Acinetobacter pittii thrombophlebitis complicating cyanoacrylate closure procedure

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ABSTRACT

Chronic venous disease is a common condition causing pain, discomfort, and skin changes that effect quality of life and productivity. Various treatment modalities have been developed to manage retrograde venous blood flow and its associated complications, ranging from conservative therapy to more invasive techniques such as endothermal ablation and cyanoacrylate closure (CAC). Recently, CAC has gained popularity due to its faster recovery time and lower incidence of postprocedure discomfort and complications. The most commonly reported side effects include phlebitis, access site bruising or pain, and dermatitis. We present a case of phlebitis caused by *Acinetobacter pittii* following a CAC procedure using the VenaSeal device (Medtronic) in a patient with diabetes. The patient required surgical resection of the affected vein and prolonged antibiotic therapy. Bacterial contamination of the cyanoacrylate adhesive within a vein poses a significant treatment challenge with antibiotics alone due to biofilm production. Aggressive source control with removal of the adhesive-treated vein could be required for treatment of endovascular infections resulting from these common procedures. (J Vasc Surg Cases Innov Tech 2024;10:101454.)

Keywords: *Acinetobacter pittii*; Chronic venous disease; Cyanoacrylate closure procedure

Chronic venous disease (CVD) is a highly prevalent, debilitating disorder that significantly reduces quality of life and imposes a considerable socioeconomic burden.[1-3] It is estimated that approximately 30% of the U.S. population suffers from CVD, translating to a loss of nearly 2 million workdays annually due to complications stemming from the condition.[2-4] CVD encompasses a diverse range of clinical presentations involving the lower extremity, including pain, swelling, heaviness, itching, skin changes, and venous leg ulcers. Compression stockings, leg elevation when feasible, regular exercise as tolerated, and weight loss when appropriate form the mainstay of conservative treatment. However, when conservative treatment fails, and the involvement is restricted to the superficial venous system, more invasive procedures such as surgery (eg, vein ligation and stripping), endovenous laser ablation, mechanochemical ablation, radiofrequency ablation, ultrasound-guided foam sclerotherapy, and cyanoacrylate closure (CAC) can be pursued.[5-8]

Medical grade cyanoacrylate adhesives have a variety of applications, from superficial closure of skin wounds to the treatment of arteriovenous malformations and varices.[9,10] *N*-Butyl-cyanoacrylate is a tissue adhesive agent first introduced in the 1960s that quickly hardens to a solid after contact with hydrogen ions in water.[10] The VenaSeal closure system (Medtronic) is a minimally invasive, nonthermal, nontumescent technique that uses cyanoacrylate glue to occlude the vein lumen.[5,7] Approved by the Food and Drug Administration in 2015, it is an ambulatory procedure not requiring anesthesia that is selected by many for its shorter recovery time and minimal pain. A recent randomized controlled study evaluating CAC vs radiofrequency ablation for treatment of incompetent great saphenous veins found the two methods to be equivalent in efficacy with continued closure at 24 months of follow-up.[11] Patient satisfaction, however, was higher in the CAC group due to the shorter procedure time and quicker recovery.[11] Dermatitis, localized pain, and phlebitis are the most reported side effects and are managed conservatively.[12-14] In 2017, the first case of hypersensitivity reaction associated with CAC was described in the WAVES (Lake Washington vascular VenaSeal post-market evaluation) trial in a patient who had developed full body urticaria 1 week after CAC.[13,15] Histopathologic examination of the excised vein in patients presenting with hypersensitivity reactions revealed mononuclear cells, including CD4+ lymphocytes, suggestive of a type IV hypersensitivity reaction.[13,15] In type IV hypersensitivity reactions, removal or avoidance of the offending agent or agents and steroid

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therapy is the standard of care.[13,15] Infections are rare complications of these procedures. We report a late postoperative infection with *Acinetobacter pittii,* a member of the *Acinetobacter baumannii* complex, in a relatively healthy man requiring surgical excision of the CAC treated veins and prolonged antibiotic therapy. The patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT

