

# Femoral artery pseudoaneurysm after carotid artery stenting

## Two case reports

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### Abstract

**Rationale:** Pseudoaneurysm, the most common complication of femoral artery catheterization, involves the formation of a space between the lumen and the surrounding fibrous tissue through the damaged arterial wall. In patients treated with antiplatelet and anticoagulant agents, the incidence of vascular complications increases with the increasing use of minimally invasive procedures.

**Patient concerns:** We experienced 2 cases of procedure-induced pseudoaneurysms. A 79-year-old man with right hemiparesis visited our hospital. Brain magnetic resonance imaging showed acute left middle cerebral artery territory infarction and severe stenosis of the left proximal carotid artery. The patient was prescribed apixaban and underwent carotid stenting through the right femoral artery. Hematoma and tenderness were observed in the right inguinal region after the procedure. The hemoglobin level decreased from 16.9 g/dL to 9.4 g/dL. Another 78-year-old man with left common carotid artery stenosis was admitted. We performed stent implantation through the right femoral artery and administered aspirin and clopidogrel. After the procedure, hematoma and tenderness of the puncture site were observed. The hemoglobin level decreased from 14.5 g/dL to 10.9 g/dL.

**Diagnosis:** Emergency computed tomography confirmed a pseudoaneurysm with a massive hematoma in the right inguinal area. The patients were diagnosed with infection-associated right pseudoaneurysm for which an emergency puncture site repair was performed.

**Interventions:** We performed resection of pseudoaneurysm and repaired puncture site.

**Outcomes:** The hemoglobin level was stabilized postoperatively and vital sign remained stable.

**Lessons:** Pseudoaneurysm is an important complication of femoral artery puncture. The use of a hemostatic device was not superior to manual compression, and the incidence of this complication was significantly higher in patients who received anticoagulant or antiplatelet agents. A pseudoaneurysm may cause a bad prognosis. Therefore, the early detection of pseudoaneurysm and immediate treatment after femoral arterial puncture are needed.

**Abbreviations:** CT = computed tomography, MRA = magnetic resonance angiography, MRI = magnetic resonance imaging, UGCR = ultrasound-guided compression repair.

**Keywords:** angiography, closure device, pseudoaneurysm, stent

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S-HJ and HGK contributed equally to this work.

The patients have given their consents for this case report.

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

All data and material supporting our findings are contained within the manuscript.

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## 1. Introduction

A pseudoaneurysm, the most common complication caused by femoral artery catheter insertion, occurs when a space forms between the blood vessel lumen and the surrounding fibrous tissue through the damaged artery wall.<sup>[1]</sup> The occurrence of local vascular complications due to a surgical procedure has recently increased with the use of an antiplatelet or anticoagulant along with femoral artery catheter insertion.<sup>[2]</sup> In particular, pseudoaneurysm frequently occurs at the puncture site below the head of the femur due to insufficient bone support resulting in angiopressure after catheter removal.<sup>[3]</sup> However, to our knowledge, only a few studies have reported local complications after cerebral angiography. Here we describe 2 cases of femoral artery pseudoaneurysm after cerebral angiography and a review of the relevant literature.

