

Subepineural Injection in Patient With Reduced Cardiac Function and ESRD Undergoing Bilateral BKA for Gangrene and Osteomyelitis

Rasheed Ivey, MD, Jonathan Hausman, MD
Department of Anesthesiology
Cedars-Sinai Medical Center, Los Angeles

Background

- Paraneural injections are considered safer than subepineural injections thus this technique is more traditionally used by regional anesthesiologist, particularly when large volumes of local anesthetic (LA) are administered
- Subepineural injection allows for a lower volume of LA and less risk of complications while also achieving surgical analgesia

Patient Presentatiion

- 40 year old female (44kg, 5' tall, BMI 25) who presented in severe sepsis due to bilateral diabetic foot infection with wet gangrene, leukocytosis, tachycardia, hypoglycemia and worsening foot pain. Surgery recommended bilateral below knee amputation for source control, and definitive management
- PMH: T1DM, ESRD on HD, CAD s/p CABG (2020), HFrEF (30% prior to admission, 15% at time of procedure), s/p ICD placement, dilated RV, mildly elevated PA pressures, PAD, wet gangrene and R foot osteomyelitis
- Based on patient history of CHF and ESRD, a regional anesthetic technique was considered to confer less risk as compared to general anesthesia
 - End Stage Renal Disease (ESRD) affects absorption, distribution, metabolism and elimination of many commonly used anesthetic agents, including local anesthetics, resulting in reduced clearance of their metabolites
 - Given the patients limited weight and ESRD, our primary concern is that elevated peak plasma concentrations could lead to adverse effects, including local anesthetic systemic toxicity (LAST)
 - Additionally, patients with ESRD are often in an acidotic state, which can delay the onset of action and reduce the effectiveness of the LA at its target site

