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Case Report

ED placement of perineural catheters for femoral fracture pain management[☆]

Abstract

Regional nerve blocks provide superior analgesia over opioid-based pain management regimens for traumatic injuries such as femur fractures. An ultrasound-guided regional nerve block is placed either as a single-shot injection or via a perineural catheter that is left in place. Although perineural catheters are commonplace in the perioperative setting, their use by emergency physicians (EPs) for emergency pain management in adults has not been previously described. Perineural catheters allow prolonged and titratable delivery of local anesthetic directly targeted to the injured extremity, resulting in opioid sparing while maintaining high-quality pain relief with improved alertness. Despite these advantages, most EPs do not currently place perineural catheters, likely due to the widespread perception that the procedure is both excessively time consuming and too technically difficult to be practical in a busy emergency department (ED). A catheter-over-needle kit, resembling a peripheral intravenous line, is now available and may be familiar to EPs than traditional catheter-needle assemblies. Recent studies also suggest excellent analgesic outcomes with intermittent perineural bolusing of local anesthetic, thereby dispensing with the need for complex and expensive infusion pumps. Herein, we describe our successful placement of perineural femoral catheters at a busy inner-city public hospital ED. Our experience suggests that this is a promising new technique for emergency pain management of acute extremity injuries.

Femoral nerve blocks are the criterion standard for management of femoral fracture pain in the emergency department (ED) [1,2], yet placement of a perineural catheter by an emergency physician (EP) has only been described in a pediatric setting [3]. Below we describe 2 adult cases in which a newly introduced perineural catheter-over-needle catheter was placed by emergency physicians (EPs) for ED management of femoral fracture pain.

Preparation included sterile gown, gloves, hat, mask, and drape. Equipment consisted of E-Catheter kit (E-Catheter, 201156-40E; Pajunk, Geisingen, Germany) (Fig. 1), ultrasound with sterile probe cover, antiseptic prep, sterile dressing, and anesthetic.

With the patient supine, the femoral nerve is visualized just distal to the inguinal ligament and approximately 1 to 2 cm cephalad to the inguinal crease [1]. The catheter-over-needle apparatus is inserted lateral to medial and in-plane, with the needle tip passing through the fascia iliaca lateral to the femoral nerve and positioned just adjacent to the nerve (Fig. 2). Successful nerve targeting is confirmed by visualizing local anesthetic spread deep to the femoral nerve (lifting

the nerve upwards) but above the iliacus muscle (Fig. 3). Once the needle tip is in position, the needle is withdrawn, leaving the outer catheter in place. The flexible inner catheter is then threaded into the perineural space (Fig. 4), followed by an initial bolus of local anesthetic and then continuous infusion and/or repeat boluses, depending on the clinical circumstances.

In case 1, a 50-year-old man with a history of chronic pulmonary obstructive disease and polysubstance abuse presented to the ED with a distal femoral fracture after a fall. Initial pain management with intravenous hydromorphone resulted in excessive somnolence with brief episodes of apnea. Nevertheless, the patient continued to complain of severe pain when aroused. Following informed consent, a perineural catheter was inserted, and an initial bolus of 20 mL 1% lidocaine with epinephrine was administered. Pain scores were 3/10

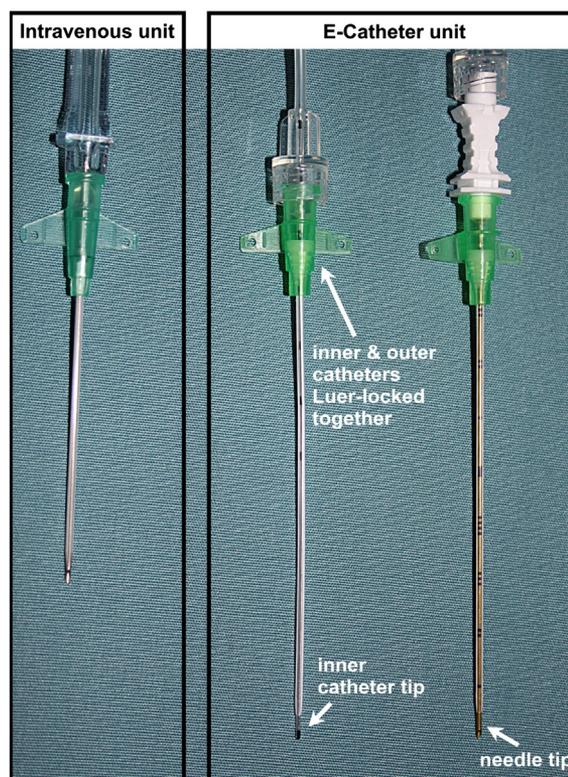


Fig. 1. A standard peripheral intravenous needle-catheter unit (left box) compared with the Pajunk E-catheter unit (right box). The E-Catheter features a catheter-over-needle (far right); withdrawal of the needle allows a thin, flexible inner catheter to be inserted into the outer catheter (center), with the inner catheter tip assuming the position originally occupied by the needle tip.

