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'SCALD-ED' BLOCK: SUPERFICIAL CUTANEOUS ANESTHESIA IN A LATERAL LEG DISTRIBUTION WITHIN THE EMERGENCY DEPARTMENT – A CASE SERIES

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☐ **Abstract—Background: In the midst of a nationwide opioid epidemic, focus has been placed on identifying and utilizing safe, effective opioid-free analgesic alternatives. Lower-extremity peripheral nerve blockades are common and often involve both motor and sensory anesthesia, resulting in leg weakness and ambulatory difficulty. The aim of this case report is to describe an ultrasound-guided peripheral nerve block technique (superficial cutaneous anesthesia in a lateral (leg) distribution within the emergency department ['SCALD-ED' block]) that provides motor-sparing, purely sensory anesthesia after a superficial injury to the lateral leg in patients presenting to the emergency department. Discussion: Two separate patients presenting with lateral leg pain after superficial injury (burn, cellulitis) reported continued breakthrough pain despite a standard analgesic modality of combination acetaminophen and ibuprofen. With the patient placed in prone position for ultrasound-guided access to lower-extremity nerve branches, the lateral sural cutaneous nerve (LSCN) was identified by tracing its pathway from the proximal sciatic nerve to the common peroneal (fibular) nerve to the superficial peroneal (fibular) nerve. Five mL of lidocaine (1%, with epinephrine) was injected along the superficial LSCN route for anesthetic blockade. Temporal assessments of anesthetic effect and pain improvement, and monitoring of motor or ambulatory impairment were conducted at regular intervals to assess the efficacy and feasibility of the blockade. Regional anesthesia along the LSCN sensory distribution was experienced at 7–9 min post blockade. Peak analgesic effect was experienced at 25–29 min. The duration of anesthesia was 120–150 min. A negligible amount of delayed sensory anesthesia was noted along the distal sural nerve distribution. No motor deficit, ambulatory difficulty, or adverse effects were experienced in either patient post blockade. Conclusion: The LSCN is an identifiable target under ultrasound guidance, susceptible to localized, purely sensory blockade of pain from superficial cutaneous lateral leg injuries.**

☐ **Keywords—regional anesthesia; ultrasound-guided; lateral sural cutaneous; leg injury; burns; pain**

INTRODUCTION

In the midst of a nationwide opioid epidemic, focus has been placed on identifying and utilizing safe, effective, opioid-free analgesic alternatives. Compared with oral or parenteral analgesic regimens, peripheral nerve blockades offer the advantage of localized pain relief and are considered a part of a multimodal approach to analgesic management. Technological advancements in sonographic imaging have resulted in high-resolution ultrasound-guided nerve blocks that offer improved anatomical identification, safety, and efficacy in administering successful blockade (1,2). Peripheral nerve blockades offer an advantage for cutaneous injuries where localized (vs. systemic) analgesia may be preferable to avoid adverse and unwanted systemic side

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effects. Throughout the lower extremities, there are a number of targets that may be considered for localized sensory anesthesia (3).

The common sural nerve is a well-studied target for regional sensory anesthesia in distal lower-extremity injuries, particularly the foot (4,5). Additionally, proximal sciatic nerve blocks can be used for fractures and deep lacerations of the lower extremity, providing both motor and sensory anesthesia (6,7). However, a literature review found no evidence to support the localized anesthesia of either the medial sural cutaneous nerve (MSCN) or lateral sural cutaneous nerve (LSCN) sensory distribution branches of the sural nerve. Interestingly, sensory mononeuropathy in a lateral leg distribution due to nerve entrapment of the LSCN has been reported (8). The objective of this case series was to assess the feasibility of a regional, purely sensory blockade of the LSCN with minimal anesthetic as a safe and effective ultrasound-guided technique for managing pain.

CASE REPORTS

Case 1

A 37-year-old man presented with left lower leg pain after a superficial burn. The patient contacted an exposed surface of his lower leg to an open grill. Physical examination showed a 4-cm second-degree burn below his lateral fibular head with extensive charcoal debris caught within the tissues and no external evidence of deeper tendon injury. The patient was given 400 mg ibuprofen and 975 mg acetaminophen upon arrival. Despite the analgesic regimen, the patient described 10/10 sharp, burning pain over the wound, with significant pain during minor superficial wound exploration and debridement. The decision was made to provide regional anesthesia with a lateral sural cutaneous nerve block (SCALD-ED block) prior to wound irrigation and assessment to effectively manage the patient's pain.

