

Successful treatment of Raynaud's syndrome in a lupus patient with continuous bilateral popliteal sciatic nerve blocks: a case report

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Abstract: Raynaud's syndrome has been treated medically and invasively, sometimes with regional anesthesia leading up to sympathectomy. We demonstrate that regional anesthesia was in this case a useful technique that can allow some patients to find temporary but significant relief from symptoms of Raynaud's syndrome exacerbation. We present a 43-year-old woman with Raynaud's syndrome secondary to lupus who was treated with bilateral popliteal nerve block catheters for ischemic pain and necrosis of her feet; this led to almost immediate resolution of her pain and return of color and function of her feet. While medical management should continue to be a front-line treatment for Raynaud's syndrome, regional anesthesia can be useful in providing rapid dissipation of symptoms and may thus serve as a viable option for short-term management of this syndrome.

Keywords: Peripheral nerve block, lupus, ischemic pain, regional anesthesia

Introduction

Raynaud's syndrome, first described in 1862, affects between 3% and 10% of the population without preference for a certain sex or ethnicity.^{1,2} It is characterized by alterations in peripheral adrenoceptor activity resulting in vasoconstriction and ischemia of the extremities in response to low temperature or emotional stress.³ This ischemia can cause pain and necrosis of tissues, ultimately leading to amputation if left untreated. Traditionally, most patients can be managed with avoidance of cold exposure and emotional stress. However, when conservative management is inadequate, a number of pharmacological, surgical, and behavioral therapies have been used. Among a number of medical interventions, nifedipine calcium channel blockers are used as a first-line treatment. This medication has resulted in a 33%–66% reduction in frequency and severity of attacks. Other medications such as alpha 1-adrenergic blockers, angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers, serotonin reuptake inhibitors, nitrates, and phosphodiesterase inhibitors have recently been evaluated in the treatment of Raynaud's syndrome.³

For patients who fail to respond to medical treatments, single peripheral nerve blocks have been shown to control the symptoms of ischemia due to Raynaud's syndrome.³ Another technique that has proven effective in refractory cases of Raynaud's syndrome is surgical sympathectomy. In the case presented by Greengrass et al,⁴ regional anesthesia was demonstrated to provide relief for some patients until the removal of the catheter, whereupon a relapse of symptoms occurred and a sympathectomy was performed thereafter.

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Case report

We present a 43-year-old woman with Raynaud's syndrome secondary to lupus who was treated with bilateral popliteal nerve block catheters for ischemic pain and necrosis of her feet. This led to almost immediate relief of pain and return of color to her lower extremities. Prior to the procedure, the patient reported severe pain of 7–8 out of 10 on a numeric rating scale. The patient's past medical history included severe mitral stenosis, aortic stenosis, hypertension, lupus nephritis, end-stage renal disease, and a third-degree heart block resulting in a pacemaker placement. The patient was noted to have systemic lupus erythematosus that was responsive only to steroids, after becoming refractory to prior treatments of Cytoxan and Imuran 11 years earlier. Our patient provided written consent for this case report and its publication. The Committee for the Protection of Human Rights of the University of Texas Health Science Center at Houston approved the retrospective review of this case.

She was originally admitted for dyspnea secondary to her aortic stenosis. The patient underwent open aortic valve and mitral valve replacement during her admission for her cardiac lesions. Her postoperative course was complicated by prolonged intubation and a flare-up of her lupus. She was followed by the rheumatology service for her lupus, who maintained her on prednisone 20 mg throughout her entire hospitalization so as to prevent a steroid withdrawal crisis. The cardiology service maintained her international normalized ratio goal at 2.5–3.5 as a result of her valve replacements. For relief of her lower extremity pain, the primary team prescribed amlodipine 10 mg by mouth daily and placed nitroglycerin patches 0.4 mg/h extended release on the soles of her feet in order to promote vasodilation and reduce cyanosis. When these measures proved ineffective, the Acute Pain Medicine Service was consulted.

Physical examination of our patient revealed an anxious woman in moderate distress. Her right lower extremity was cool to the touch from the toes to the ankle. There was dry gangrene on the second and third toes with dusky discoloration. Limitation of plantar flexion and dorsiflexion was observed secondary to pain and prolonged immobility. On the left foot, there was change in color with mottling of the skin but without significant dry gangrene. Limited range of motion was again seen secondary to pain. A complete blood count revealed white blood cell count of $7,500/\text{mm}^3$, hemoglobin 7.8 g/dL, and platelet $457,000/\text{mm}^3$. The patient was being anticoagulated with a heparin drip given her recent valve replacements. Her international normalized ratio at

the time of the placement of the blocks was 3.21, which was within the target range of 2.5–3.5 desired by the cardiology service. Serum analysis for lupus was not done as the patient already had a confirmed diagnosis of lupus from a previous hospitalization. The patient repeatedly screamed in pain to even light touch of the lower legs or feet.

