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## Delayed Presentation of Catheter-Related Subclavian Artery Pseudoaneurysm

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Central venous catheterization is a common diagnostic and therapeutic procedure in modern clinical practice. Pseudoaneurysms of the subclavian artery are rare and usually occur immediately after the causative event, whether the cause was trauma or a medical procedure. Here we report the rare case of a 71-year-old woman with delayed presentation of catheter-related subclavian pseudoaneurysm. The patient was treated for aspiration pneumonia with respiratory failure in another hospital. The patient's chest wall swelling began two weeks after the initial catheterization in the other hospital, probably because of slow leakage of blood from the injured subclavian artery caused by incomplete compression of the puncture site and uremic coagulopathy. She was successfully treated with ultrasound-guided thrombin and angiography-guided histoacryl injection without stent insertion or surgery. Her condition improved, and she was discharged to her home.

**Key Words:** aneurysm, false; embucilate; subclavian artery; thrombin.

Central venous catheters are commonly used for diagnostic and therapeutic purposes. However, they may sometimes be the cause of a number of catheter-related complications ranging from mild to severe.[1] Rare, potentially serious complications include development of a pseudoaneurysm of the subclavian artery and its subsequent progression and eventual rupture. Most of the complications occur and present immediately after the causative event, but in rare cases, presentation could be delayed.

Here we report the rare case of a 71-year-old woman with a delayed presentation of catheter-related subclavian pseudoaneurysm who was successfully treated with ultrasound-guided thrombin and angiography-guided histoacryl injection.

### Case Report

A 71-year-old woman was transferred to the emergency department for specialized intensive care including assisted ventilation and renal replacement therapy. Her medical history included diabetes and a previous cerebrovascular incident. She had

been admitted at another hospital one month earlier because of aspiration pneumonia. Although broad-spectrum antibiotics were administered, her condition had gradually worsened; ventilation was initiated in the intensive care unit because of acute respiratory failure. Her doctor had attempted to place a central line via the left subclavian vein. Vessel access was performed using the standard needle and guidewire technique