Case 2

A 26-year-old man presented with lateral leg pain from suspected cellulitis. Physical examination showed a 2 × 3 cm area of erythema on the lateral aspect of his lower leg, just below the knee. The region was markedly tender with discrete borders. The patient was given antibiotics and a combination of 400 mg ibuprofen and 975 mg acetaminophen upon arrival, but the pain persisted. Regional anesthesia was provided with a SCALD-ED block proximal to the site of infection, resulting in significant improvement of pain.

Anatomy of the Lateral Sural Cutaneous Nerve

As the sciatic nerve travels through the posterior compartment of the thigh, it enters the popliteal fossa before dividing into two branches: the tibial nerve (TN) and common peroneal (fibular) nerve (CPN) (Figure 1) (9). Whereas the TN maintains its downward trajectory between the medial and lateral gastrocnemius extending into the deep posterior compartment of the leg, the CPN travels lateral to the gastrocnemius and wraps around the neck of the fibula, before diving distally toward the lateral malleolus. Several centimeters distal to the sciatic division, the CPN divides into the deep peroneal nerve (DPN) and superficial peroneal nerve (SPN) (Figure 1). The DPN wraps around the lateral fibular head before coursing deep into the anterior compartment to supply motor innervation to the leg. The SPN gives rise to the LSCN before continuing on into the lateral

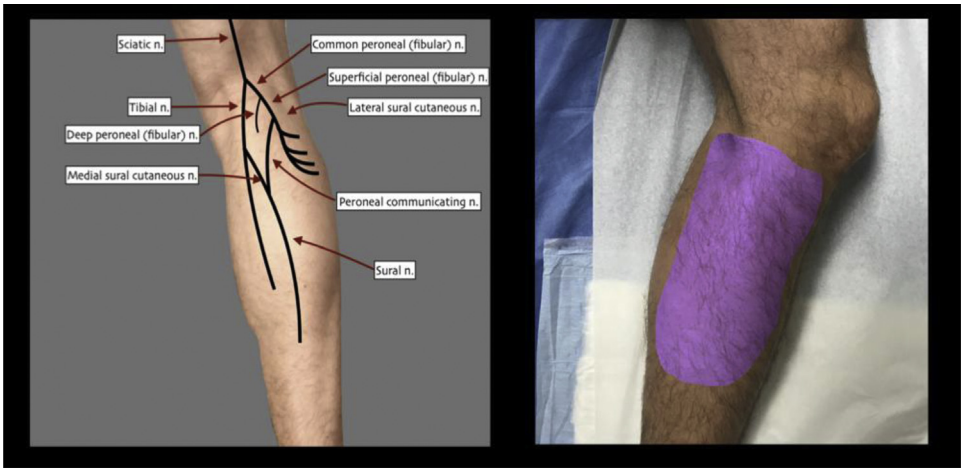

Figure 1. Sciatic nerve branches.

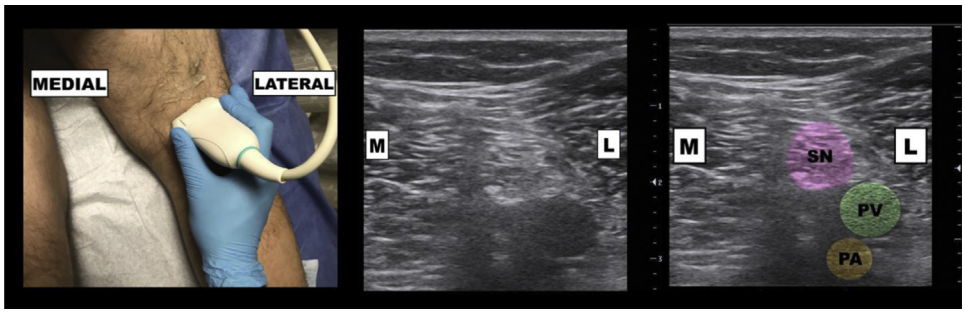

Figure 2. Sciatic nerve identification. SN = sciatic nerve; PV = popliteal vein; PA = popliteal artery.

compartment of the leg as the peroneal communicating nerve (10). Following the sciatic division, the TN gives rise to an MSCN branch that ranges toward the medial leg. As MSCN and LSCN course distally along the surface of the posterior gastrocnemius, the two branches maintain a merging trajectory and coalesce to form the sural nerve.

