


# Acute embolic occlusion of the right common iliac artery after revision total hip arthroplasty treated with catheter-directed thrombolysis and balloon angioplasty: A case report

SAGE Open Medical Case Reports  
3: 2050313X15594836  
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DOI: 10.1177/2050313X15594836  
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## Abstract

**Methods:** A 63-year-old woman with atrial fibrillation presented clinical symptoms and signs of acute ischemia in the right lower extremity on the 17th postoperative day after revision total hip arthroplasty of the left hip for aseptic loosening of femoral component. Aspirin was discontinued 7 days before surgery. Both computed tomography angiography and digital subtraction angiography demonstrated complete occlusion of the right common iliac artery. An emergency catheter-directed thrombolysis with urokinase combined with balloon angioplasty was performed to obtain complete patency of the right common iliac artery.

**Results:** The patient received anticoagulation and antiplatelet therapy postoperatively and was fine at the 2-year follow-up.

**Conclusions:** This case demonstrated that catheter-directed thrombolysis combined with balloon angioplasty could be an efficacious, minimally invasive approach for the treatment of acute embolic occlusion of the common iliac artery. Preoperative anticoagulation for patients undergoing total hip arthroplasty with long-term use of aspirin for atrial fibrillation needs further investigation.

## Keywords

Embolism, common iliac artery, catheter-directed thrombolysis, balloon angioplasty

Date received: 1 August 2014; accepted: 24 November 2014

## Introduction

Acute common iliac artery embolism is a rare medical emergency which threatens the limb, even life, and requires prompt recognition and urgent intervention. In approximately 85% of cases of acute arterial embolism, the emboli originate from a cardiac source,<sup>1</sup> including atrial fibrillation associated with valvular heart disease or mural thrombi in an infarcted left ventricle. About two-thirds of noncerebral emboli enter vessels of the lower extremity, and 50% of these obstruct the iliofemoral arterial segment.<sup>1,2</sup> Emboli tend to lodge at arterial bifurcations.<sup>3</sup>

Atrial fibrillation is the most common cause of embolic sources from the heart.<sup>4</sup> Anticoagulation therapy is essential in patients with atrial fibrillation to prevent systemic thromboembolism. Vitamin K antagonists (VKAs) or novel oral anticoagulants (NOACs) such as dabigatran, rivaroxaban, and apixaban, are the main drugs for thromboprophylaxis in

patients with atrial fibrillation.<sup>5</sup> Aspirin is recommended as an alternative to VKAs in low-risk patients or in those with contraindications to oral anticoagulation.<sup>6</sup> Here, we introduce a case of acute embolic occlusion of the right common iliac artery treated with catheter-directed thrombolysis and balloon angiography in a patient after revision total hip arthroplasty with discontinuation of long-term use of aspirin for atrial fibrillation 7 days before surgery.

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**Figure 1.** CT angiography demonstrated total occlusion of the right common iliac artery and the origin of internal and external iliac arteries without collaterals.

## Case report

A 63-year-old woman was admitted to our department because of pain and limitation in motion in the left hip for 2 years after primary total hip arthroplasty with hybrid prosthesis for avascular necrosis of the femoral head 15 years ago. The patient underwent mitral commissurotomy because of mitral stenosis 30 years ago, when she complicated with atrial fibrillation, since then she had been taking aspirin 100 mg once daily. The patient presented absolute arrhythmia and uneven first heart sound on auscultation. Electrocardiogram demonstrated atrial fibrillation. X-ray film of the pelvis and the left femur revealed osteolysis around the femoral stem and subsidence of femoral component.

The patient was diagnosed as aseptic loosening of the femoral component after total hip arthroplasty and underwent revision total hip arthroplasty with cementless acetabular component and cementless modular stem and allograft for bone defects in both sides. Aspirin was discontinued 7 days before surgery. The procedure was performed uneventfully. The patient began to take rivaroxaban 10 mg 12 h after surgery, which was planned once daily for 35 days. The patient was told to start functional exercises of the left lower extremity as soon as tolerated and began to ambulate with crutches with the left lower extremity free of weight bearing on the 15th day postoperatively.

