

Importance of Vigilant Monitoring After Continuous Nerve Block: Lessons From a Case Report

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ABSTRACT

Introduction: Continuous peripheral nerve block achieves good pain control. However, uncontrolled pain despite an effective block in the target areas of the nerve can be an early sign of ischemia. We report a case of iatrogenic injury to the axillary artery during shoulder surgery in a patient who had continuous supraclavicular block and demonstrate how vigilant monitoring helped the diagnosis and resulted in timely management of upper limb ischemia.

Case Report: A 58-year-old female underwent total revision surgery of her right shoulder under continuous supraclavicular block. Postoperatively, she complained of pain along the medial side of her forearm despite clinical evidence of nerve block. Continuous neurovascular monitoring and timely angiography confirmed axillary artery injury, and subsequent vascular repair saved the patient's limb.

Conclusion: Iatrogenic injuries to vessels or nerves sometimes occur during orthopedic surgical procedures. Regional anesthesia can mask and delay the onset of these symptoms. Postoperative monitoring and the ability to differentiate between the effects of local anesthetics and the body's response to ischemia are important for avoiding postoperative complications. This case report aims to improve awareness about the need for vigilant monitoring of the distal pulses after peripheral nerve blocks.

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INTRODUCTION

Continuous peripheral nerve blocks are used extensively for postoperative pain management. Although nerve blocks achieve good pain control, pain physicians should be aware that uncontrolled pain, despite an effective block in the target areas, or pain in nonanesthetized areas can be an early sign of ischemia. We report a case of iatrogenic injury to the axillary artery during shoulder surgery in a patient who had continuous supraclavicular block and demonstrate how vigilant monitoring helped us diagnose and manage the upper extremity ischemia.

CASE REPORT

A 58-year-old female with a history of stable hypertension presented for revision surgery of her right total shoulder. She was premedicated with 1 mg midazolam and around noon on the day of the surgery received a supraclavicular nerve block with a catheter for postoperative pain management. The nerve block was performed under ultrasound guidance and strict aseptic precautions without any adverse events. A total of 20 mL of 0.75% ropivacaine was injected, and the block was confirmed with sensory and motor testing. Following the nerve block, the patient underwent the revision shoulder surgery in the sitting position under general anesthesia. The surgery lasted 260 minutes and was associated with 300 mL blood loss. Intraoperatively, the patient had stable hemodynamics, and the surgeon reported a difficult, yet uncomplicated procedure. Postoperatively, the supraclavicular catheter was connected to an infusion pump containing 0.2% ropivacaine. The infusion was set up as patient-controlled analgesia to a basal rate of 8 mL per hour and patient demand dose of 12 mL every 60 minutes as needed. The patient was comfortable in the postanesthesia care unit (PACU), did not need any supplemental analgesia, and was transferred to the regular nursing floor around 7 pm. Staff performed routine monitoring according to hospital policy.

At 4 am, almost 9 hours after the end of surgery, the patient complained of pain along the medial side of her forearm. She was in tears and described the sensation as "My right hand feels like balloons, and

Table. Guide to Post-Nerve Block Neurovascular Monitoring

Vital Parameter	>1 Hour in PACU		Regular Nursing Floor
	First Hour in PACU	Until Return of Sensation	
Capillary refill	15 minutes	30 minutes	
Movement of the extremity	15 minutes	30 minutes	
Sensation	15 minutes	30 minutes	
Pulse		Every 2 hours	Every 4 hours

PACU, postanesthesia care unit.

the movement is unnatural. I can move my hands, but they are numb.” She had no pain over the surgical site. On physical examination, the arm was slightly dusky, capillary refill was brisk, radial and brachial pulses were palpable, and the hand was warm. After receiving a top-up dose through the supraclavicular catheter with 15 cc of 0.5% ropivacaine, the patient reported satisfactory pain relief. At this point, neurovascular checks were performed hourly to exclude any progressive ischemic injury.

At the 9 am examination, the hand was cyanosed and the pulses were weak. The patient reported increasing pain in the hand and forearm. Emergency angiography of the right upper limb showed a 3-cm segment of occlusion in the axillary artery adjacent to the shoulder joint with reconstitution at the level of the most distal part of the circumflex humeral artery. Immediate exploration of the right axillary artery confirmed a partial occlusion. Vascular surgeons repaired the occlusion via a subclavian artery-to-brachial artery bypass using a saphenous venous graft. Pulses in the right upper limb returned. Postoperatively, the patient recovered well and gained full function of the right upper limb. She was discharged home on postoperative day 4 with full neurological and functional recovery.

DISCUSSION

Regional anesthesia is a common mode of postoperative pain management in the orthopedic setting. However, the profound analgesia provided may delay the diagnosis of other potentially harmful conditions such as compartment syndrome and vascular insufficiency in which pain is usually one of the major presenting symptoms. Iatrogenic injuries to vessels and/or nerves occur sometimes during orthopedic surgical procedures. Wilson et al¹ reported 27 vascular injuries from 1997 to 2002 during orthopedic surgeries, with an incidence of 0.005%. In his series, 62% of injured patients showed clinical signs of acute ischemia on Doppler flow assessment. The risk of injury increased when patients presented with preexisting vasculopathy or underwent redo orthopedic surgeries.^{1,2} These injuries may manifest first during the

immediate postoperative period. Previous studies¹⁻³ reported the need for early limb-saving surgeries in patients with vascular injuries. Hence, early identification of the injury is important to salvage the affected area.

Wilson et al¹ found that the most common presentations of arterial injury were pain, pallor, and paresthesia, combined with a loss of pulse. Undiagnosed or delayed compartment syndrome has been reported with other analgesic modalities, including epidural, intravenous continuous analgesic, systemic, and oral opioids.⁴ An important indicator of problems in these cases is an increase in pain despite escalation of the analgesic dose. Other signs of ischemic pain such as paresthesia can also be attributed to the nerve block. Even a single-shot peripheral nerve block with long-acting local anesthetics can last 12-24 hours and can mask early signs of limb ischemia. Continuous nerve blocks extend that effect.

Currently, there are no recommendations regarding monitoring after nerve blocks. Preoperative nerve block and continuous nerve catheterization are routinely performed at our institution so patients can participate in early physiotherapy and can be discharged home faster with a continuous infusion pump.⁵ We routinely monitor capillary refill, sensation, and movement of the surgical limb every 15 minutes for the first hour and then every 30 minutes in the PACU until sensation returns (Table). Pulses are checked every 2 hours in the PACU and every 4 hours on the regular nursing floor when the patient is awake. Postoperative monitoring and the ability to differentiate between the effects of local anesthetics and the body's response to ischemia are important to avoid complications related to vascular injuries in the postoperative setting. In this case, the continuous neurovascular monitoring made early intervention and limb salvage surgery possible.

CONCLUSION

This case report aims to improve awareness among pain physicians about the need for vigilant monitoring, especially of the distal pulses, after peripheral nerve blocks. Pain in an area unrelated to the surgical site

and any change in the character of the pain must be evaluated and constantly followed. A lack of proper postoperative monitoring may significantly delay identification of the injury. We recommend that neurovascular monitoring become a routine practice following regional anesthesia. Currently, no definitive guidelines address the frequency of this monitoring. Our institute's guidelines may be used as reference, keeping in mind the risk of vascular injury.

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