Whereas the communication of the LSCN and MSCN results in a common cutaneous innervation of the distal lower leg, the individual MSCN and LSCN branches offer their own individual cutaneous innervation prior to the communication. The MSCN supplies cutaneous innervation to the area overlying the medial gastrocnemius, and the LSCN supplies innervation over the lateral leg distal to the fibular head (Figure 1). Of significance, there is no motor component to the LSCN, MSCN, or sural nerve (10,11).

Advantages of an LSCN Block

The anatomic location of the LSCN is superficial, making it relatively easy to locate with the high-frequency (5–10 MHz) linear ultrasound transducer. The superficial location also allows for a shallower penetration with the injection needle and clear visualization of injectate as it bathes the surrounding nerve. Additionally, the small nerve diameter, superficial location, and relatively tight compartment of the posterior leg require a smaller minimal effective volume–that is, the minimal volume of anesthesia needed to abolish sensory modalities (12,13). As with all peripheral nerve blocks, there is also the advantage of a localized form of pain relief, preventing systemic loading of analgesic medication and improved door-to-analgesia timing (14,15). Lastly, the LSCN has strictly cutaneous innervation, avoiding any significant undesired distal extremity motor paralysis. The SCALD-ED block may be considered for several potential indications including burns, laceration repair, wound irrigation, abscess drainage, and cellulitis pain.

Ultrasound guidance provides further safety and efficacy in administering the nerve block (2,15,16). As compared with anatomical landmark localization in which one-third of nerve blocks fail, ultrasound guidance has demonstrated up to 95% block success (15). Ultrasound offers direct needle visualization, a reduced risk of systemic toxicity, and improved analgesic effectiveness, making it essential in the emergency setting (17).

Contraindications to a SCALD-ED Block

Absolute contraindications to the LSCN block—similar to all nerve blocks—include patient refusal and allergy to anesthesia (18). Relative contraindications include overlying infection at the injection site, coagulopathy, known neuropathy or neurologic damage in the extremity being treated, and a history of adverse reaction to

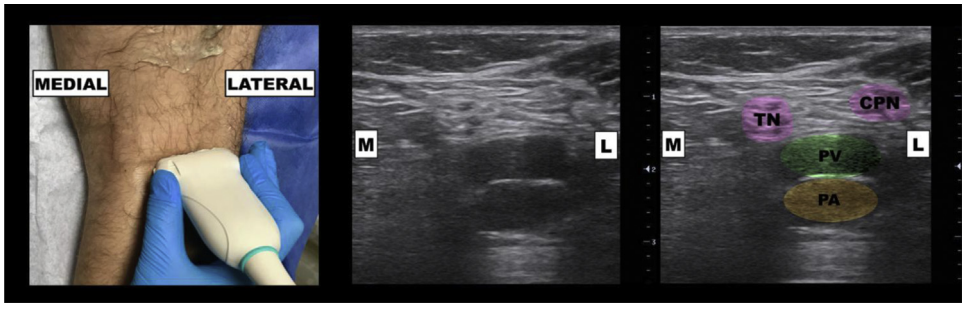

Figure 3. Common peroneal nerve identification. TN = tibial nerve; CPN = common peroneal nerve; PV = popliteal vein; PA = popliteal artery.

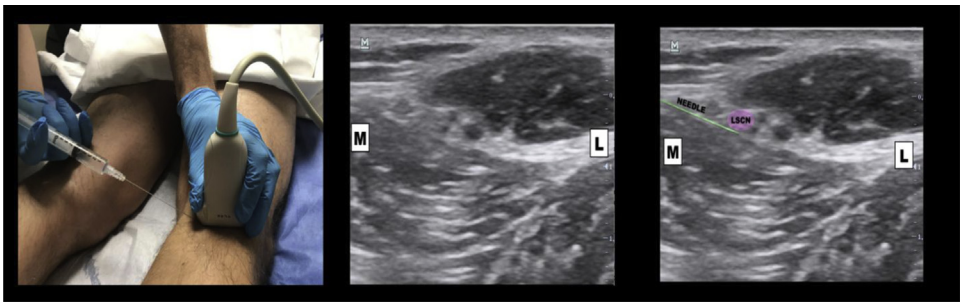

Figure 4. Anesthetic injection. LSCN = lateral sural cutaneous nerve.

anesthetics, including cardiovascular or neurological side effects (18–20).

