

# Posterior Thigh Abscess as a Complication of Continuous Popliteal Nerve Catheter

Christopher J. Tucker, MD, Kevin L. Kirk, DO, and James R. Ficke, MD

## Abstract

Continuous peripheral nerve catheters (CPNCs) have become increasingly popular for postoperative analgesia in orthopedic surgery involving the lower limbs. The CPNC technique has been found to reduce postoperative pain and facilitate earlier discharge and recovery. Until recently, potential infectious complications associated with CPNCs have remained largely unreported.

In this report, we present the case of a posterior thigh abscess that developed after placement of a continuous popliteal nerve catheter and required surgical débridement.

Continuous peripheral nerve catheters (CPNCs) have become increasingly popular for postoperative analgesia in orthopedic surgery involving the lower limbs.<sup>1</sup> The CPNC technique has been found to reduce postoperative pain and facilitate earlier discharge and recovery.<sup>2,3</sup> Until recently, potential infectious complications associated with CPNCs have remained largely unreported.<sup>4-9</sup>

In this report, we present the case of a posterior thigh abscess that developed after placement of a continuous popliteal nerve catheter and required surgical débridement. The authors have obtained the patient's written informed consent for print and electronic publication of the case report.

## CASE REPORT

A male soldier in his mid-20s injured by a blast while serving in Operation Iraqi Freedom sustained multiple bilateral lower extremity injuries, including closed right pilon and talus fractures; closed left pilon, navicular, and multiple

metatarsal fractures; and an open left calcaneal fracture. Within 2 weeks of injury, he underwent definitive internal fixation of all fractures except the open left calcaneal fracture. Repeated operative débridements were required before definitive fixation because of open soft-tissue wounds of the left foot.

Multiple modalities, including epidural catheters, single-shot peripheral nerve blocks, and multiple different CPNCs, were required for perioperative pain management throughout the patient's hospitalization. The last CPNC was placed 25 days after final left lower extremity fracture fixation using a nerve stimulator and ultrasound guidance using sterile technique. Incomplete relief of pain prompted placement of a supplemental epidural catheter 3 days later. As this catheter provided minimal additional benefit, it was removed the next day. The patient was diagnosed with sympathetic-mediated pain and opioid-induced hyperalgesia and was transferred to the surgical intensive care unit (SICU) for respiratory observation together with aggressive pain management using intravenous lidocaine and ketamine.

The patient first became febrile to 102.8°F on the night of SICU admission (postcatheter placement day 4). When workup revealed leukocytosis (white blood cell [WBC] count, 14 10<sup>9</sup>/L), the previous left leg surgical site was evaluated for abscess with a contrast-enhanced computed tomography (CT) scan (Figures 1A, 1B). The study revealed fluid collection in the gastrocnemius muscle and a small amount of air in the lateral popliteal fossa presumed to be related to the recently placed CPNC. Operative exploration of the fluid collection revealed a consolidated hematoma, which was evacuated. The intraoperative cultures were negative, and the wound eventually healed without complication.

Over the next 2 days, the patient continued to exhibit persistent episodic fevers ( $T_{max}$ , 103.3°F), worsening infection laboratory markers (WBC count, 17 10<sup>9</sup>/L; C-reactive protein, 12.19 nmol/L; erythrocyte sedimentation rate, 73 mm/h), and significantly increased tenderness at the CPNC site with persistent neuropathic pain in the leg and foot. The catheter was removed on postplacement day 6, and the tip was cultured. An ultrasound was performed to evaluate for abscess at the catheter site, but its findings were indeterminate, and empiric intravenous vancomycin was initiated. On postplacement day 8 (2 days after removal of the CPNC), foot pain remained poorly controlled, and the patient developed substantially increased posterior thigh swelling, tenderness, and induration. The catheter tip culture results were positive for methicillin-

