations compared to continuous perineural infusion.

- Sessler et al. demonstrated that a popliteal sciatic nerve block with LB provided a prolonged sensory nerve block with plasma bupivacaine concentrations well below the toxic threshold.[1]
- Kalouli et al. demonstrated that 0.2% ropivacaine infusion can accumulate over 48 hours and can lead to toxic levels.[2]
- Total plasma concentrations progressively increased with continuous infusions, but unbound local anesthetic – the fraction most closely associated with systemic toxicity – was not measured.

2. Transgluteal sciatic LB appears safe despite proximal injection outside the FDA-studied popliteal space

- Although transgluteal sciatic administration of LB is off-label, pharmacokinetic and safety data from popliteal sciatic studies support low systemic exposure and prolonged analgesia.

3. POD 1 pain may reflect differential nerve coverage or proximal block dynamics.

- FI catheter spreads within a potential space with indirect contact with the femoral nerve.
- Distribution may be inconsistent and may be volume-dependent, requiring an increase in infusion rate and/or intermittent boluses in order to provide adequate density.

4. Clinical Implication:

- Combined proximal regional strategies may provide a viable alternative when distal anatomy precludes standard BKA blocks.
- LB can be used safely for surgical anesthesia analgesia and postoperative analgesia in a transgluteal sciatic block, though duration of block may be shorter than with LB in a popliteal sciatic block.

References

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