

Vanishing Phantom Limb Pain Following Adductor Canal and Sciatic Nerve Block with Peripheral Nerve Catheter Infusion

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Case Discussion

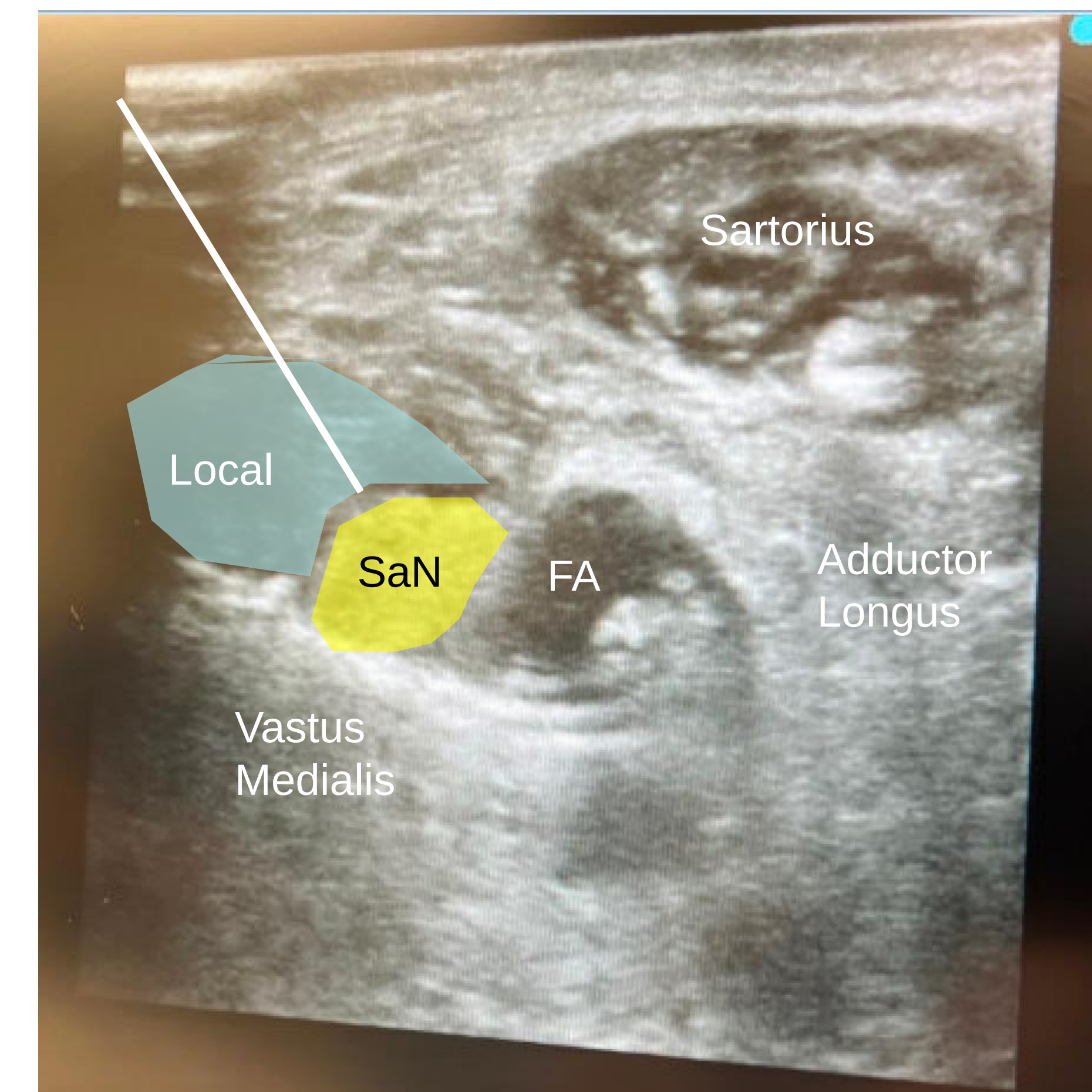
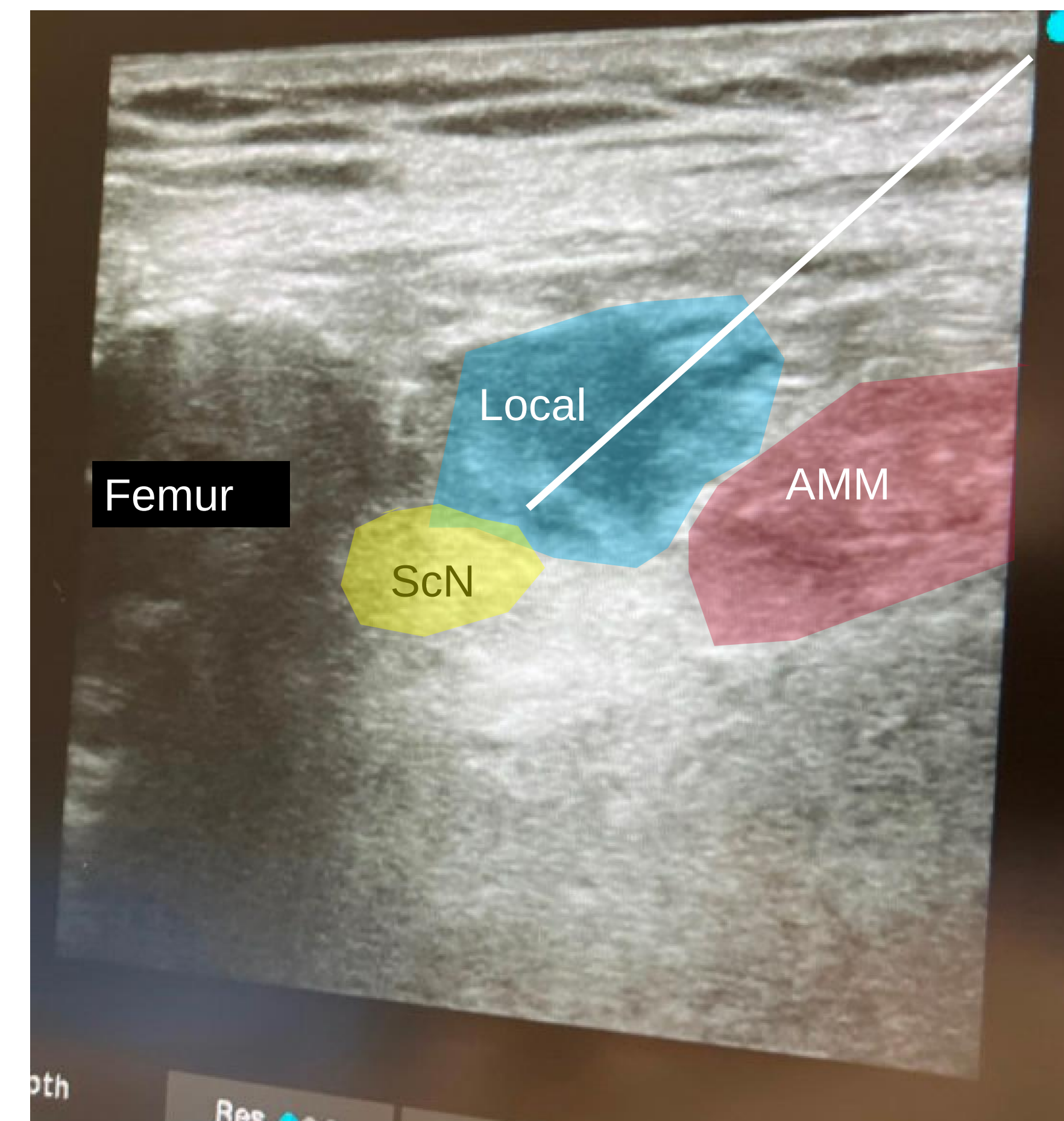
We present the case of 67-year-old male with a complex history including end-stage renal disease, heart failure, cerebrovascular disease, and significant peripheral arterial disease status-post bilateral below-the-knee amputations more than a year previously, who presented for elective surgical debridement of a chronic wound on the left lower limb stump. The patient suffered from chronic residual neuropathic and phantom limb pain following failed pharmacologic, surgical, and functional therapy.