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Fig. 2. Ultrasound-guided, in-plane, lateral approach to the femoral nerve. See text for details.

ten minutes postblock and 0/10 forty minutes postblock. After his pain began returning 3 hours later, an additional 10 mL of 1% lidocaine with epinephrine was injected through the catheter with complete resolution of pain within 5 minutes. A third bolus of 10 mL 0.25% bupivacaine was administered after 2 additional hours, and the catheter was removed before transfer to the ward. At 1-month follow-up, the patient reported satisfaction with the procedure and denied any residual neurologic deficits.

In case 2, a 63-year-old woman presented to the ED with a comminuted proximal femur fracture, a transverse distal femur fracture, and a left anterior shoulder dislocation after a head-on motor vehicle collision. Initial pain management with hydromorphone and midazolam resulted in poor pain relief and excessive somnolence with a brief apneic episode while undergoing a computed tomographic scan. The patient did not tolerate bedside attempts to reduce shoulder pain, and further sedation was decided against given her already tenuous respiratory status. Following informed consent, a perineural femoral catheter was placed, and an initial bolus of 20 mL 1% lidocaine with epinephrine was given. Thirty minutes after the procedure, she rated her pain 0/10. Three times in the subsequent 12 hours, her pain returned, and she was redosed each time with 10 mL 0.25% bupivacaine without epinephrine. During her ED stay, the patient underwent Steinman pin placement, bed transfer, and multiple limb manipulations for x-ray imaging with minimal discomfort. Her opioid analgesics were reduced, and she was alert and conversational throughout her time in the ED. The catheter was removed 12 hours after insertion when the patient was transferred.

We present the first use of femoral perineural catheters placed by an EP for management of adults with acute fracture pain. The catheter-over-needle technique that we describe here is less



Fig. 3. The secured perineural femoral catheter. The entire apparatus is then covered with a transparent occlusive dressing and clearly labeled with an indelible marker to avoid being mistaken for an intravenous line.

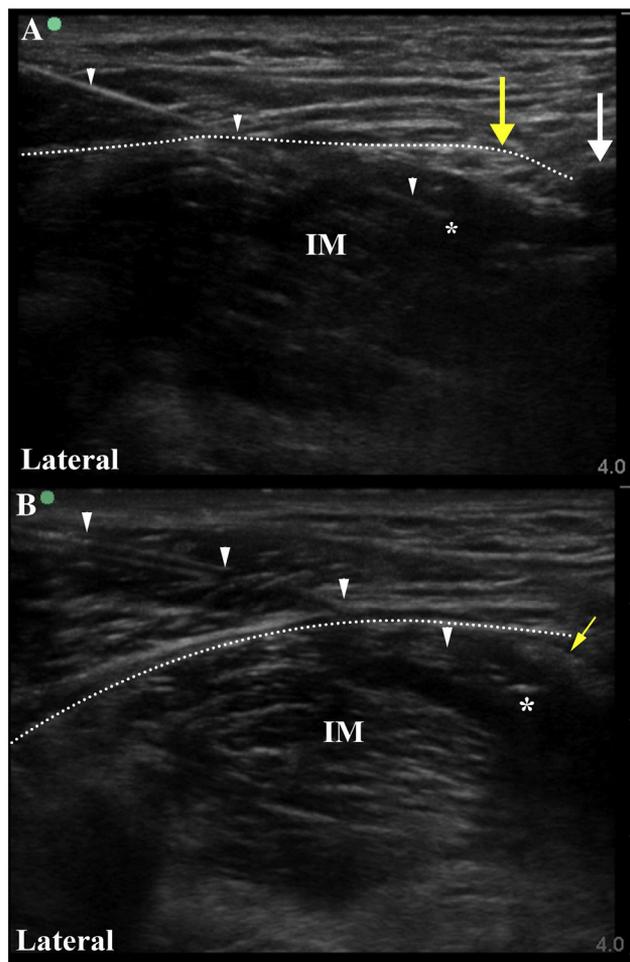


Fig. 4. A, Ultrasound image of perineural catheter placement. This image shows the introducer needle (arrowheads) with the overriding 21G cannula being positioned underneath the fascia iliaca (dotted line). The perineural space is opened with a small bolus of local anesthetic that lifts the femoral nerve (yellow arrow) upwards. The femoral artery (white arrow) is visualized medial to the nerve. B, Ultrasound image of the introducer 18G cannula in place. The needle has been removed, and the flexible injection catheter has been threaded through the introducer cannula (white arrowheads) with its distal tip (asterisk) in the perineural space underneath the femoral nerve (yellow arrow) and above the iliacus muscle. IM, iliacus muscle.

cumbersome than the traditional catheter techniques that are unfamiliar to most EPs and which involve epidural-type catheters threaded through a Tuohy needle (ie, catheter through needle). In contrast, the E-catheter design is already familiar to EPs, with an expected shorter and minimal learning curve due to its resemblance to common peripheral intravenous lines [4,5]. In the cases described here, sterility level was on par with that used for central venous catheter placement, and the catheter-over-needle design (ie, a short catheter already preloaded onto the needle rather than a long, cumbersome, epidural-type catheter) should further minimize the risk of contamination [6] in a busy ED environment. In summary, our experience suggests that the E-catheter unit is not only easy to place but also offers significantly greater flexibility to tailor and prolong analgesia depending on the clinical need with the added ability to pause dosing and allow block recovery for neurologic or compartment evaluation if desired. This kind of tailored regional anesthesia has an exciting and promising role in improving pain management in the ED.

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