## 2. Case presentation

### 2.1. Case 1

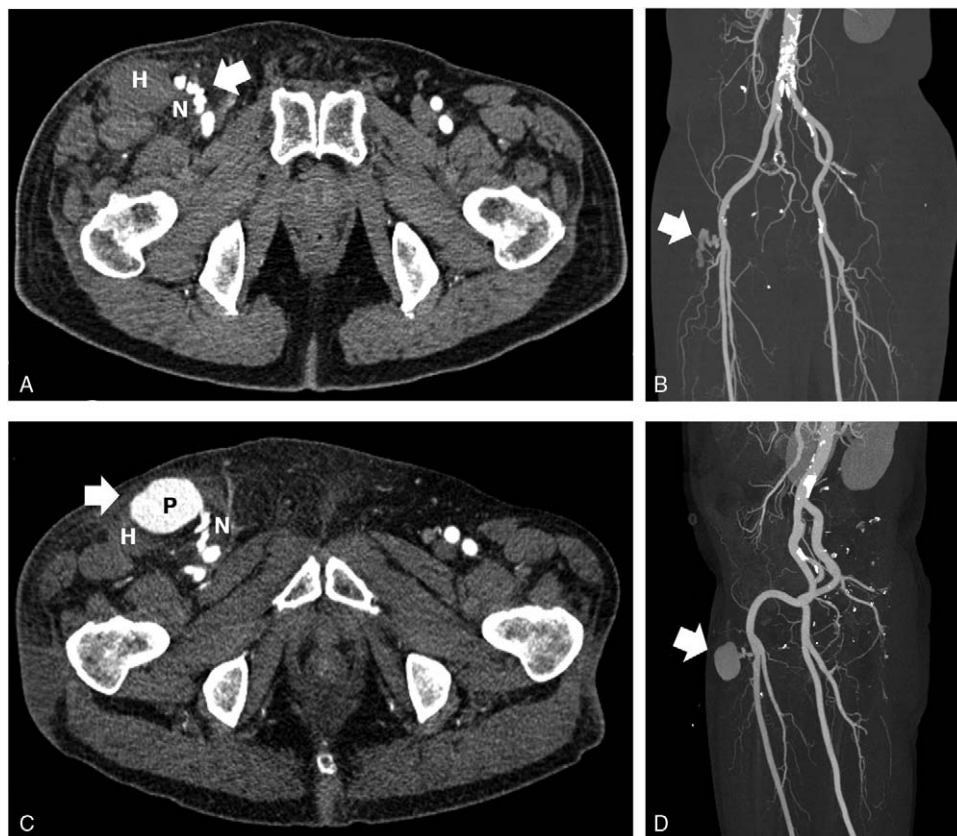
A 79-year-old man visited our clinic with a 3-day history of weakness of the right hand. He was taking medication for chronic obstructive pulmonary disease. However, he had no hypertension or diabetes and did not smoke. A neurological examination showed no abnormalities except for weakness in the distal portion of the right upper extremity (Medical Research Council Grade 4+). At the time of the visit, his National Institutes of

Health Stroke Scale score was 1 point. Acute cerebral infarction was observed in the left middle cerebral artery territory on brain magnetic resonance imaging (MRI). Moreover, severe stenosis was found in the left proximal internal carotid artery on brain magnetic resonance angiography (MRA). In addition, atrial fibrillation was observed on echocardiography performed during the visit. The patient was prescribed apixaban 10 mg/day and underwent balloon angioplasty and carotid artery stent insertion through the right femoral artery. Moreover, puncture site closure was conducted using an Angio-seal closure device.

The second day after the procedure, hematoma accompanying ecchymosis and tenderness was observed in the right inguinal area. Although the patient's vital signs were stable, his hemoglobin level decreased from 16.9 g/dL to 9.4 g/dL before the surgical procedure. Emergent computed tomography (CT) was performed to identify the cause of the hemoglobin decrease after a fluid infusion and blood transfusion. We confirmed the presence of pseudoaneurysm accompanying a massive hematoma in the right inguinal area (Fig. 1A, B). After pseudoaneurysm removal and puncture site restoration surgery, the vital signs remained stable and the hemoglobin level normalized.

### 2.2. Case 2

A 78-year-old man visited our hospital with stenosis of the left common carotid artery detected on brain MRA during a health check examination. The patient was already on antiplatelet



**Figure 1.** Axial view and angiography of contrast-enhanced computed tomography with right femoral pseudoaneurysm in 2 patients. (Case 1—A and B. Case 2—C and D) Hematoma (H) and pseudoaneurysm (P) communicate with the right common femoral artery through a pseudoaneurysm neck (N). The white arrow indicated a pseudoaneurysm (P) which is communicated with right common femoral artery.

treatment and no abnormalities were found in a neurological examination. Although there were no specific findings on brain MRI, the MRA results showed severe stenosis of the left common carotid artery. The patient was administered aspirin 100 mg/day and clopidogrel 75 mg/day and underwent balloon angioplasty and carotid artery stent insertion through the right femoral artery. Moreover, the puncture site was closed using an MYNXGRIP closure device.

