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Case Report
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Acute Charcot Event Secondary to Complication of Ultrasound Guided Popliteal Nerve Blockade for Double Arthrodesis: A Case Study

Sean R Van Aken[1], Renee E Shepherd[2] and Kimberlee B Hobizal[1]*

[1]Department of Podiatric Surgery, Heritage Valley Health System, USA

[2]Department of Foot Surgery, San Fernando Valley, USA

Abstract

In this article we present a case of a 54-year-oldfemale that underwent a double arthrodesis, ankle arthroscopy, and posterior muscle group lengthening for posterior tibial tendon dysfunction and tarsal coalition of the right foot with associated arthritic changes of the ankle. The patient was administered a pre-operative regional single shot femoral, popliteal fossa, right lower extremity nerve block. The patient experienced unilateral temporal peripheral neuropathy as a complication of the peripheral nerve block, which went on to secondarily cause an acute Charcot event. This appears to have been a rare sequence of complications that we were unable to find any other reported cases of in an extensive literature search. Popliteal fossa peripheral sciatic nerve blocks have been reported with relatively low complication rates and are typically regarded as a safe and effective procedure. While rare, peripheral nerve injuries are among the main complications associated with peripheral nerve blockade. As an attempt to avoid complications, attention should be paid to the location of the needle tip throughout a peripheral block to avoid intraneural injection. The patient in this case was treated for the acute Charcot event which has since stabilized, and she is now ambulating in supportive shoe gear.

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Correspondence:
Sean R Van Aken, Department of Podiatric Surgery, Heritage Valley Health System, Beaver, Pennsylvania, USA;
E-mail: srvanaken@gmail.com

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Introduction

Popliteal nerve blocks are a commonly used intervention for accomplishing regional analgesia pre or post-operatively for many orthopedic surgeries of the foot and ankle. Popliteal sciatic nerve blocks have increased in practice as an alternative to general and spinal anesthesia partially due to their ability to provide excellent operative and post-operative analgesia, decreased narcotic requirements, and increases in reported patient satisfaction [1]. Advancements in ultrasonography have allowed for better delivery of regional anesthesia. Ultrasound-guided peripheral nerve blocks have proven superior to single injection and neurostimulation blocks with higher success rates, faster onset, and faster progression to sensorimotor block without increasing block procedure time or associated complications [2]. In the following case, we report an incident of peripheral neuropathy that developed post-operatively as an assumed complication of a pre-operative ultrasound-guided popliteal nerve block which ultimately led to an acute Charcot event as a secondary complication. In a literature search, no evident cases of an acute Charcot event occurring secondary to temporal, unilateral peripheral neuropathy induced by a popliteal nerve block were able to be sourced.

Case Presentation

A 54-year-old female presented to clinic with complaints of right foot and ankle pain. After several years of conservative treatment from other physicians, she came in for a second opinion to discuss surgical intervention of her ongoing pain. Her past medical history is significant for Factor V Leiden, hypertension, and hypothyroid disease. Clinical and radiographic imaging revealed a diagnosis for Stage 3 Posterior Tibial Tendon Dysfunction. After thorough discussion of perioperative and post-operative expectations, the patient was consented for surgical intervention. After clearance from her primary care physician, patient was to undergo a double arthrodesis of the right foot consisting of fusions of the talonavicular and subtalar joints along with an ankle arthroscopy and posterior muscle group lengthening on the right lower extremity. Patient presented the day of surgery with an ASA class 3 to anesthesia team and was administered Midazolam and Fentanyl in the pre-operative waiting area prior to being taken back for regional single shot femoral, popliteal fossa, right lower extremity nerve block. A nerve stimulator was used to locate the location

