

Endovascular Management of Acute Total Occlusion of the Aorta

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Acute total occlusion of the aorta is a rare and clinically critical condition requiring aggressive immediate diagnosis and treatment. A 73-year-old male was seen at our hospital complaining of pain sensation in both legs. Under the likely impression of an acute total occlusion of the aorta, emergency abdominal aortogram was done, which revealed total occlusion of the distal aorta and both iliac arteries. Intra-arterial thrombolysis with urokinase was attempted for 48 hours as intervention during the acute stage is highly related to distal thromboembolic events. Follow-up angiography showed improved arterial flow but residual stenosis at both the common iliac arteries. Self-expandable nitinol stents were inserted at both the iliac arteries by the v-kissing technique resulting in a satisfying outcome as seen on angiography without complications. The patient was discharged without additional medical problems. From our experience, we conclude that the use of intra-arterial thrombolysis with percutaneous transluminal angioplasty is an alternative to the conventional surgical approach in treating acute total occlusion of the aorta.

Key Words: Thromboembolism, Thrombolysis, Percutaneous transluminal angioplasty, Stents

INTRODUCTION

Acute total occlusion of the aorta is a rare and clinically critical condition requiring aggressive immediate diagnosis and treatment. Two thirds of these cases are due to thrombosis and one third due to embolism¹. Embolic aortoiliac occlusion is associated with high mortality and morbidity rates^{2,3}. As to recent developments in intervention techniques, the use of intra-arterial thrombolysis with percutaneous transluminal angioplasty (PTA) is an alternative strategy to the conventional surgical approach in treating acute total occlusion of the aorta. The authors report a case of an acute total occlusion of the aorta treated successfully with the above mentioned alternative intervention technique.

CASE REPORT

A 73-year-old male was seen at our hospital complaining of pain and numbness in both legs. The symptoms occurred abruptly while the patient was watching television at home. He had no history of medical problems and was not taking any medication. He had smoked two packs of cigarettes a day for 20 years. Physical examination presented a male with normal axillary temperature, pulse rate of 90 beats/min, respiratory rate of 20/min, and blood pressure of 140/90 mmHg. Both legs were cold to touch and tender. Femoral pulses were undetectable bilaterally, as were the popliteal and dorsalis pedis pulses. A decrease in bilateral lower extremity muscle power without focal neurologic deficit was

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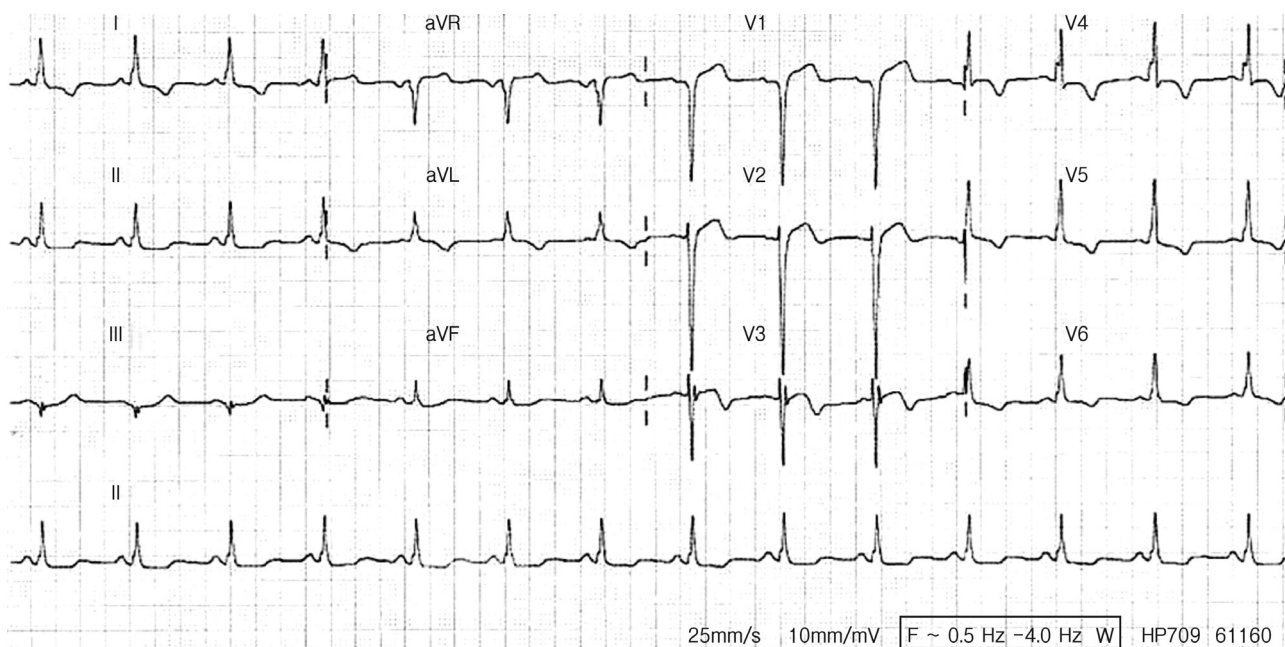


Fig. 1. Electrocardiography showed normal sinus rhythm with delta waves.

noted. Electrocardiography (ECG) showed normal sinus rhythm with delta waves (Fig. 1). Chest X-ray revealed mild cardiomegaly. Laboratory tests showed high levels of creatinine kinase (479 mg/dL) and myoglobin (1,344 mg/dL). Complete blood cell, electrolytes, routine urinalysis and liver function tests were normal. Low-density lipoprotein-cholesterol was 143 mg/dL.

