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Title

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Permalink

<https://escholarship.org/uc/item/8k6732pn>

Journal

JEM Reports, 2(2)

ISSN

2773-2320

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Publication Date

2023-06-01

DOI

10.1016/j.jemrpt.2023.100031

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Peer reviewed

1 **Ultrasound-guided Superficial Fibular Nerve Block in the Emergency Department for**
2 **Refractory Cancer-Related Lower Extremity Pain**

3
4 ABSTRACT

5 **Background:** Ultrasound-guided nerve blocks have been increasingly used in the emergency
6 department (ED) to provide effective regional analgesia without relying on the use of systemic
7 medications, which given in high quantities may cause respiratory depression. Ultrasound-guided
8 nerve blocks on the superficial fibular nerve have been relatively understudied in the context of
9 ED utilization.

10 **Case Report:** We report the case of a 65-year-old woman with a history of acute lymphoblastic
11 leukemia (ALL) on lifelong non-cytotoxic chemotherapy and sarcoma who presented with a
12 chief complaint of right lower extremity pain for one week after minor trauma. She reported
13 severe pain and was unable to bear weight. Her workup was negative for fracture, thrombus,
14 compartment syndrome, or limb ischemia. Pain relief was not achieved even after utilization of
15 several doses of parenteral analgesics. After 12 hours in the Emergency Department, the patient
16 was treated with an ultrasound-guided superficial fibular nerve block. Within one hour of
17 treatment, she was able to ambulate and was discharged. During oncology follow-up, she was
18 found to have a recurrence of malignancy in her area of pain based on an outpatient bone scan
19 and MRI. This case report demonstrates the successful utilization of a superficial fibular nerve
20 block for refractory cancer-related pain.

21 **Why should an emergency physician be aware of this?:** Cancer-related refractory pPain is one
22 of the most difficult conditions to treat in the emergency department. Patients requiring multiple

23 | high doses of opioids and sedatives are at risk for airway compromise. Refractory pain [related to](#)
24 | [cancer](#) can lead to extended ED stays or hospital admission. This case study highlights the use of
25 | a superficial fibular nerve block for refractory [cancer-related](#) pain in the ED and details the
26 | technique for performing the procedure.

27

28 | KEYWORDS: ultrasound; nerve block; regional anesthesia; POCUS; pain; [oncology](#)

29

30 INTRODUCTION

31 | Nerve blocks are a specific regional anesthesia technique which utilize the injection of a
32 | local anesthetic to disrupt nerve function distal to the injection site. They are commonly
33 | conducted via two main methods: ultrasound-guided and landmark-guided. Ultrasound imaging
34 | helps visualize the nerve and needle tip to ensure successful delivery of anesthetic at the site of
35 | the nerve and to decrease complications such as improper site injection and damage to
36 | surrounding vasculature. Landmark-guided nerve blocks approximate the relative location of a
37 | nerve compared to a known nearby landmark [1]. Ultrasound-guided nerve blocks have
38 | increasingly been found to be an effective method of pain management in the Emergency
39 | Department following injury or preceding procedures [2-6]. In a recent survey of academic
40 | Emergency Departments within the United States, three-fourths were found to perform
41 | ultrasound-guided nerve blocks. Common indications for nerve blocks in the ED include fracture
42 | pain management, laceration repair, dislocation reduction, abscess incision and drainage, and
43 | foreign body removal. [6].

44 | The superficial fibular (peroneal) nerve branches from the common fibular nerve at the
45 | level of the fibular neck and carries both sensory and motor fibers. It carries sensory information

46 from the anterolateral aspect of the leg as well as along the dorsum of the foot (Figure 1).
47 Additionally, it innervates the peroneus longus and peroneus brevis muscles, which control
48 plantar flexion and eversion respectively [13, 14]. Distally, the superficial fibular nerve courses
49 between the peroneus brevis and the intermuscular septum which separates the anterior and
50 lateral compartments of the leg and eventually transverses more superficially until it pierces the
51 crural fascia and branches into the cutaneous nerves [14].

52 Superficial fibular nerve blocks particularly are understudied in the context of the
53 emergency department. In a systematic review of ultrasound-guided nerve block utilization in the
54 ED, superficial fibular nerve blocks were not reported as a recognized type of ultrasound-guided
55 nerve block [6]. Beyond emergent indications for nerve blocks, superficial fibular nerve blocks
56 have been indicated for leg venography and complex regional pain syndrome following foot
57 trauma [7-8].