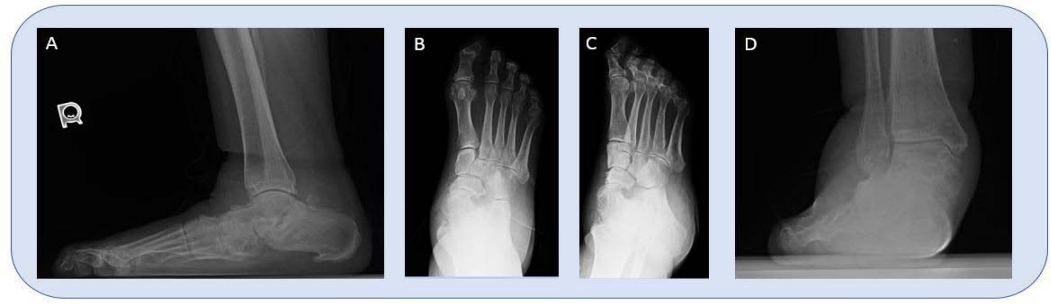

Figure 1: Pre-operative lateral (A), Anteroposterior (B), Medial Oblique (C) of the right foot; Anteroposterior radiograph of the right ankle (D). Foot is in a planovalgus position as evidenced by radiographs.

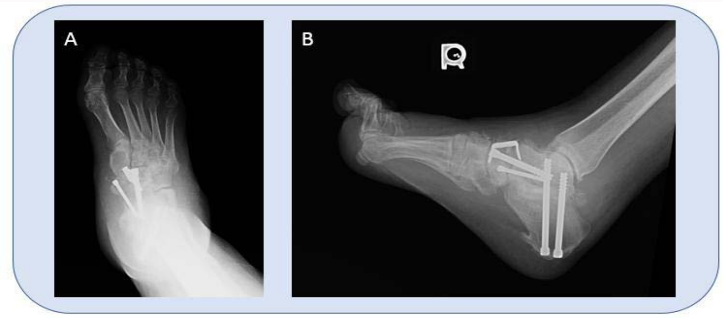

Figure 2: AP (A) and lateral (B) foot X-rays taken 2 weeks Post-Operative. Osseous sequelae dorsally at the midfoot remaining from the surgery.

Figure 3: AP (A), lateral (B), and medial oblique (C) X-rays taken 3 months post-operative. Radiographs demonstrate significant swelling of the soft tissue envelope of the midfoot and ankle, as well as subperiosteal resorption at the intermediate cuneiform and navicular.

for injection and was performed under ultrasound guidance. A bolus of 40 mL of Ropivacaine 0.37% and 4 mg of Decadron was injected. Patient tolerated procedure well and was taken back to the operating room. Intra-block findings were negative for paresthesia, aspiration was negative for blood every 3 mL, and there was no resistance to injection. Ankle arthroscopy was carried out utilizing anteromedial and anterolateral portals. The subtalar joint was prepped through a curvilinear incision at the lateral aspect of the joint. Prep of the talonavicular joint was completed with an additional incision at the medial aspect of the joint. The Subtalar joint was fused with two headless 6.5 Synthes screws. The talonavicular joint was fused utilizing one 6.5 and one 4.5 headless Synthes screw with staple fixation. Of note, a pneumatic thigh tourniquet was utilized intra-operatively with a total inflation time of 120 min. Patient was admitted to the hospital for post-operative pain control along with physical therapy consult to assist with new non-weight bearing status of the right lower extremity. No complications or acute events were reported, and she was discharged the next day on oral pain medications along with Lovenox for DVT prophylaxis. On the first post-operative visit two weeks out from surgery, patient stated pain was well controlled. Reported pain had gotten to a 9/10 at times but admitted to not having any need for opioid use and had been well controlled with Tylenol. Light touch and epicritic sensation were intact with no paresthesia noted. Generalized mild post-operative edema was appreciated to the entire foot and ankle. The patient was casted in a fiberglass cast. The patient progressed extremely well during the post-operative course with no pain at future appointments and no complaints. The patient completed a course of physical therapy, progressed to full weight bearing and returned to work without any complications or complaints up to that point in time. At a 12-week post-op follow-up appointment, the patient presented with significant edema to the entire right lower extremity, and intermittent numbness, tingling, and electrical sensation. This was the first complaint of any type of discomfort throughout the post-operative course. Patient stated all of this started about two weeks earlier after returning to work as a teacher where she was subjected to prolonged periods of standing. The patient was sent for a Doppler ultrasound which was negative. An Unna boot was applied which aided in decreasing the observed