Under the likely impression of a total occlusion of aorta or both iliac arteries and Wolff-Parkinson-White (WPW) syndrome with paroxysmal atrial fibrillation, symptoms progressed rapidly to cyanosis in both legs. We performed an emergency abdominal aortogram.

The left radial artery was punctured and a 5 Fr pigtail catheter was advanced under guidance of a 0.035-inch hydrophilic wire (Terumo, Tokyo, Japan) until it reached the origin of the right renal artery bifurcation. The aortogram revealed total occlusion of the distal aorta and both iliac arteries with visible thrombus in the right iliac artery (Fig. 2). As intervention during the acute stage is related to distal thromboembolic events, intra-arterial thrombolysis with urokinase was initiated. Before the urokinase infusion, the obstructing lesion was dilatated with a 4 × 20 mm small PTA balloon (PowerFlex, Cordis Co., Bridgewater, NJ, USA) in order to achieve an arterial flow for the urokinase to flow through. With fluoroscopy guidance, a multi-side hole catheter was inserted into the right iliac artery allowing for intra-arterial

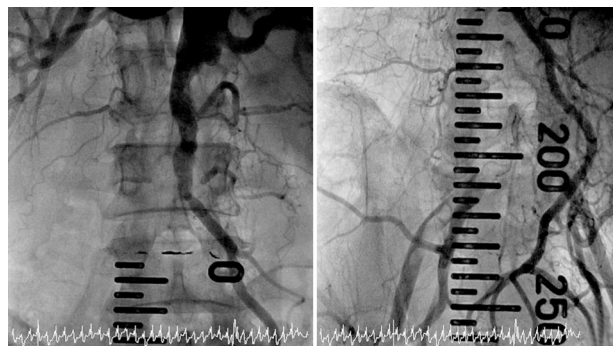


Fig. 2. Aortogram revealed total occlusion of distal aorta and both iliac arteries. Thrombus is visible in right iliac artery.

urokinase infusion for 24 hours (initial intra-arterial bolus of 200,000 units; 120,000 units/hr for 2 hours; 100,000 units/hr for 2 hours; and 80,000 units/hr for 20 hours). The next day, a follow-up angiography showed improved arterial flow from the distal aorta to the right proximal femoral artery but with persistent remnant occlusion. For a better arterial flow, a multi-side hole catheter was inserted into the left iliac artery for an additional 24 hours of bilateral continuous intra-arterial urokinase infusion. On the third day, a final aortogram revealed no visible thrombus but a 50% luminal narrowing at the distal aorta, a 70% narrowing at the right common iliac artery and a 90% narrowing at

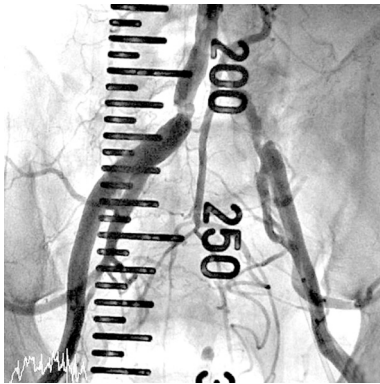


Fig. 3. After intra-arterial urokinase infusion for 48 hours, aortogram revealed no visible thrombus but significant luminal narrowing in the distal aorta and both common iliac arteries.

the left common iliac artery (Fig. 3). The mean pressure gradient between both the common iliac arteries and the distal aorta was greater than 15 mmHg, but the mean pressure gradient between the proximal aorta and the bifurcation of aorta was less than 10 mmHg. Thus, we decided to intervene at both the common iliac arteries instead of at the distal aorta. Predilation was done with a 6 mm balloon to each side of the common iliac arteries and two 8 × 80 mm self-expandable nitinol stents (Smart stent, Cordis Co.) were inserted into both the iliac arteries by the v-kissing technique followed by kissing ballooning. After PTA, an angiogram showed a normal arterial current in both iliac arteries (Fig. 4) and there was no pressure gradient between the common iliac arteries and the distal aorta. Digital subtraction angiography showed a satisfying outcome without complications.

The patient was discharged without additional medical issues. He was prescribed aspirin, warfarin, cilostazol, and a statin. In follow-up, he was symptom-free in both legs for nine months.