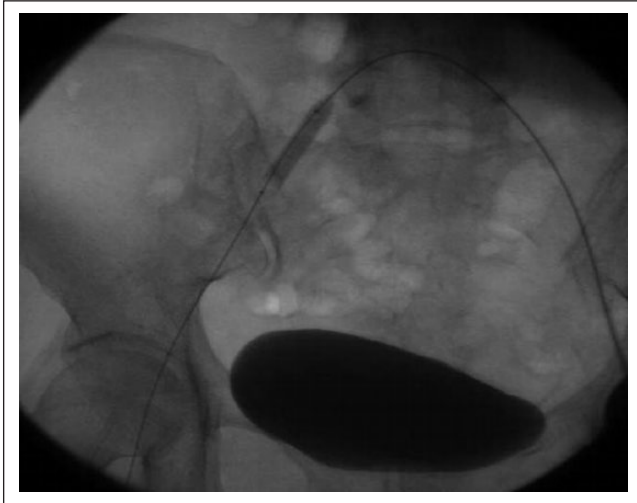


**Figure 2.** DSA demonstrated total occlusion of the right common iliac artery and the origin of internal and external iliac arteries without collaterals.

The patient felt sudden numbness, tingling in the right lower extremity, and inability to move it after having a nap on the 17th postoperative day. Physical examination: pulse 80/min and blood pressure (BP) 120/70 mmHg mentally conscious, with pupils round, symmetrical, and sensitive to light. There was loss of sensation, paresis, and decreased skin temperature for the right lower extremity, with pedis artery impalpable on the right side and normal pedis artery on the left side.

The color Doppler showed that there was insufficient blood flow with low vascular tension in the right lower extremity, which suggested stenosis or incomplete obstruction proximal to the popliteal artery. Computed tomography (CT) angiography showed that there was complete occlusion of the right common iliac artery and the beginning of internal and external iliac arteries, with no collateral circulation from the contralateral side (Figure 1), which caused narrowing of arteries of the right lower extremity.

The patient underwent an emergency digital subtraction angiography (DSA; Figure 2) and catheter-directed thrombolysis combined with balloon angioplasty. The procedure was performed by a contralateral retrograde approach under regional anesthesia. Initially, catheter-directed thrombolysis was performed with urokinase 300,000 units for half an hour. Subsequent angiography showed antegrade flow with large residual thrombi. Then, a balloon was used to get patent recanalization (Figure 3), followed by urokinase 500,000 units pumped into the right common iliac artery for 24 h. Post-procedure angiography demonstrated smooth blood flow without filling defects in the previously occluded arteries (Figure 4). The feeling of tingling in the right lower extremity



**Figure 3.** Balloon angioplasty following catheter-directed thrombolysis.

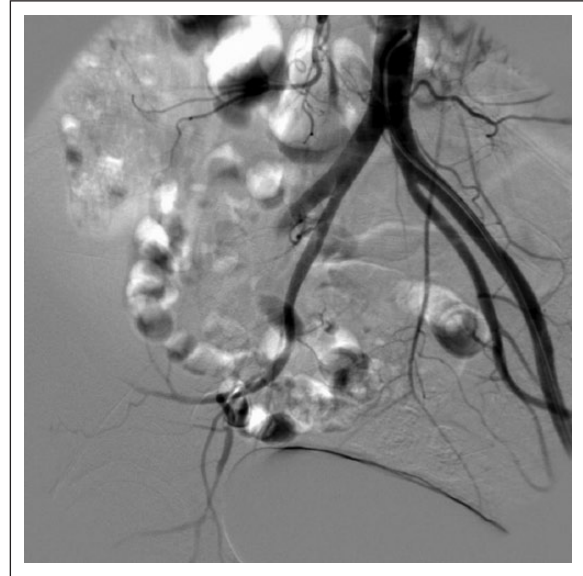
disappeared soon after balloon angioplasty. The right pedis artery got palpable and skin temperature gradually returned to normal. Sensation gradually recovered with disappearing of numbness in the right lower extremity. No presentation of ischemia-reperfusion injury, such as swelling of the right lower extremity, increased creatinine, or hyperkalemia, was detected.