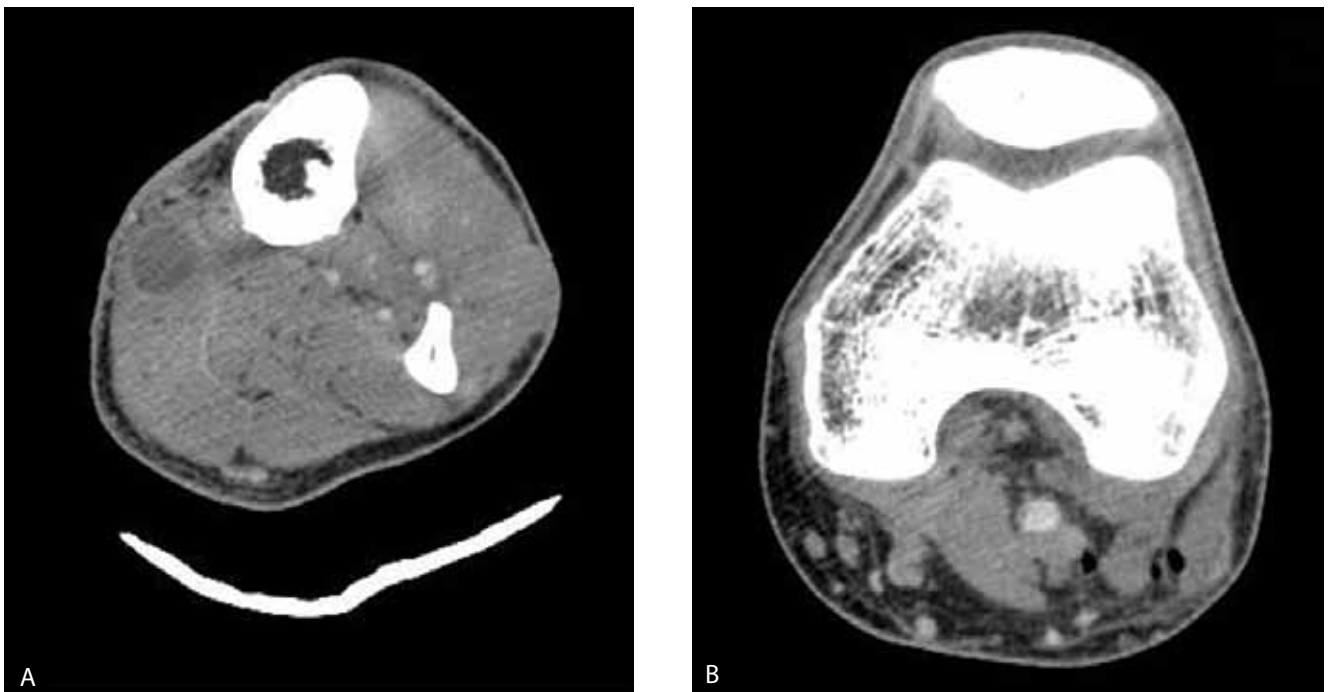
CPT Tucker, MC USA, is Orthopedic Surgeon, Department of Orthopedics and Rehabilitation, Walter Reed National Military Medical Center, Bethesda, Maryland. He was an orthopedic resident at Brooke Army Medical Center at the time the article was written.

LTC Kirk, MC USA, is Foot and Ankle Surgeon, Department of Orthopedics and Rehabilitation, Brooke Army Medical Center, Fort Sam Houston, Texas.

COL Ficke, MC USA, is Consultant to Surgeon General, Orthopedic Surgery, and Chairman, Department of Orthopedics and Rehabilitation, Brooke Army Medical Center, Fort Sam Houston, Texas.

Address correspondence to: Christopher J. Tucker, MD, Orthopedic Surgery Service, Department of Orthopedics and Rehabilitation, Walter Reed National Military Medical Center, 8901 Wisconsin Avenue, Bethesda, MD 20889 (tel, 210-882-8745; e-mail, ctucker20@hotmail.com).

Am J Orthop. 2010;39(3):E25-E27. Copyright Quadrant HealthCom Inc. 2010. All rights reserved.



**Figure 1.** (A) Initial contrast-enhanced computed tomography scan of left leg shows fluid collection in medial head of gastrocnemius muscle. No rim enhancement is noted. (B) Contrast-enhanced computed tomography scan of left popliteal fossa shows subtle air in lateral deep soft tissues in vicinity of popliteal catheter insertion site. Note absence of fluid collection or contrast enhancement.