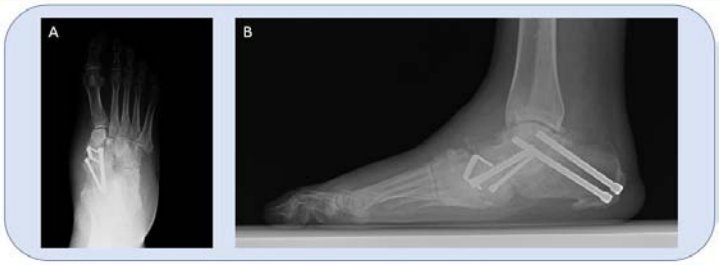

Figure 4: AP (A) and lateral (B) X-rays taken 6 months post-operative. Soft tissue swelling has decreased and midfoot does not demonstrate any further degeneration since 3-month post-operative radiographs. This was correlated with the clinical picture of decreased erythema and temperature of the foot. The hardware remains intact.

swelling at the next appointment one week later. An additional Unna boot was applied which showed further improvement at the next appointment one week later. Approximately six months post-operatively, the patient returned to clinic for a re-check of the right lower extremity regarding swelling without complaints of pain. The patient was identified to be experiencing an Eichenholtz stage 1 acute Charcot event due to clinical signs of swelling, warmth, erythema, and lack of sensation along with subperiosteal resorption and fragmentation of the midfoot radiographically. The patient was treated appropriately with total contact casting which progressed to Unna boot application with a CAM walker. The acute Charcot event has advanced from the fragmentation phase into the coalescence phase and is deemed stable at this time. The hardware has remained well-positioned. At the last follow-up appointment, roughly nine months post-operatively, the patient noted that sensation has been returning to the extremity. The patient had returned to ambulating in normal shoe gear and was utilizing compression stockings as needed.

Discussion

Through an exhaustive literature search we were unable to find any cases of peripheral neuropathy that occurred as a complication of a peripheral nerve block and went on to further cause an acute Charcot event as a secondary complication. The major complications reported from Peripheral Nerve Blocks (PNB's) are infection and peripheral neuropathy or neuropraxia [1]. Relatively low rates of peripheral neuropathy have been reported as a complication following a PNB. Compere et al. [3] reported a complication rate of 0.25% for infection and 0.50% for neuropathy in a prospective study of 400 continuous popliteal sciatic nerve blocks for post-operative analgesia. A retrospective study by Hajek et al. [4] looking at 157 procedures of continuous popliteal nerve block for hallux valgus surgery suggested a higher prevalence of neuropathic complications than prior literature. A complication rate of 1.26% was reported for persistent post-operative peripheral neuropathy associated with popliteal sciatic nerve blocks. While Peripheral Nerve Injuries (PNI) from PNB's have been reported as rare events, there have been multiple studies on the underlying mechanisms of injury. There are currently three main mechanisms thought to cause a PNI which are mechanical and injection injury, vascular or ischemic injury, and chemical or neurotoxic injury. The likelihood and severity of a PNI occurring following a PNB is directly related to the location of the tip of the needle during the injection in relation to the nerve itself. Intra-neural injection can lead to sustained periods of elevated intraneural pressure [5]. This increase in pressure can lead to compression and/or entrapment of the nerve that if sustained long enough, can cause axonal focal demyelination. Nerve ischemia can result from sustained intraneural pressure exceeding capillary occlusion pressure [6]. The most likely source of a PNI following a PNB is from intrafascicular injection of the local anesthetic. Intrafascicular injection can lead to mechanical nerve trauma, rupture of the perineurium, and subsequent myelin and axonal degeneration from destruction of the protective environment within the fascicle. Although advancements in ultrasonography have led to the use of ultrasound guidance, there have not been any decreases in the risk of a block related PNI observed. Aubuchon et al. [7] investigated the frequency of PNB as an etiology of sciatic neuropathy in a retrospective review spanning a 5-year period. They discovered that compression, trauma, fractures, and hip arthroplasty accounted for approximately 60% of the cases. PNB was found to be the third most common etiology, accounting for 16% of the cases. The authors concluded that PNB is commonly associated with sciatic neuropathy and should be included in the differential diagnosis. Limitations to this study are that this case was an isolated incidence. As such, it is hard to account for all the contributing factors to the underlying etiology. Nerve conductance velocity testing was not performed on this patient at any point in the post-operative follow-up period. Pneumatic tourniquet use and postsurgical inflammatory neuropathy, as well as independent patient factors could have also been contributing factors to the post-surgical complications experienced in this case [8,9].