A 52-year-old man was referred to the vascular surgery clinic at Tripler Army Medical Center for recurrent phlebitis and associated cellulitis refractory to antibiotic therapy. He had type 2 diabetes (hemoglobin A1c <7.0%) and hyperlipidemia treated with alogliptin, metformin, and atorvastatin. He had undergone a VenaSeal procedure on the left great saphenous vein (GSV) and left small saphenous vein (SSV) for symptomatic varicose veins performed at a civilian ambulatory surgery clinic 4 months prior. Access and intervention of the GSV and SSV occurred separately on 2 consecutive days with no reported complications. The patient had no history of venous or arterial disease, venous thromboembolism, peripheral neuropathy, chronic ulcers, skin changes, or significant lower extremity trauma. His feet were well maintained without evidence of fungal infection or skin breakdown. Approximately 2 weeks after the procedure, he developed left ankle swelling and pain, primarily localized around the SSV access site without extension. The GSV access site and track were not involved. He was seen in the emergency department and treated for cellulitis with cephalexin and trimethoprim-sulfamethoxazole. A contrast-enhanced computed tomography (CT) scan of the leg demonstrated edema and fat stranding without abscess formation, and Doppler ultrasound did not reveal deep vein thrombosis in the left lower leg. The patient traveled via plane on holiday to the mainland and experienced a recurrence 2 weeks later for which he was prescribed oral clindamycin. The development of subjective fevers 1 day later prompted him to seek care at a nearby emergency department. He was given a dose of vancomycin, followed by oritavancin, so that he could make his return flight home. His symptoms initially improved; however, 2 weeks after returning to Hawaii, the left ankle pain and swelling had returned in the same location. He was given another course of oral antibiotics (cephalexin and doxycycline). After completion of this third course of antibiotic therapy, he began to develop purulent drainage at the SSV access site, ~2.5 months after his CAC procedure. Infectious diseases was consulted and empirically started linezolid therapy. Cultures from the discharge grew pure colonies of an isolate in the *Acinetobacter baumannii* complex sensitive to ampicillin/sulbactam, ciprofloxacin, piperacillin/tazobactam, ceftazidime, imipenem, and tobramycin. Further speciation of the isolate was not possible with the available microbiological techniques. Repeat Doppler ultrasound and CT of the left lower leg did not reveal deep vein thrombosis or focal abscess formation. The CT scan again demonstrated edema and fat stranding surrounding the SSV, suggestive of superficial thrombophlebitis with surrounding cellulitis (Fig 1). The laboratory test results showed persistently normal white blood cell counts, erythrocyte sedimentation rates, and C-reactive protein levels, and blood cultures were negative throughout the nearly 3-month period of symptoms.

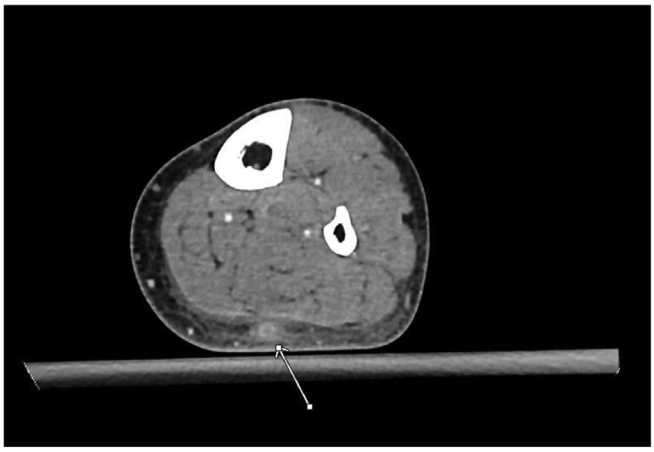

Fig 1. Computed tomography (CT) scan with intravenous contrast of the left lower extremity. *Arrowhead* indicates expansion of the lesser saphenous vein with adjacent edema and fat stranding, suggestive of superficial thrombophlebitis with surrounding cellulitis and edema.