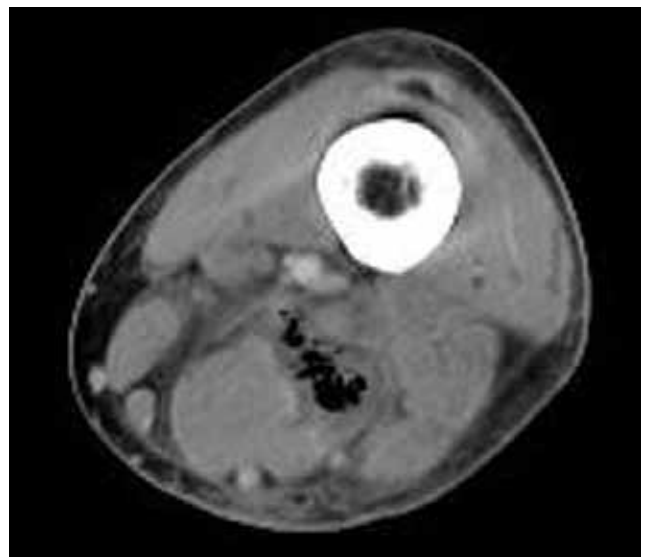
resistant *Staphylococcus aureus* (MRSA). Reevaluation of the catheter insertion site with repeat contrast-enhanced CT scan revealed a 2.2 × 7-cm rim-enhancing fluid/air collection in the superior popliteal fossa consistent with a deep abscess (Figure 2). During urgent surgical débridement of the abscess, approximately 30 cm<sup>3</sup> of frankly purulent material was drained from around the sciatic nerve between the 2 heads of the biceps femoris in the popliteal fossa. Culture results were positive for MRSA. Neuropathic foot pain improved dramatically after this surgery, laboratory markers normalized over the next week, and the wound healed without further intervention or complication. The patient made a complete recovery from the CPNC-associated infection.

### DISCUSSION

Compared with general anesthesia, regional anesthesia is associated with multiple benefits, including reduced morbidity and mortality, superior postoperative analgesia, reduced opioid requirement, and enhanced cost-effectiveness.<sup>1,10</sup> Until recent years, the literature examining complications associated with peripheral nerve catheters have focused predominantly on failure rates of attaining adequate analgesia and neurologic sequelae, with little attention directed toward infections.<sup>1,3,10</sup>

Infection from CPNCs is another potentially serious complication that has not received significant attention. Development of a deep thigh abscess associated with a continuous popliteal nerve catheter is extremely uncommon. To our knowledge, it has been reported in the literature only once before.<sup>6</sup>

Bacterial colonization of CPNCs has been investigated and reported, but correlation to clinically significant infection remains to be determined. In a series of 1,416 patients who received CPNCs in a variety of locations, Capdevila and colleagues<sup>5</sup> reported an overall colonization rate of 28.7% (18.9% in popliteal location) at a median duration of use of 56 hours. The most predominant bacterial species were coagulase-negative *Staphylococcus* (61%) and gram-



**Figure 2.** Repeat contrast computed tomography scan of left distal thigh shows rim-enhancing air/fluid collection in superior popliteal fossa, surrounding sciatic nerve, consistent with deep abscess.

negative *Bacillus* (21.6%). Three percent of patients had local inflammatory signs, and there was only 1 deep infection, a psoas abscess secondary to a femoral nerve catheter in a female patient with diabetes.

Several studies have examined the acute and long-term complications, including infections, associated with CPNC use. A study of 1,001 cases of popliteal sciatic nerve catheters used for elective orthopedic foot and ankle surgery reported an overall success rate of 97.5%, with acute complications limited to paresthesias during localization (0.5%), pain during local application (0.8%), and blood aspiration (0.4%).<sup>4</sup> Late complications were limited to 2 cases of “inflammation” at the puncture site; no infections were noted. Median duration of CPNC use was 48 hours (range, 30-192 hours). In another prospective study, of 3,491 peripheral regional catheters in various locations, Neuburger and colleagues<sup>8</sup> reported a 12.1% overall rate of complications, including inflammation in 146 cases (4.2%), infections in 83 cases (2.4%), and severe infections requiring surgical drainage of abscess in 29 cases (0.8%). Bacteria most often encountered included *S aureus* (54%) and *Staphylococcus epidermidis* (38%). In addition, a prospective study of 2,285 perineural catheters, including 355 popliteal catheters, reported a 4.2% incidence of local inflammation and a 3.2% incidence of purulent infection, with surgical intervention required in 0.9% of cases.<sup>9</sup> Catheter tip cultures returned *S aureus* in 58% of cases and *S epidermidis* in 42%. These series demonstrate that CPNC-associated infections that require surgical treatment, though uncommon, still occur.