Ultrasound-guided adductor canal and sciatic nerve blocks with 10 cc of 0.5% bupivacaine were used for surgical anesthesia, and peripheral nerve catheters were placed at these sites for postoperative analgesia. The patient was placed under sedation with dexmedetomidine and propofol and underwent wound debridement.

Postoperatively the patient experienced excellent pain control with a continuous infusion of 14 cc/hr of 0.1% bupivacaine for three days. At his post-operative visit he reported complete resolution of his chronic residual neuropathic and phantom limb pain despite minimal improvement in wound healing. Of note, this patient also received sedation with dexmedetomidine, which has been shown to decrease the rate of perioperative PLP in patients undergoing amputation, but this effect has not been studied in treatment of chronic PLP.

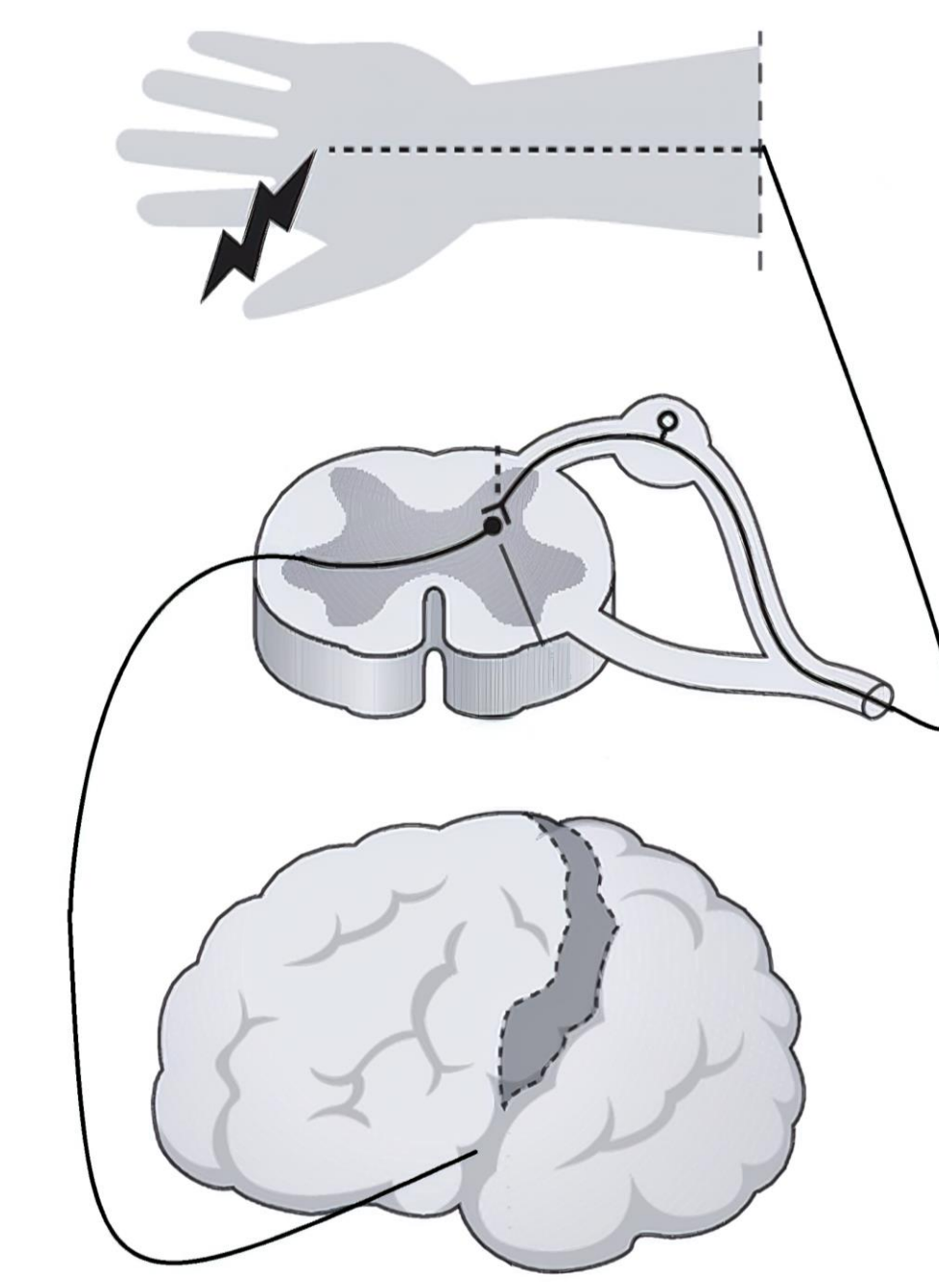
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Ultrasound images of sciatic (left) and Adductor Canal (right) nerve blocks with labeled simulated needle paths. Abbreviations used: FA - Femoral Artery, AMM - adductor magnus muscle, SaN-saphenous nerve, ScN - sciatic nerve.