DISCUSSION

The clinical approach to an acute arterial occlusion requires thorough history taking and physical examination. With symptoms alone, it may be difficult to differentiate from related abdominal aortic disease entities. Differential diagnoses include aortic embolism, in situ thrombus, atherosclerosis (occlusive or aneurysmal), arterial dissection, arterial trauma, a hypercoagulable state, low-flow states, and vasospasm. The most common causes of acute arterial occlusion are thrombus and embolism, where an embolus is difficult

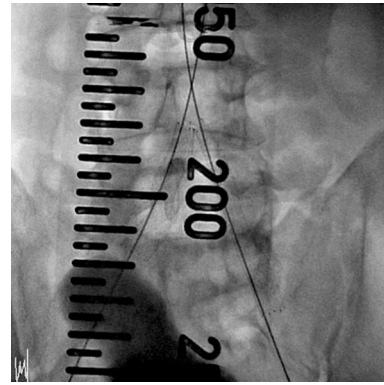


Fig. 4. Self-expandable nitinol stents were inserted at both iliac arteries by v-kissing technique. Final aortogram post-insertion shows good arterial flow.

to distinguish from in situ thrombosis⁴. Although these diseases may present insidiously or subtly, they require immediate evaluation and aggressive management. In other case reports, sudden abdominal aortic occlusion from trauma have presented with neurologic deficits ranging from sensory loss to paraplegia⁵. On the other hand, the gradual occlusion of the mid-abdominal aorta by atherosclerosis does not typically present with neurological symptoms⁵.

Predisposing factors for acute arterial occlusion in this patient include smoking and possibly paroxysmal atrial fibrillation suspected under the diagnosis of WPW syndrome. The reported incidence of paroxysmal atrial fibrillation in patients with WPW syndrome is as high as 11.5 to 39.0%⁶. In our patient, WPW syndrome with paroxysmal atrial fibrillation was considered on ECG.

Randomized controlled trials and registry reported that the use of thrombolytic therapy for acute limb ischemia is as effective as bypass surgery^{7,8,9}. In the Rochester Trial, 114 patients with upper or lower extremity arterial occlusion were randomized to receive thrombolytic therapy (urokinase) or undergo immediate surgery. There was no difference in the rate of major amputation (18% at 12 months in each group). However, mortality was significantly higher in the surgery group (42% vs. 16% at 12 months). The high mortality in the surgery group was attributed to the higher frequency of cardiopulmonary complications after surgery⁷. In the surgery vs. thrombolysis for ischemia of the lower extremity Trial, 393 patients were randomized to undergo thrombolytic therapy or immediate surgery. There was no difference in the rate of major amputation or death between the two groups⁸. The thrombolysis or peripheral arterial surgery Trial included 272 patients. There was no difference in the rate

of major amputation or death between the two groups. The one-year amputation free survival rate was 65% in the thrombolysis group and 70% in the surgery group⁹). Based on these data, catheter-directed thrombolysis is the preferred therapy for acute arterial occlusion. The advantage of thrombolytic therapy is that it offers a low-risk alternative to open surgery in complex patients with severe comorbidities. Other advantages of pursuing immediate angiography in patients with acute limb ischemia include delineation of the limb arterial anatomy with visualization of both inflow and runoff vessels. Complete aortogram with runoffs should be obtained prior to intervening with occlusive lesions, as short- and long-term patency and clinical success are dependent on the outflow status¹⁰).

During the acute stage of disease, when thrombus is visible on an aortogram, early intervention such as PTA or stent insertion may lead to distal embolic events. Embolization of the distal arteries is a serious potential complication that may produce worsening ischemia or limb loss¹¹). Thrombolysis before PTA is an effective method to reduce this possibility.

In our patient, it was important to make channels at the occlusion sites with small PTA balloons for the thrombolytic to flow into the distal iliac arteries. If outflow is occluded, the effects of the thrombolytic can be limited. Dosage and technique of urokinase infusion are various^{12,13}). Considering the smaller body weight of Koreans, we administered a bolus of urokinase followed by a continuous infusion in reduced doses.

Measuring the proximal and distal pressure gradient of a lesion can determine the need for an intervention. The use of intraarterial pressure for assessing the hemodynamic significance of aortoiliac artery disease was initially described by vascular surgeons¹⁴). The angiogram done on our patient before the intervention showed three stenotic lesions. By using a multi-purpose catheter, the pressure gradient was measured. As a general agreement, a mean pressure gradient greater than 10 mmHg could result in clinical manifestations such as pain, ischemic changes, ulcer, and delayed wound healing in the involved extremity. For lesions of questionable hemodynamic significance (gradient <10 mmHg), additional vasodilatation testing should be considered¹⁵). This approach is useful in determining the clinical significance of stenotic lesions. In our patient, there were significant pressure gradients between the distal aorta and both iliac arteries. The kissing stents technique was applied to the distal aorta and the iliac artery lesions to accommodate the involved large vessel and reduce the pressure gradients.

PTA with selective stent placement is well-known for its cost-effectiveness compared with primary stent placement or PTA alone in iliac and aortic lesions¹⁶). Stent placement can be primarily indicated in cases involving iliac artery occlusions, focal aneurysms, ulcerated plaques, intimal flaps, and unsatisfactory PTA results.

In conclusion, the recent development in intervention techniques has brought strikingly attractive alternatives with notable benefits to patients. The use of intra-arterial thrombolysis with PTA is an alternative strategy in treating acute total occlusion of the aorta.

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