The patient's vital signs and neurological symptoms were stable after the procedure. However, a mild fever (38.2°C) and hematoma accompanying puncture site tenderness were observed the day after the procedure. A laboratory test showed that the hemoglobin level decreased from 14.5 g/dL to 10.9 g/dL. Moreover, the emergent CT revealed that pseudoaneurysm occurred in the right femoral artery (Fig. 1C, D). The patient was diagnosed with an infection-associated pseudoaneurysm for which an emergent pseudoaneurysm resection and puncture site reconstruction were performed. The patient was stable afterward and then discharged.

### 3. Discussion

Both patients described here experienced pseudoaneurysm accompanying an acute hemoglobin level decrease after undergoing cerebral angiography through the femoral artery while taking anticoagulant or antiplatelet agents. We conducted further evaluations of suspected pseudoaneurysm due to the hematoma accompanying the tenderness that expanded in the inguinal area after the femoral artery catheter insertion.

When a hematoma accompanying tenderness while the vibration thrill of the femoral artery is felt or bruit is auscultated, further evaluations of pseudoaneurysm should be performed.<sup>[3]</sup> Color Doppler ultrasonography, the most common test, is used to confirm the presence of a communicating tract and pseudoaneurysm number and size. When a pseudoaneurysm is large, its location and size can be identified more precisely using contrast-enhanced CT or MRI.<sup>[4]</sup> It was difficult to conduct ultrasounds for these patients due to severe tenderness at the hematoma site, decrease in hemoglobin level, and rapidly expanding hematoma. Therefore, contrast-enhanced CT was conducted immediately.

The treatment of pseudoaneurysm may vary depending on its size and symptoms. A pseudoaneurysm <2 cm in diameter that is not expanding can be treated conservatively. Among conservative treatments, ultrasound-guided compression repair (UGCR) can be the first option. A thrombus in the pseudoaneurysm lumen compresses the pseudoaneurysm neck and blocks the blood flow. If UGCR fails, embolization, in which thrombin or multiple small coils are injected into the aneurysm neck, is performed.<sup>[5]</sup> Surgical treatment can be considered when infection, rapid swelling, non-surgical treatment failure, skin necrosis, compression syndrome such as neuropathy, or claudication occurs.<sup>[6]</sup> Simple wound suturing after hematoma removal may be sufficient, while surgical reconstruction with a patch can be added as needed.<sup>[7]</sup> In these cases, conservative treatments such as compression using ultrasonography or a simple procedure could not be conducted due to severe pain and they needed emergency operations because

of the rapid hematoma expansion, an abrupt decrease in hemoglobin, and symptoms of infection such as fever.

The use of an arterial puncture closure device such as the MYNXGRIP compared to manual compression did not affect the occurrence of complications. However, the occurrence of pseudoaneurysm was significantly higher for patients taking anticoagulant or antiplatelet agents.<sup>[8]</sup> Similarly, our patients' bleeding was controlled using a hemostasis device while they were taking medications and a pseudoaneurysm occurred. This result suggests that in a future large-scale systematic prospective study of the effects and abnormal responses of a hemostasis device on patients taking anticoagulant or antiplatelet agents will be necessary.

Pseudoaneurysm is an important complication of femoral artery puncture that may lead to a poor prognosis for patients such as hematoma and infection. If a patient takes anticoagulant or antiplatelet agents, such as in our cases, it will be necessary to control bleeding using sufficient pressure for a sufficient time after femoral artery puncture. Moreover, it is important to identify the pseudoaneurysm as soon as possible by observing the patient carefully and continuously. Additionally, physicians must pay enough attention to these patients. For example, it is recommended that the hematoma development, puncture site, and fever be checked periodically. Thus, if a pseudoaneurysm is suspected, active treatment such as an emergency operation can be performed efficiently.

### Author contributions

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