Conclusion

The primary purpose of the paper was to present a rare combination of complications that occurred following a relatively common foot and ankle surgical intervention in a patient without prominent risk factors for these complications. It is possible that there are not any other publications referencing an acute Charcot event occurring as a secondary complication of a peripheral nerve block. It is important for the foot and ankle surgeon to educate patients on all possible risks associated with surgery and to also be prepared to handle any complications that may arise post-operatively. Peripheral nerve blocks are perceived as safe and effective procedures with low complication rates. While ultrasonography has increased the overall efficacy of PNB's, the complication rates have not seen a decrease. Avoiding intraneural injection during peripheral nerve blocks should be a primary concern to attempt to increase the safety of the block for the patient. The attending physician in this case continues to utilize PNB's as necessary, but thoroughly analyzes patient risk factors and educates patients accordingly.

References

1. Canales MB, Huntley H, Reiner M, Ehredt DJ, Razzante M. The popliteal nerve block in foot and ankle surgery: an efficient and anatomical technique. J Anesth Clin Res. 2015;6:553.

2. Perlas A, Wong P, Abdallah F, Hazrati LN, Tse C, Chan V. Ultrasound-Guided Popliteal Block Through a common Paraneural Sheath *vs.* Conventional Injection: A Prospective, Randomized, Double-blind study. Reg Anesth Pain Med. 2013;38(3):218-25.

3. Compère V, Rey N, Baert O, Ouennich A, Fourdrinier V, Roussignol X, et al. Major complications after 400 continuous popliteal sciatic nerve blocks for post-operative analgesia. Acta Anaesthesiol Scand. 2009;53(3):339-45.

4. Hajek V, Dussart C, Klack F, Lamy A, Martinez JY, Lainé P, et al. Neuropathic complications after 157 procedures of continuous popliteal nerve block for hallux valgus surgery. A retrospective study. Orthop Traumatol Surg Res. 2012;98(3):327-33.

5. Brull R, Hadzic A, Reina MA, Barrington MJ. Pathophysiology and etiology of nerve injury following peripheral nerve blockade. Reg Anesth Pain Med. 2015;40(5):479-90.

6. Kerns JM. The microstructure of peripheral nerves. Techniques in Regional Anesthesia and Pain Management. 2008;12(3):127-33.

7. Aubuchon A, Arnold WD, Bracewell A, Hoyle JC. Sciatic neuropathy due to popliteal fossa nerve block. Muscle Nerve. 2017;56(4):822-4.

8. Maguiña P, Jean-Pierre F, Grevious MA, Malk AS. Posterior interosseous branch palsy following pneumatic tourniquet application for hand surgery. Plast Reconstr Surg. 2008;122(2):97e-9e.

9. Staff NP, Engelstad J, Klein CJ, Amrami KK, Spinner RJ, Dyck PJ, et al. Post-surgical inflammatory neuropathy. Brain. 2010;133(10):2866-80.