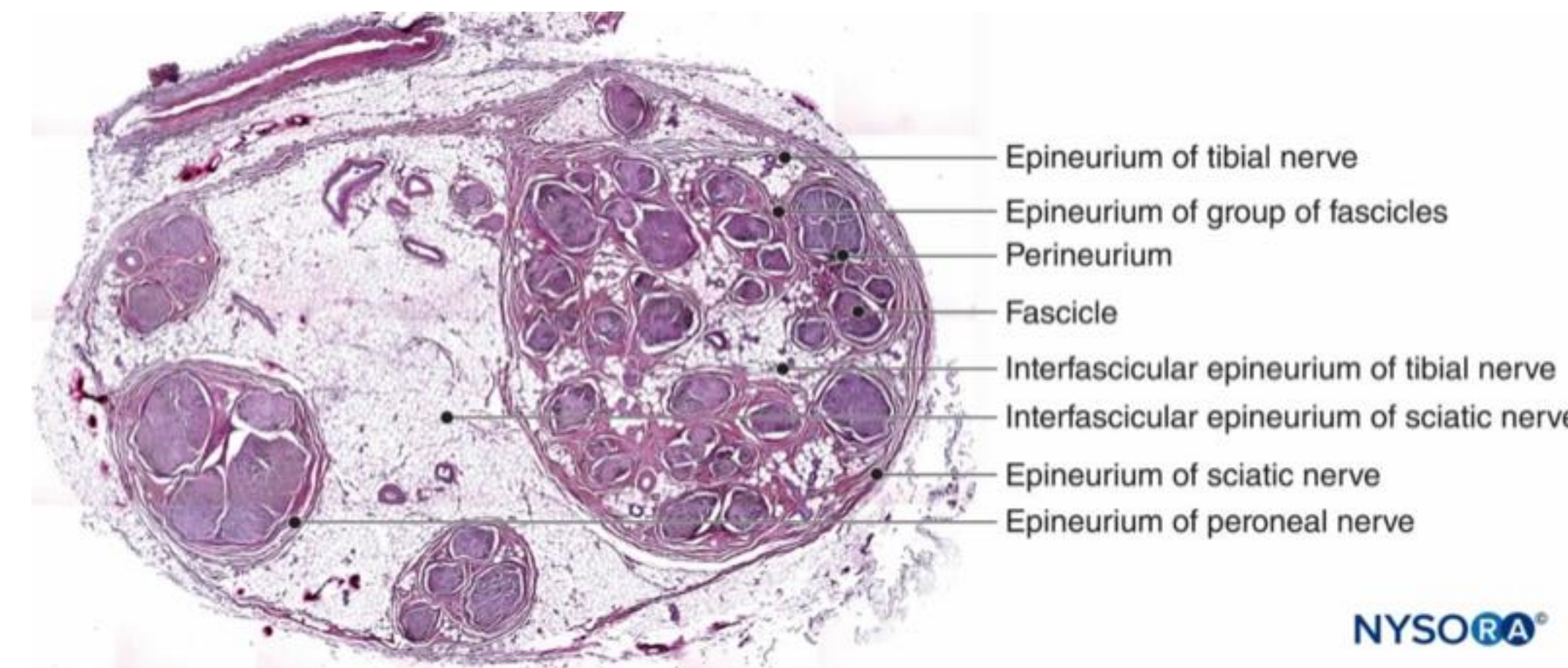


Figure 1: Sciatic Nerve at popliteal Fossa



Figure 2: POCUS Right Popliteal Sciatic Subepineural Injection

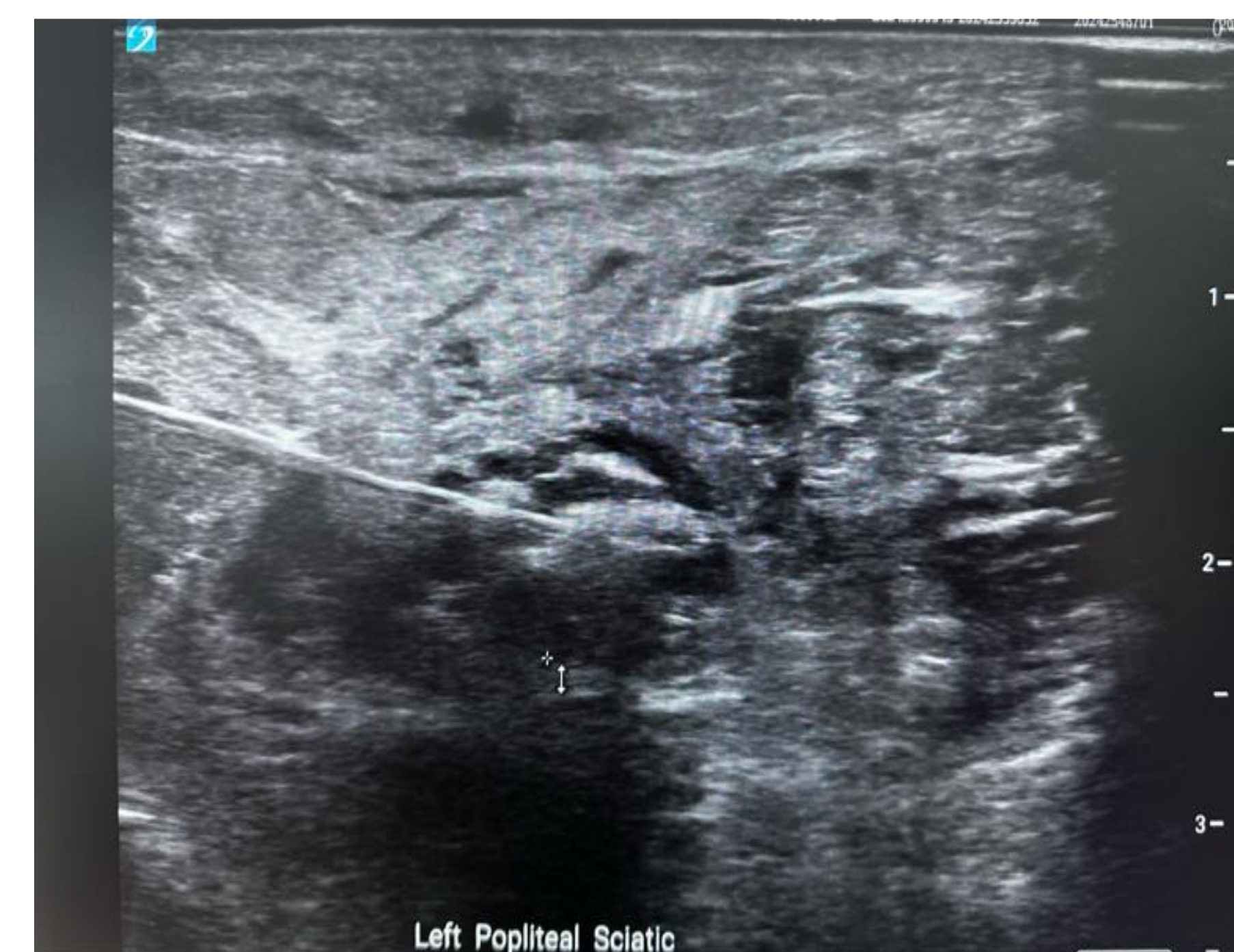


Figure 3: POCUS Left Popliteal Sciatic Subepineural Injection



Figure 4: POCUS Right Adductoir Canal Subepineural Injection



Figure 5: POCUS Left Adductor Canal Subepineural Injection

Methodology

- Ultrasound guided bilateral subepineural sciatic nerve block at the popliteal fossa and bilateral subepineural saphenous nerve blocks at the adductor canal
- 0.5% Ropivacaine (+1: 200,000 Epinephrine) was chose due to its lesser cardiotoxic profile
- The literature varies regarding max. dose ranging from 3mg/kg to 3.5mg/kg placing the max. dose for this patient between 132mg and 154mg
 - Total administered:** 20mL (100mg)
 - Right popliteal: 7mL Ropivacaine + Epinephrine (fig. 2)
 - Left popliteal : 7mL Ropivacaine + Epinephrine (fig. 3)
 - Right Adductor: 3mL Ropivacaine + Epinephrine (fig.4)
 - Left Adductor: 3mL Ropivacaine + Epinephrine (fig.5)

Discussion

- This case highlights multiple considerations for patients with extensive comorbid conditions, when evaluating for peripheral nerve blocks
- Understanding pharmacokinetics of the LA and the risk they pose in critical patient populations is key