58 Typical methods of anesthesia in the emergency department beyond parenteral pain
59 medications include local anesthetics injected around open wounds or into joint spaces, which
60 have varying efficacy, or procedural sedation, which demands vigilant airway monitoring and
61 post-procedural observation. Ultrasound-guided peripheral nerve blocks are a safer alternative
62 that uses local anesthetic targeted to a specific region of innervation, commonly directed at a
63 proximal nerve. In the past, nerve blocks were less frequently performed by emergency
64 physicians due to uncertainty in being able to identify the nerve without imaging and risking
65 complications. Ultrasound minimizes these risks by offering physicians a clear view of the
66 nerve(s) they intend to anesthetize [9]. In the ED, nerve blocks increase the duration of analgesia,
67 reduce doses of parenteral analgesic medications, and reduce nursing interventions required to
68 monitor patients receiving high doses of systemic analgesic medications alone [10]. Using nerve

69 blocks as opposed to general sedation and opiates for pain management has been shown to
70 significantly decrease opioid usage both post-surgery and in the ED [11,12].

71 We present this case study of an ultrasound-guided superficial fibular nerve block in the
72 ED for severe lower extremity pain refractory to multiple doses of opioid analgesics.

73

74 CASE REPORT

75 A 65-year-old female with a past medical history significant for sarcoma of her left
76 clavicle 30 years previously, acute lymphoblastic leukemia on lifelong non-cytotoxic
77 chemotherapy, asthma, and coronary artery disease presented to the ED with a chief complaint of
78 leg pain for approximately one week. She had sustained a minor injury to the right shin after
79 hitting her right lower leg on the side of a coffee table. The patient initially reported minimal
80 pain and bruising but had worsening symptoms over the three days prior to evaluation in the ED.
81 On initial presentation, she reported 10/10 pain to the right lower extremity from below the knee
82 to above the ankle without any sensory or motor deficits; this pain ~~which~~ was preventing her
83 from ambulating . Her vitals on presentation were blood pressure 143/71, pulse 94, respiratory
84 rate 18, temperature 98.8 °F (37.1 °C), and oxygen saturation 99% on room air. On physical
85 exam the patient had soft tissue swelling to the right shin with no overlying skin changes. Her
86 compartments were soft to palpation and she had intact distal dorsalis pedis and posterior tibial
87 pulses. X-rays of the right knee and tibia and fibula did not reveal any fracture, dislocation, or
88 joint effusion. Doppler ultrasound was negative for deep vein thrombosis.

89 Over the course of approximately 12 hours, the patient received two doses of intravenous
90 hydromorphone 1mg, intravenous ketamine 21mg (0.3mg/kg dose for analgesia), oral oxycodone
91 5mg, transdermal lidocaine 4% patch and oral acetaminophen 650mg with no relief. She

92 additionally required several doses of antiemetics to manage the nausea she experienced from the
93 narcotics. At this point, the ED physicians decided to perform a right superficial fibular nerve
94 block. Within ten minutes of performing the procedure the patient reported a significant
95 improvement in pain. The patient was seen walking to the restroom within 30 minutes of the
96 procedure and reported almost complete resolution of her pain.

97 During a routine phone follow-up, she reported her pain was relieved for three total days
98 after the nerve block. During oncology follow-up, she was suspected to have a bony malignancy
99 in her area of pain based on an outpatient bone scan that showed increased uptake in her area of
100 pain. An MRI was ordered and demonstrated multiple areas of altered marrow signal and
101 enhancement at the right tibial tubercle and in the mid to distal tibial shaft with additional foci in
102 the mid to distal fibular shaft, indicating a recurrence of her malignancy in her area of pain.

103

104 TECHNIQUE

105 For an ultrasound-guided superficial peroneal-fibular nerve block, the patient should be
106 placed in the supine or left lateral decubitus position. Written consent should be obtained
107 detailing the risks of nerve damage to both motor and sensory branches, infection, allergic
108 reaction, bleeding, intravenous injection, pain, swelling, and unsuccessful block. The injection
109 site can be identified by palpating the fibular head and using ultrasound to confirm the location of
110 the superficial peroneal-fibular nerve, approximately two centimeters distal to the fibular head
111 along the lateral aspect of the fibula. The transducer should be placed perpendicular and in a
112 short-axis view (Figure 2).