Ultrasound-Guided LSCN Localization and Blockade

The sciatic nerve (SN) is identified by placing the linear high-frequency (5–10 MHz) ultrasound transducer approximately 20 cm superior to the popliteal fossa. The SN is visualized by identifying its superficial location to the popliteal vein and popliteal artery (Figure 2). The SN is tracked distally into the popliteal fossa until sciatic division into the TN medially and the CPN laterally is visualized (Figure 3).

The CPN division is tracked distally approximately 6–8 cm until the separation of the DPN and the SPN/lateral sural cutaneous nerve is visualized. As opposed to the DPN, which dives deep, the SPN and lateral cutaneous nerve remain in plane and in open display for analgesic targeting. (Note: if the LSCN is not directly visualized, its location can be estimated as 1–2 cm distal to the separation from the DPN).

The LSCN is approached with a 22–25-gauge injection needle tracing medial to lateral, dividing through planes while maintaining visualization of the needle and surrounding vasculature (Figure 4).

Once the location of the needle along the inferior border of the LSCN is obtained, aspiration is applied to ensure no vascular penetration. Upon confirmation and visualization of the needle tip, 5 mL of anesthetic (e.g., lidocaine 1%) is administered, bathing the undersurface of the target nerve.

DISCUSSION

The SN was easily identifiable under ultrasound guidance, and the bifurcation between the TN and CPN was visible just distal to the popliteal fossa in both patients. A bifurcation occurred approximately 2.5 cm distal to the SN bifurcation along the CPN, marking the separation of the DPN from the SPN/LSCN. In each case, the SPN/LSCN was tracked distally an additional 4 cm to where the LSCN was identified and isolated. A slow infusion of 5 mL lidocaine 1% was used to bathe the inferior surface of the LSCN. Using ultrasound guidance, both muscle and vasculature were circumvented and LSCN localization achieved.

In each case, regional anesthesia along the LSCN sensory distribution was experienced within 10 min post injection. Peak analgesic effect occurred at 25–29 min post injection. The duration of LSCN distribution anesthesia was 120–150 min. The onset and duration achieved in each case are consistent with the previously reported pharmacokinetics of lidocaine anesthesia with epinephrine (21).

At approximately 45 min post injection in case 2, mild anesthesia was experienced along the lower aspect of the lateral leg as well as the lateral foot, consistent with sural nerve distribution of the foot (22,23). We hypothesized that a slow diffusion of lidocaine from the initial injection site spread to the surrounding nerves, resulting in a nominal distal extremity numbness consistent with the sural nerve distribution (suspected diffusion of anesthesia in association with the close proximity of the LSCN to the peroneal cutaneous and MSCN). No discomfort, motor deficit, or ambulatory difficulty were experienced secondary to the diffusion effects, limiting concern for this result. (Note: Bupivacaine may serve as a superior anesthetic in practice due to its increased duration. However, lidocaine 1% was used for this analysis due to its consistent availability in our emergency department compared with bupivacaine.)

CONCLUSION

The use of the SCALD-ED block was successfully achieved with the described technique in two separate cases of lateral cutaneous leg pain. Though the nerve block resulted in mild anesthesia outside of our targeted area, the effect was negligible and did not result in discomfort or motor deficit secondary to the diffusion effect. Based on the limited discomfort, successful anesthesia with minimal anesthetic, and absence of motor paralysis, the SCALD-ED technique described is safe

and effective in providing localized anesthesia for superficial cutaneous injury to the lateral leg.

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ARTICLE SUMMARY

1. Why is this topic important?

Pain is the chief complaint of over 100 million patients presenting to the emergency department each year. Peripheral nerve blockade offers a safe, effective, localized, nonopioid form of analgesia for use in moderate to severe pain presentations.

2. What does this article attempt to show?

An ultrasound-guided lateral sural cutaneous nerve (LSCN) blockade for superficial lateral leg injuries is a safe, effective technique for providing purely sensory analgesia using a minimal amount of anesthetic.

3. What are the key findings?

The ultrasound-guided LSCN blockade (SCALD-ED block) was successful in achieving extended analgesic relief of lateral leg pain unresponsive to first-line analgesics without motor paralysis or other adverse effects.

4. How is patient care impacted?

The SCALD-ED block offers another safe, effective, non-opioid analgesic tool that can be used to address patient pain in an emergency setting.