- As an alternative means of limiting the risk of LAST we considered staggering the regional nerve blocks between operative sites as well and staging surgical intervention over the course of multiple days
- Given patient size and multiple comorbidities, risk/benefit of subperineural injection over more traditional subparaneural injections allowed for reduction in total volume of LA, conversely reducing risk of LAST and cardiotoxicity

References

- Diwan S, Nair A, Sancheti P, Zundert AV. Does subepineural injection damage the nerve integrity? A technical report from four amputated limbs. Korean J Pain. 2021 Jan 1;34(1):132-136. doi: 10.3344/kjp.2021.34.1.132. PMID: 33380576; PMCID: PMC7783848.
- Nupur N Uppal, Mital Jhaveri, Susana Hong, Linda Shore-Lesserson, Kenar D Jhaveri, Hassan Izzedine, Local anesthetics for the Nephrologist, *Clinical Kidney Journal*, Volume 15, Issue 2, February 2022, Pages 186–193, <https://doi.org/10.1093/ckj/sfab121>
- Figure 1: Sciatic nerve at the level of popliteal fossa. Hematoxylin-eosin. (Reproduced with permission from Reina MA, De Andres JA, Hernández JM, et al: Successive changes in extraneural structures from the subarachnoid nerve roots to the peripheral nerve, influencing anesthetic block, and treatment of acute postoperative pain. Eur J Pain. Suppl 2011;5(2):377-385.)