Pulmonary Thromboembolism - A Complication after Surgical Repair of a Chronic Femoral Arteriovenous Fistula

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Rarely, an arteriovenous fistula (AVF) can follow a femoral arterial puncture for cardiovascular catheterization. Surgical repair has been suggested as the standard treatment. We report a 66-year-old woman with a pulmonary thromboembolism as a complication of surgical repair of a chronic femoral AVF. We believe that the repair of the AVF led to a sudden decrease in venous blood flow, leading to thrombus formation at the site of damaged endothelium. Therefore, doctors should consider all possible complications that can arise from a sudden change in blood flow as a result of repairing a chronic AVF. (Korean J Med 2015;88:430-433)

Keywords: Pulmonary thromboembolism; Arteriovenous fistula; Postoperative complications

INTRODUCTION

In rare cases, an arteriovenous fistula (AVF) can follow a femoral arterial puncture performed for cardiovascular catheterization and intervention. The reported incidence of femoral AVF is 0.006-0.86% [1-2]. Although one-third of AVFs resolve spontaneously, surgical repair is the standard for care, and endovascular repair using a covered stent has been suggested as an alternative treatment for iatrogenic femoral AVFs [3]. A case of pulmonary thromboembolism following surgical repair of a chronic AVF is described here.

CASE REPORT

A 66-year-old woman was admitted to our hospital with intermittent chest pain that she had been experiencing the past 2...
years. Her pain was exertional and would last for several minutes. She denied any other symptoms. The systems review was unremarkable. Her medical history consisted of hypertension, chronic kidney disease, right calf lymphedema diagnosed 40 years earlier, and coronary artery disease. She had a metal stent placed in the left anterior descending artery in December 2006 and underwent angioplasty five times for stent restenosis from September 2007 to February 2010 at a regional hospital. On physical examination, she had non-pitting edema of the right calf. The rest of her examination was within normal limits. On July 30, 2012, coronary angiography was performed via the femoral artery, which revealed a patent stent and no significant stenosis in the native coronary arteries.

The day after catheterization, her right groin was swollen, and a bruit was heard around the lesion. We suspected a femoral AVF and performed duplex ultrasonography, confirming an AVF between the superficial femoral artery and vein. No thrombus was seen in the femoral artery or vein (Fig. 1) or calf vein. The patient was diagnosed with an iatrogenic right femoral AVF, and surgical repair including ligation and division of the AVF was performed the next day. Interestingly, the intraoperative findings were not consistent with a newly developed AVF. Based on the adhesions surrounding the fistula, the fistula had likely been present for at least several months. Furthermore, the location of the arterial end of the fistula did not match the recent puncture site made at the time of catheterization. Therefore, we believe that a hidden chronic AVF was found due to the large hematoma that formed at the nearby site after the current catheterization.

On postoperative day 2, the patient collapsed suddenly due to severe hypoxia. One minute of cardiopulmonary resuscitation revived her, and her oxygen saturation improved with supplemental oxygen. An electrocardiogram revealed a new S wave in lead 1, and a Q wave and T wave inversion in lead III. The plasma d-dimer exceeded 20 µg/mL. These clinical features suggested a pulmonary thromboembolism. Subsequent computed tomographic pulmonary angiography showed multiple thromboemboli obstructing the bilateral main and segmental pulmonary arteries (Fig. 2) and a thrombus extending from the distal right external iliac vein all the way to the proximal right common femoral vein. A hematoma was seen around the right common femoral artery (Fig. 3). Since the patient was stable hemodynamically, anticoagulation with unfractionated heparin was initiated, followed by warfarin for 4 days. Adequate anticoagulation was achieved on postoperative day 10, and the period of heparin and warfarin overlap was 4 days. She used oxygen for 6 days and was discharged on 2.5 mg warfarin per day.

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**Figure 1.** Duplex Doppler ultrasonography showed an arteriovenous fistula between the superficial femoral artery and vein. The arterial blood flow superimposed on the venous flow at the right proximal superficial femoral vein confirms the presence of a fistula between the artery and vein. A, artery; V, vein.

**Figure 2.** Computed tomographic angiography shows a thromboembolism involving the bilateral main and segmental pulmonary arteries (arrows). Ao, aorta; PA, pulmonary artery; LV, left ventricle.
DISCUSSION

We report a 66-year-old woman with a massive pulmonary thromboembolism as a complication from surgical repair of a chronic femoral AVF. Her AVF had not been detected until a thorough physical examination and ultrasonography performed for a large hematoma from her current catheterization revealed its presence. In addition, the chronicity of the AVF was not recognized until the right groin was explored. We think that the thrombus that developed at a site of venous endothelial injury caused long-term high-pressure arterial flow. In addition, the non-pitting edema of the right calf might have been caused by lymphedema related to chronic venous insufficiency due to the chronic AVF. Since there was no evidence of thrombus in the iliofemoral vein or calf vein on duplex ultrasonography of the right lower extremity preoperatively, its development was most likely triggered by the ligation of a long-standing AVF. Despite venous endothelial injury, the high flow from the artery through the AVF might have prevented thrombus formation. Repair of the AVF might have led to a sudden decrease in venous blood flow, leading to formation of a thrombus at the site of damaged endothelium.

Venous endothelium appears to be more susceptible than arterial endothelium to developing inflammation [4]. Furthermore, changes in flow direction lead to endothelial disturbances, which can provoke inflammatory responses [5]. Marked up-regulation of proinflammatory genes and progressive neointimal formation in the venous endothelium were demonstrated in an AVF rat model [6]. With the cumulative effect of inflammation and neointimal hyperplasia accompanying the chronic AVF in this patient, a rapid decline in flow caused by repair of the AVF might intensify thrombus development at a site with a broken endothelial barrier.

In the late 1990s, thrombectomy coupled with the formation of a temporary AVF and anticoagulation was the standard treatment for femoral venous thrombosis. The temporary AVF was reported to provide several benefits, including an increase in blood flow in the proximal thrombectomized vein, prevention of immediate thrombosis, and sufficient time for endothelial healing [7]. We knew that an AVF could cause thrombosis, but this case showed the reverse phenomenon: the potential development of thrombosis on repairing a chronic AVF.

The clinical consequence of an AVF is its left-to-right shunt and associated hemodynamic consequence. It can cause progressive heart failure due to cardiac volume overload [8]. Consequently, AVF repair is indicated for patients who develop symptoms, such as steal syndrome causing distal limb ischemia, significant edema or venous insufficiency, or heart failure [9-10]. Therefore, we suggest that doctors consider all possible complications that can arise from a sudden change in blood flow as a result of repairing a chronic peripheral AVF.

REFERENCES

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