He was medically managed with antibiotics alone, receiving high-dose ampicillin (4 g)/sulbactam (2 g) intravenously every 8 hours for 2 weeks, with resolution of the cellulitis. However, within 3 weeks of completing antibiotic therapy, he had a recurrence of symptoms, prompting more aggressive therapy with surgical resection (Fig 2). Cultures from the proximal and distal SSV tissue grew an isolate in the *A. baumannii* complex with an identical susceptibility profile to the original culture of the pus collected from the SSV access site. Fungal and mycobacterial cultures from the surgery were negative. Blood cultures remained negative. Limited resection of the SSV was initially performed; however, he continued to experience pain, erythema, and induration at the access site. Thus, he was taken back to the operating room 3 days later for further resection to remove as much of the remaining vein containing the residual adhesive as feasible. Cultures of the resected SSV from this second surgery also grew *A. baumannii* complex. Visual inspection of the resected SSV showed inflammation and thrombosis of the access site and distal perforation of the SSV (Fig 3). An additional 6 weeks of high-dose ampicillin/sulbactam resulted in complete resolution of infection. Unfortunately, the chronic inflammation and extensive resection required for source control resulted in severe left sural neuropathy requiring anticonvulsants (eg, gabapentin) for pain control and lifestyle modification with slow recovery to near baseline function.

DISCUSSION

To the best of our knowledge, we present the first case of *Acinetobacter* infection after CAC requiring extensive surgical resection in combination with prolonged antibiotic therapy and resulting in temporary nerve damage.

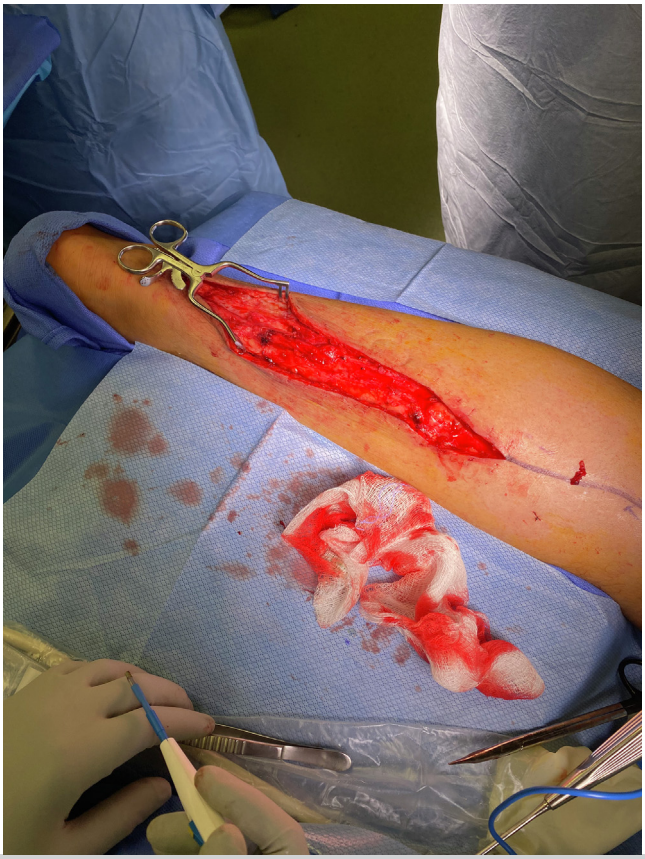

Fig 2. Small saphenous vein (SSV) and debridement to healthy tissue.