We elected to provide bilateral popliteal sciatic nerve block catheters for the purpose of reducing sympathetic innervation to her extremities, thereby promoting vasodilation. After informed consent was obtained from the patient, we administered 2 mg of midazolam intravenously for anxiety. The patient was placed in the supine position with her hip flexed and her left leg propped up on several blankets to allow access to her popliteal fossa. The ultrasound probe was placed in the popliteal fossa and scanned cephalad, paying close attention to the location where the sciatic nerve split into the tibial and common peroneal nerve branches. Using sterile technique, the skin was infiltrated with 2 cc of 1% lidocaine, and an 18 G 10 cm stimulating echogenic needle was inserted at the sciatic nerve under constant ultrasound visualization. A 20 mL bolus of 0.2% ropivacaine was given, and a 20 G catheter was inserted perineurally and secured at the skin. In a similar manner, the right sciatic nerve block catheter was placed without complication. The catheters were then connected to two distinct computer-assisted drug delivery pumps, one on each side, with 0.2% ropivacaine infusion at 6 mL/h without the option for patient-controlled analgesia boluses.

Within 30 minutes of completion of the procedure, there was a reddish hue to the previously dusky areas indicative of reperfusion to her toes. She was able to stand on her feet within 24 hours, with the assistance from a physical therapist. On day 2, the catheters were removed and the infusions discontinued. The patient reported that she was able to ambulate on her feet from the second day with complete resolution of the pain in the remainder of her hospital stay. Cyanosis of the skin also improved significantly during her hospital stay. There was no hematoma, bleeding, or other complications noted. Further follow-up revealed that several months later, the patient underwent elective partial amputation of her toes bilaterally, which had been noted to have dry gangrene prior to the initiation of the peripheral nerve blocks.

Discussion

Raynaud's syndrome is typically associated with hyperactivity of the sympathetic nervous system, resulting in vasoconstriction, decrease in capillary surface area, and increase in vascular permeability.⁵ Conservative treatments include avoidance

of cold or emotional stress and behavioral therapies. Medical treatment options include calcium channel blockers, antipressants, angiotensin-converting enzyme inhibitors, and selective phosphodiesterase inhibitors. Regional anesthesia has been used as a diagnostic and therapeutic treatment of Raynaud's syndrome, and sympathectomy has been used for long-term achievement of "excellent analgesia without recurrence of ulcers".¹

Our patient had been diagnosed with lupus and suffered from Raynaud's syndrome secondary to her flare-up after stresses from her recent aortic and mitral valve replacement surgery. She had resolution of her pain and ischemia symptoms for the 4 days of her hospital stay subsequent to the peripheral nerve blocks. This led the authors to the conclusion that there may be many other patients who may respond well to regional anesthesia techniques and may benefit from a temporary sympathectomy as a promising treatment.

The decision to place peripheral nerve block catheters in this patient was based on careful consideration of her medical history and specific risks and benefits. A lumbar epidural would be contraindicated in this patient because at the time of the procedure, our patient was on anticoagulation medications for her mitral and aortic valve replacement. Furthermore, the risk of hypotension would cause a direct insult to her already compromised heart and kidneys. Popliteal sciatic blocks are generally considered to have a lower risk for bleeding because of the use of direct visualization with ultrasound techniques and the compressibility of the site should bleeding occur. There has been a successful report of off-label use of Exparel (liposomal bupivacaine) in patients with digital ischemia with previous modest clinical improvement after peripheral nerve block catheters.⁶ However, Exparel is currently US Food and Drug Administration approved only for wound infiltration and its vasodilatory properties are unknown at this time, and thus was not considered in this case. Nevertheless, further research needs to be performed to determine the safety and potential role of liposomal bupivacaine in peripheral nerve blocks.

Several reports quantify changes in digital blood flow after regional block with direct skin temperature and thermographic monitoring or with photoplethysmography flow studies.⁵⁻⁷ Although helpful, these studies are cumbersome

and results are variable between different interpreters. The positive outcomes from the peripheral nerve block catheters were an improvement in pain control without an opioid burden, mobility, color change, wound healing, and an ability to participate in rehabilitation by our patient, which translates to a profound success for our efforts. If medical management with nifedipine or amlodipine can reduce the frequency of attacks, it could be feasible to provide a nerve block for patients who are hospitalized when they do experience severe exacerbations with signs of necrosis. While regional anesthesia may not be a long-term solution for many patients, it should be considered as a viable option for symptom relief prior to amputation.

Conclusion

Peripheral nerve block catheters were effective as a means of intervention in this patient for short-term symptom relief of Raynaud's syndrome refractory to medical management. While the result in this instance was excellent patient satisfaction, more evidence is required to evaluate the continuous infusion of local anesthetics through the peripheral nerve catheters for the treatment of Raynaud's syndrome.

Disclosure

The authors report no conflicts of interest in this work.

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