After the procedure, the patient received subcutaneous low-molecular-weight heparin calcium 4100 units twice daily for 2–3 days, warfarin 2.5 mg once daily for half a year, and aspirin 100 mg once daily for life time. The international normalized ratio (INR) was maintained within 2–3. The procedure went uneventfully without any complications, and the patient was fine at the 2-year follow-up. Informed consent was obtained from the patient for publication of this case report. The institutional review board of The Third Hospital of Changsha does not require ethics approval for reporting individual cases.

## Discussion

The acute onset of ischemia in the right lower extremity, the absence of previous intermittent claudication, the normal contralateral pedis artery, and chronic atrial fibrillation suggests that it is an acute arterial embolism,<sup>3</sup> not acute thrombosis that caused the event. Angiography demonstrated complete occlusion of the right common iliac artery with the absence of collaterals and normal luminal appearances other than the affected area, which is suggestive of acute arterial embolism. Acute iliac artery embolism after revision total hip arthroplasty in patients with atrial fibrillation has been rarely reported.

Acute common iliac artery embolism is always limb-threatening, and even life-threatening, which calls for prompt recognition and emergency intervention. The commonly



**Figure 4.** Angiography demonstrated complete patency of the right common iliac artery, internal and external iliac arteries 24 h after balloon angioplasty and catheter-directed thrombolysis.

used treatment strategies include surgical embolectomy, bypass surgery, Fogarty balloon catheter embolectomy, percutaneous aspiration thrombectomy, mechanical thrombectomy, stent-assisted recanalization, and catheter-directed thrombolysis, and so on. Surgical embolectomy needs direct exposure of the occluded arteries with rigid instruments or suction devices, which were often inefficient and may cause trauma to the artery.<sup>7</sup> Aortobifemoral bypass is associated with high risk of groin wound complications and graft thrombosis.<sup>8</sup> As the patient was on the 17th postoperative day after revision total hip arthroplasty and was anticoagulated with rivaroxaban, open surgery is invasive for the patient and is associated with risks of more blood loss and hematoma. Fogarty balloon catheter embolectomy is an effective procedure for acute limb embolism with prompt recanalization for the embolized artery, yet it has some complications such as distal embolization, intimal dissection, and diffuse intimal hyperplasia attributed to repeated catheter manipulation through the embolus.<sup>9</sup> Percutaneous aspiration embolectomy is mainly used for acute arterial and graft occlusions below the inguinal ligament, and total clearance of the thrombus from the iliac arteries is seldom achieved with percutaneous aspiration embolectomy because of the larger caliber of the iliac arteries compared with the size of the catheter.<sup>10</sup> Mechanical thrombectomy is associated with a significant risk of distal embolism, which may be as high as 28% in some reported series.<sup>10</sup> Stent-assisted recanalization of acute limb ischemia has the advantage of rapid recanalization, while it is not suitable for a long arterial occlusion which involves multiple territories and lesions crossing the joint or infrapopliteal arterial lesions,<sup>11</sup> and for this patient with no signs of lesions of arteries other than the occluded segment,

stent may not be well indicated. Catheter-directed thrombolysis is often used for thrombotic occlusion but is effective for treating acute emboli.<sup>3</sup> It may not be the best solution for most patients with severe ischemia, as thrombolysis requires therapy infusion of 24–72 h to get recanalization of the occluded artery, which is far too long for salvage of the limb.

The clinical staging of acute limb ischemia for this case should be classified into level IIB according to Rutherford's<sup>12</sup> classification system, which calls for immediate revascularization for salvage of the limb. Catheter-directed thrombolysis with urokinase was performed to create a passage in half an hour and then balloon angioplasty was completed to make the recanalization patent enough for the right lower extremity. The thrombus was completely lysed with no signs of distal embolization, nor iliac stenosis documented angiographically, which excluded the necessity for stenting. Balloon angioplasty makes larger contact area between the thrombus and urokinase, which may expedite lysis of the thrombi. Blum et al.<sup>13</sup> proposed percutaneous transluminal angioplasty combined with local low-dose thrombolysis as a true alternative to vascular surgery and a first-line treatment for acute or chronic iliac artery occlusion. Although it has been suggested that an embolus is less likely to lyse with the use of thrombolytic agents than clot recently developed, this apparently logical view has not been defined by any trials or studies according to Rutherford's<sup>12</sup> view. The main complication associated with recanalization of iliac occlusions remains distal embolization,<sup>13</sup> which can be solved by continuing thrombolytic infusion with a microcatheter in an occluded distal or pedal artery or by microtibial balloon embolectomy.<sup>14</sup> In this anticoagulated patient, hemorrhage, another risk factor that should be taken into account, did not occur. This minimally invasive procedure proved to be feasible for salvage of the limb at the early stage of acute iliac artery embolism. Due to the prompt recognition and immediate intervention, fasciotomy was not necessitated for salvage of the limb.