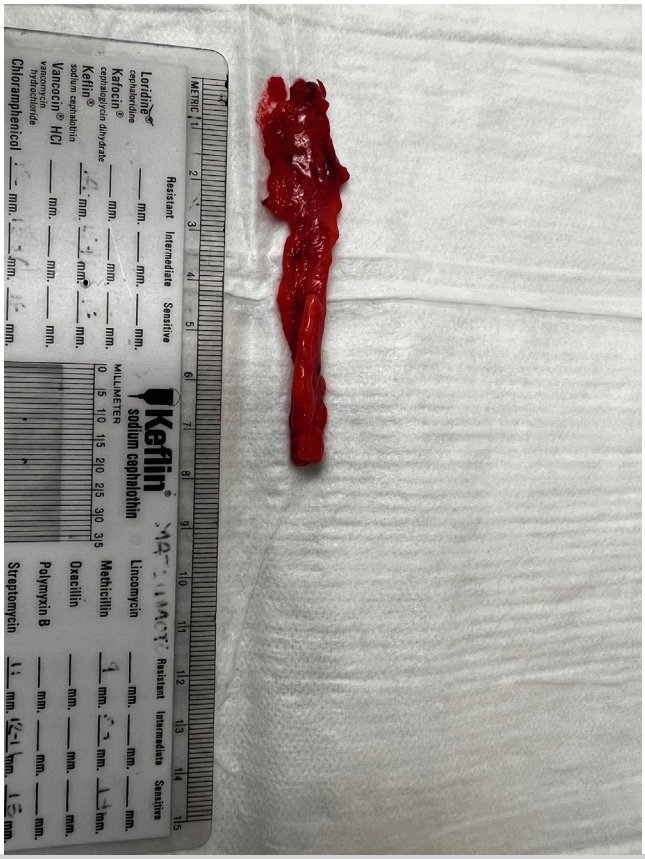

Fig 3. Excised distal small saphenous vein (SSV), thrombosed and inflamed.

Access site infections with both gram-negative and gram-positive organisms, such as *Staphylococcus aures, Enterobacter, Pseudomonas,* and *Citrobacter koseri* have been reported but remain uncommon.[16-18] All the patients required localized resection of the access site with removal of the retained adhesive. In our case, the patient had no predisposing risk factors (eg, trauma or skin breakdown) or environmental exposures (eg, water, soil, or prolonged hospitalization) to suggest an external source for the infection. A hypersensitivity reaction has been suggested as a risk factor for access site infection; however, our patient endorsed delayed closure and poor healing of the SSV access site only, with the GSV access site fully healed.

To the best of our knowledge, this is the first case of *Acinetobacter* infection occurring with CAC. The species most associated with healthcare-related infections are within the *A. baumannii* complex. Its ability to contaminate and infect wounds has been well described in military service members returning from Iraq and Afghanistan.[19] Whole genome sequencing of the isolate did not match strains identified in a Department of Defense–wide surveillance repository (Multidrug-Resistant Organism Repository and Surveillance Network, Walter Reed Army Institute of Research, Silver Spring, Maryland) from that region of the world or from our hospital. Colonization was excluded with negative surveillance cultures from the axilla, peri-rectum, and groin. The extensive antibiotic exposure targeting bacteria found on the skin likely selected for more resistant gram-negative pathogens such as *Acinetobacter.*

Primary contamination of the cyanoacrylate adhesive is the most likely cause of the infection, rather than delayed inoculation at the SSV access site from host colonization or contact with healthcare personnel. We were not able to obtain samples of the adhesive to confirm the hypothesis due to the long interval between the procedure and his presentation to us for care (~4 months). The recurrence with antibiotic therapy alone suggests biofilm formation is a significant factor in preventing clearance. Biofilms are extracellular polymers that enable microorganisms to firmly adhere to and proliferate on surfaces, allowing better access to nutrients and protection from antibiotics. Furthermore, cultures of the SSV sections sent from both surgeries grew *A. pittii,* indicating the entire length of the adhesive could have been infected, necessitating complete resection of the involved vein for definitive source control.

Unfortunately, the extensive resection, combined with the chronic inflammation from the long duration of infection, contributed to his traumatic sural neuropathy.

CONCLUSIONS

As CAC continues to increase in popularity, with patients selecting this option over other minimally invasive procedures or conservative management, infectious complications could be seen more frequently, particularly in those patients not responding to standard postoperative management. Atypical organisms such as *A. pittii* pose unique therapeutic challenges because of their intrinsic antibiotic resistance, propensity to form biofilms, and indolent course, as highlighted by our patient's case.

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DISCLOSURES

None.

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