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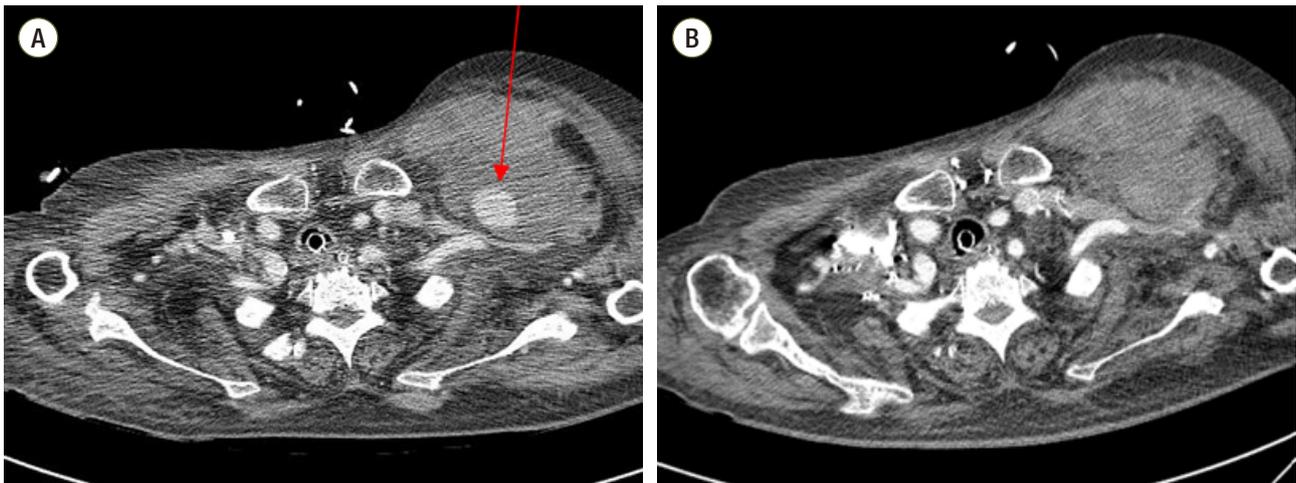
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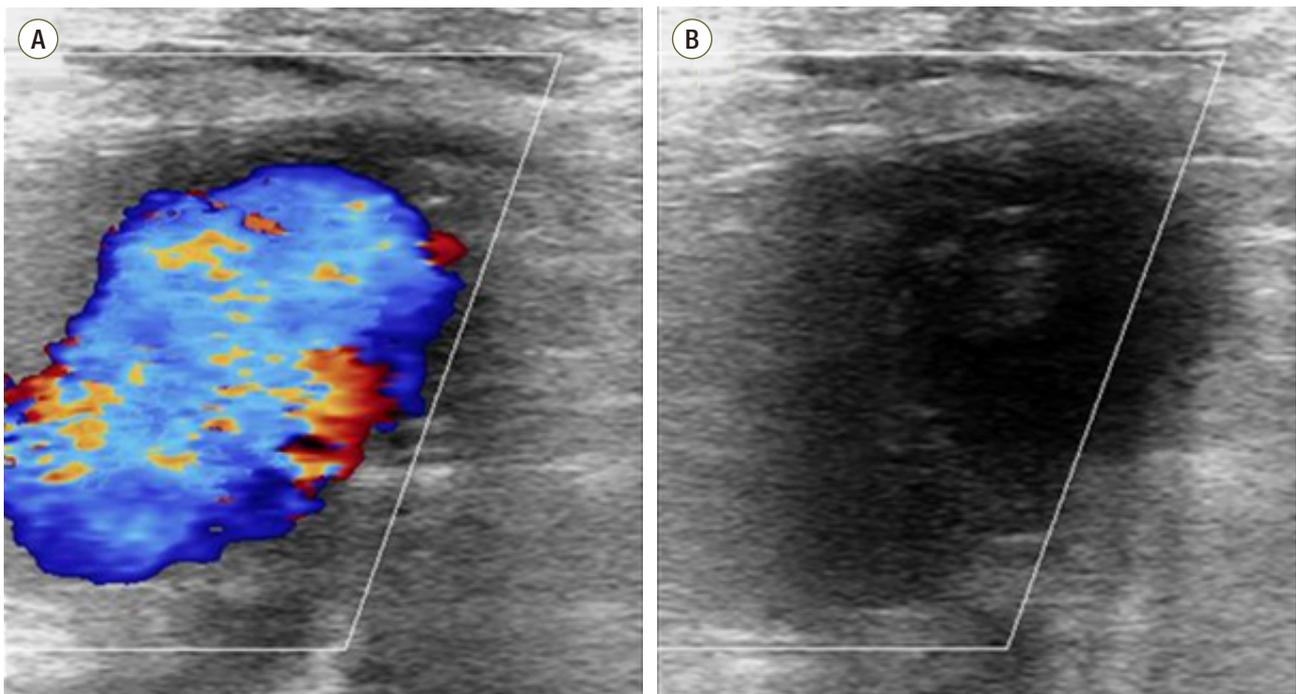
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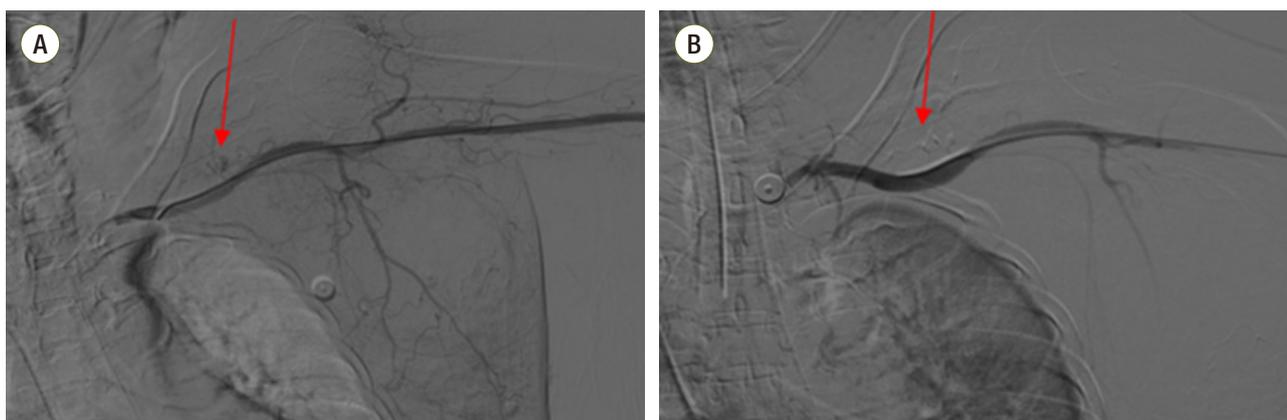
**Fig. 1.** Chest computed tomography (CT) scanning. It revealed a 2.6-cm enhancing nodular lesion, suggesting a pseudoaneurysm at the left subclavicular area with surrounding hematoma (arrow) (A). CT scanning after embolization revealed no bleeding and a smaller hematoma (B).



**Fig. 2.** An ultrasound-guided thrombin injection was performed at the pseudoaneurysm of the left subclavian artery (A: pre-injection, B: post-injection).

without ultrasonographic guidance, but catheter placement via the left subclavian vein failed after several trials. Even with aggressive treatment, her symptoms gradually worsened, and she developed acute kidney injury. She was transferred to our hospital for management of pneumonia and continuous renal replacement therapy. In the emergency department, laboratory diagnostics revealed the following:

leukocyte count, 22,160/mm<sup>3</sup>; C-reactive protein level, 3.95 mg/dL; and pro-calcitonin quantitative level, 2.15 µg/L. Other blood chemistry values were within reference ranges except increased blood urea nitrogen (70 mg/dL) and creatinine (4.7 mg/dL). In order to protect her renal function, we changed her antibiotic to a less nephrotoxic one with a dose adjustment. Fortunately, her respiratory symptoms



**Fig. 3.** Angiography findings. It revealed active bleeding of a branch of the left subclavian artery (arrow) (A). After embolization, angiography showed no evidence of extravasations of contrast media (arrow) (B).