Another question that we should ponder over is the cause of the acute common iliac artery embolism. Discontinuation of aspirin 7 days before surgery, revision total hip arthroplasty, inappropriate dosing of rivaroxaban postoperatively, long-term immobility, and blood pressure changes secondary to postural changes after ambulation may be contributing factors to the event. Aspirin was discontinued 7 days before surgery for the sake of perioperative bleeding, while abrupt discontinuation of aspirin results in an increased thromboxane A<sub>2</sub> activity and a decreased fibrinolysis, leading to increased platelet adhesion and aggregation.<sup>15</sup> Bone trauma in hip arthroplasty causes venous damage, increased local and systemic activation of coagulation, and suppression of fibrinolysis,<sup>16</sup> which may increase the risk of thrombosis in the left atrium. Rivaroxaban, the direct Factor Xa inhibitor, which is proved to be effective in prevention of both stroke and systemic arterial embolism in patients with atrial fibrillation<sup>17</sup> and venous thrombosis in patients after total hip or knee arthroplasty,<sup>18</sup> has no effect of thrombolysis. The dose

for the prevention of stroke and systemic embolism in patients with atrial fibrillation is 20 mg once daily,<sup>17</sup> while rivaroxaban was used 10 mg once daily in this patient for the prevention of venous thrombosis.

What is the optimal preoperative anticoagulation for patients undergoing total hip arthroplasty with long-term use of aspirin for atrial fibrillation? Atrial fibrillation is associated with a significantly high risk of stroke and systemic embolism, which requires routine anticoagulation therapy. Total hip arthroplasty is associated with high risks of both thromboembolism and bleeding. So, what can we do for preoperative anticoagulation for this patient—withdrawing aspirin, continuing aspirin, or bridging anticoagulation? Cossetto et al.<sup>19</sup> reported that it is safe to continue low-dose (100 mg/day) aspirin in the perioperative period as a part of multimodal thromboprophylaxis for total knee and hip arthroplasty without increasing blood loss and drop in the hemoglobin level. The American College of Chest Physicians (ACCP) guidelines suggest bridging anticoagulation during interruption of VKAs therapy for patients with atrial fibrillation at high risk for thromboembolism and continuing aspirin perioperatively rather than stopping aspirin 7–10 days before surgery for patients at moderate to high risk for cardiovascular events who are requiring noncardiac surgery.<sup>20</sup> Could bridging anticoagulation be an alternative to continuing aspirin for patients with long-term use of aspirin for atrial fibrillation in the preoperative period of total hip or knee arthroplasty? Thus, further investigation is needed for preoperative anticoagulation for patients undergoing total hip or knee arthroplasty with long-term use of aspirin for atrial fibrillation.

In conclusion, prompt recognition and immediate, effective intervention is essential for salvage of the limb with acute arterial embolism; catheter-directed thrombolysis combined with balloon angioplasty is an efficacious, minimally invasive approach for acute embolic occlusion of the common iliac artery; preoperative anticoagulation for patients undergoing total hip arthroplasty with long-term use of aspirin for atrial fibrillation needs further investigation.

### Acknowledgements

The authors thank Professor Koenig, the chief of Orthopedics Department and director of LVR Clinic in Germany, and Ms Liu Lihua, a pharmacist of The Third Hospital of Changsha, for the linguistic revision of this article.

### Declaration of conflicting interests

The authors declare that there is no conflict of interest.

### Funding

This research received no sponsorship from any funding agency.

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