Proposed Mechanisms of Phantom Limb Pain



(Nikolajsen, 2012)

Peripheral Mechanisms

- Severed peripheral nerves form disorganized growths called neuromas
- Neuromas have high sodium channel activity and spontaneous activation resulting in stump and phantom limb pain
- Blocking these channels reduces pain, but PLP can persist after neuroma removal

Spinal Cord Mechanisms

- Disorganized growth of severed nerves in the dorsal root ganglion can affect neighboring nerves, leading to regional hyperexcitability and sensitization
- This process can also disrupt descending inhibitory signals leading to amplified pain

Cerebral Mechanisms

- Extensive cortical remodeling takes place following loss of afferent innervation
- Cortical areas corresponding to missing tissue are invaded by areas of neighboring structures
- Pain may result from incongruent afferent signals in these areas
- Prosed psychiatric component due to known association of PLP with poor coping strategies

Phantom Limb Pain

Phantom limb pain (PLP) is defined as pain that is felt to arise from a removed part of the body, commonly an amputated limb. In 2005 there were an estimated 1.6 million Americans living with limb loss, and this number is projected to double by 2050. Between half and three quarters of these patients are estimated to experience PLP.

This pain can be extremely difficult to treat, with current pharmacologic approaches including opioid and non-opioid pain relievers, muscle relaxants, anticonvulsants, and various psychiatric medications. Surgical options include neurectomy, rhizotomy, cordotomy, sympathectomy, and CNS stimulation.

Scattered case reports exist of long-term PLP treatment using peripheral nerve blocks, including 21-day resolution of PLP from a traumatic 4th finger amputation using a single injection of ropivacaine and lidocaine (Sekiguchi et al., 2023), as well as significant improvement of PLP pain from a transtibial upper extremity amputation following a five-day perineural infusion of ropivacaine (Sekiguchi et al., 2023). Additionally, a recent RCT of 144 patients demonstrated improvement in PLP for at least one month after a six-day perineural infusion of lidocaine (Ilfeld et al., 2021).

Discussion

Here we present a case of treatment-resistant PLP completely resolved by short-term infusion of bupivacaine through peripheral nerve catheters. While not without risk, this therapy could provide safe, enduring, and low-cost relief of treatment-resistant PLP without need for more intensive surgical procedures or long-term cognitive and/or pharmacologic intervention.