improved along with her renal function. However, on the fifth day after she was transferred to our hospital, we found swelling in her left upper anterior chest area. We performed a computed tomography (CT) examination of the chest. CT scanning revealed a 2.6-cm enhancing nodular lesion, suggesting a pseudoaneurysm at the left subclavicular area with surrounding hematoma (Fig. 1A). Because the patient was on a ventilator and her vital signs were unstable, we chose a bedside procedure to resolve this problem. We immediately performed an ultrasound-guided thrombin injection at the pseudoaneurysm of the left subclavian artery (Fig. 2). The swelling gradually decreased over the next four days; her medical condition, including respiratory failure and renal failure, also continued to improve. However, on the eighth day after the procedure, swelling of the chest wall had begun to increase, and we performed ultrasonography. On ultrasonography, blood flow could not be visualized at the pseudoaneurysm because the vessel was blocked by a thrombus. Because the patient's condition, including renal function, was relatively stable, angiography was performed using fluoroscopy to find the cause of the swelling. Angiography revealed active bleeding of a branch of the left subclavian artery (Fig. 3A). Embolization was performed at the same branch of the subclavian artery using n-butyl-2-cyanoacrylate (Histoacryl, B. Braun Medical Inc., Bethlehem, PA, USA). Follow-up angiography, performed after four days, revealed no visible extravasation from the subclavian artery (Fig. 3B).

Both the patient's medical condition and left chest swelling gradually improved. Follow-up CT scanning revealed no

evidence of active bleeding or pseudoaneurysm (Fig. 1B).

The patient was continuously treated for aspiration pneumonia and respiratory failure, and her condition ultimately improved. One month after the procedure, she was discharged to her home.

## Discussion

A central venous line may be useful for monitoring the cardiovascular function of patients in critical condition and for administering vasoactive drugs or solutions that would irritate peripheral veins, such as total parenteral nutrition.[2] However, central line insertion may cause a number of complications such as skin infection, thrombophlebitis, pneumothorax, thrombosis, central-line-associated sepsis, hemorrhage, and arrhythmia.[1] Pseudoaneurysm of the subclavian artery can also develop after inadvertent puncture of the artery. Subclavian pseudoaneurysms are rare, and their true incidence is unknown. Most cases are secondary to arterial catheterization, surgical procedures, and radiology interventions, but in a few cases described in the literature, injury to the subclavian artery was caused by blunt trauma.[3] Patients with subclavian pseudoaneurysm may be asymptomatic or they may present with chest pain, Horner syndrome, paresthesia, hoarseness, upper limb ischemia, a pulsatile mass, or hemoptysis.[4]

Early recognition and optimal diagnostic tools are very important in such cases. Various diagnostic methods may be used. Sonography is highly sensitive and specific for ac-

cessible arterial injuries, and it is often useful for rapid bedside assessment in the intensive care unit. Spiral contrast-enhanced computed tomography usually provides a good diagnostic yield and was used to make the initial diagnosis in this case. Angiography not only enables accurate diagnosis but also provides endovascular treatment options without surgery.[5] These diagnostic tools are complementary; their use depends on the condition of the patient.

In the case described here, signs of subclavian artery pseudoaneurysm were not seen until approximately two weeks after catheterization. We suggest the following possible explanations of the delayed presentation. First, the patient was a quiet, overweight, geriatric woman with ample free space for a hematoma reservoir. Second, she could not complain of chest discomfort because of intubation and deep sedation during ventilator care. Third, uremic coagulopathy played a role in the continuous leakage of small amounts of blood from the injured vessel.[6]

The classical treatment of pseudoaneurysm is open surgery for resection and end-to-end anastomosis, venous graft, suture, or bypass.[7] However, open surgery involves considerable morbidity and mortality, particularly with high-risk patients and urgent surgeries. Therefore, less invasive procedures have been developed. Marin et al. published the first report of the use of covered stents to treat pseudoaneurysms.[8] Since the 1990s, ultrasound-guided compression repair and ultrasound-guided thrombin injections have been used. Ultrasound-guided thrombin injection has a primary success rate of 97% and a low complication rate of 1.3%, with an embolic rate of 0.5%.[9] Moreover, the use of endovascular stent treatment or embolization of vascular injuries via angiography has become an acceptable and less invasive alternative to surgical repair in subclavian artery injury.[10]

If the patient's vital signs had been stable and anticoagulation for stent placement had been possible, we could have considered stent insertion. However, her condition did not allow for this option; her vital signs were unstable and she had a cerebrovascular accident with severe disabilities. We therefore chose to use treatment modalities that did not include stent placement. Fortunately, we have also successfully performed ultrasound-guided thrombin injection and histoacryl embolization by angiography without stent insertion.

In conclusion, overweight and geriatric patients with

uremic coagulopathy could be predisposed to bleeding and delayed presentation of hematoma and pseudoaneurysm. Therefore, such patients require accurate and relatively long compression times compared with other patients. Ultrasound-guided access, if available, should also be considered in order to avoid unnecessary damage to blood vessels.

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