113 The superficial fibular nerve should appear as a honeycomb-like circular structure where
114 it lies anterior to the fibula (Figure 3). Insert the needle laterally, visualizing it on a needle-in-

115 plane view on ultrasound until the tip approaches the superficial aspect of the nerve [13].
116 Hydrodissection, or injecting a small amount of anesthetic into an area with the goal of
117 separating soft tissue structures or planes, can aid in identifying the correct location. 10-15mL of
118 local anesthetic is typically sufficient for this region [15].

119 For this patient we utilized a combination of lidocaine 1% and bupivacaine 0.25% for
120 short and long-acting analgesia respectively, and triamcinolone acetonide to prolong the pain-
121 relieving effects of the two medications. Steroids have been increasingly studied to improve
122 outcomes in nerve blocks [16] and the addition of triamcinolone acetonide in nerve blocks has
123 shown benefit in reducing pain for two weeks longer than local anesthetic alone [17].
124 Triamcinolone acetonide is an insoluble steroid with an ester group, which lasts longer than non-
125 ester steroids like dexamethasone [18].

127 DISCUSSION

128 Superficial fibular nerve blocks in the ED are indicated for pain control in cases of
129 fracture dislocation reduction, wound exploration and repair, abscess incision and drainage,
130 foreign body removal, or other cases of significant pain where systemic pain control is less
131 desired. As with other nerve blocks, the superficial fibular block should not be used in areas of
132 overlying infection, suspected neurological damage, or patients with severe coagulopathy. Due to
133 the distal innervation of the superficial fibular nerve, it is possible that this nerve block may
134 cause weakness in plantarflexion and foot eversion, although in one study that utilized a common
135 peroneal nerve block in conjunction with other blocks, none of the 380 patients suffered motor or
136 sensory function [19]. Other possible complications include intravascular injection leading to
137 systemic toxicity and/or hemorrhage, allergic reaction to the anesthetic, and infection around the

138 procedure site. Consent for the procedure should be obtained with a review of allergies to
139 medications. Lipid emulsion should be readily available in the event of local anesthetic toxicity.

140 This case study is an example of the utilization of an ultrasound-guided superficial fibular
141 nerve block in the emergency department which helped decrease the need for multiple doses of
142 parenteral opiates. This nerve block dramatically relieved this patient's pain and allowed her to
143 ambulate out of the ED when she was unable to bear weight on presentation. She reported
144 complete pain relief for three days following her procedure and return of 2/10 pain on day four
145 with no impairment of ambulation. During a follow-up, outside record review revealed a recent
146 bone scan with increased uptake in the area where the patient had pain. An MRI demonstrated
147 multiple areas of altered marrow signal and enhancement suspicious for a bony malignancy
148 which was likely exacerbating her acute pain in the setting of recent minor trauma. This
149 prompted further investigation which found a recurrence of her ALL and her chemotherapeutic
150 agent was increased as a result.

151

152 **WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?**

153 This case study further validates the increasing practice of conducting ultrasound-guided
154 nerve blocks in the Emergency department for localized pain relief, even if the cause is not
155 immediately identifiable in the ED. Refractory pain can be difficult to manage in the ED setting.
156 Many physicians feel that multiple rounds of parenteral opioid analgesics warrant extended
157 observation for close monitoring of potential respiratory depression. When dealing with pain that
158 limits ambulation, patients may require admission for rehabilitation evaluation and consideration
159 for placement in a facility. Regional anesthesia with ultrasound-guided nerve blocks offers an
160 additional modality of pain control that has the potential to decrease the duration of ED stays and

161 avoid observation or admission for additional monitoring or evaluation. Superficial fibular nerve
162 blocks are not commonly practiced by emergency physicians, but they can be easily performed
163 in the ED with the same equipment as required for most other nerve blocks.

164

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219

220 FIGURES

- 221 1. Diagram detailing the region of the leg that is innervated by the superficial fibular nerve
- 222 2. Anatomy and landmark guided injection for superficial ~~peroneal~~fibular nerve block
- 223 3. Ultrasound guided ~~peroneal~~superficial fibular nerve block from the lateral approach