Many risk factors have been associated with development of peripheral nerve catheter infections. Duration of catheter therapy is almost universally cited, with one study attributing a relative risk ratio of 4.61 to duration of 48 hours or more.<sup>5</sup> The same study identified additional risk factors, including postoperative monitoring in an ICU setting, male sex, and absence of antibiotic prophylaxis.<sup>5</sup> Another factor considered to increase the risk for infection is anesthesiologist’s inexperience.<sup>9</sup>

Our patient had several risk factors associated with deep infection, including longer duration of use, monitoring in an ICU setting, and male sex. We believe that the relative infrequency with which CPNC-associated deep infections occur contributed to the delay in diagnosis of the deep abscess. This patient’s case highlights the importance of remaining vigilant while investigating the source of persistent postoperative pain in the setting of increasing anesthetic requirements despite CPNC placement. There must be a high index of suspicion for rare yet serious complications.

## CONCLUSIONS

This case illustrates how serious complications can occur after placement of a continuous peripheral popliteal nerve catheter for postoperative analgesia. We highlight the importance of diligent monitoring, of minimizing controllable risk factors, and of giving prompt attention to changes in the patient’s condition in attempts to minimize the risk for developing CPNC-associated infections.

## AUTHORS’ DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

The views expressed in this manuscript are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or U.S. Government. All authors are employees of the United States government. This work was prepared as part of their official duties and as such, there is no copyright to be transferred.

## REFERENCES

1. Wiegel M, Gottschaldt U, Hennebach R, Hirschberg T, Reske A. Complications and adverse effects associated with continuous peripheral nerve blocks in orthopedic patients. *Anesth Analg*. 2007;104(6):1578-1582.
2. White PF, Issioui T, Skrivaneck GD, Early JS, Wakefield C. The use of continuous popliteal sciatic nerve block after surgery involving the foot and ankle: does it improve the quality of recovery? *Anesth Analg*. 2003;97(5):1303-1309.
3. Zaric D, Boysen K, Christiansen J, Haastrup U, Kofoed H, Rawal N. Continuous popliteal sciatic nerve block for outpatient foot surgery—a randomized, controlled trial. *Acta Anaesthesiol Scand*. 2004;48(3):337-341.
4. Borgeat A, Blumenthal S, Lambert M, Theodorou P, Vienne P. The feasibility and complications of the continuous popliteal nerve block: a 1001-case survey. *Anesth Analg*. 2006;103(1):229-233.
5. Capdevila X, Pirat P, Bringuier S, et al. Continuous peripheral nerve blocks in hospital wards after orthopedic surgery—a multicenter prospective analysis of the quality of postoperative analgesia and complications in 1,416 patients. *Anesthesiology*. 2005;103(5):1035-1045.
6. Compere V, Cornet C, Fourdrinier V, et al. Thigh abscess as a complication of continuous popliteal sciatic nerve block. *Br J Anaesth*. 2005;95(2):255-256.
7. Cuvillon P, Ripart J, Lalourcey L, et al. The continuous femoral nerve block catheter for postoperative analgesia: bacterial colonization, infectious rate and adverse effects. *Anesth Analg*. 2001;93(4):1045-1049.
8. Neuburger M, Breitbarth J, Reisig F, Lang D, Büttner J. Complications and adverse events in continuous peripheral regional anesthesia. Results of investigations on 3,491 catheters [in German]. *Anaesthesist*. 2006;55(1):33-40.
9. Neuburger M, Büttner J, Blumenthal S, Breitbarth J, Borgeat A. Inflammation and infection complications of 2285 perineural catheters: a prospective study. *Acta Anaesthesiol Scand*. 2007;51(1):108-114.
10. Brull R, McCartney CJ, Chan VW, El-Beheiry H. Neurological complications after regional anesthesia: contemporary estimates of risk. *Anesth Analg*. 2007;104(4):965-974.

---

This paper will be judged for the Resident Writer’s Award.

---