Treatment of an Acute Common Iliac Artery Occlusion with Mechanical Thrombectomy and Stenting

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ABSTRACT

We report a case of acute lower extremity ischemia caused by occlusion of the right common iliac artery (CIA), which we treated with mechanical thrombectomy followed by stent placement. The current role of mechanical thrombectomy in the treatment of acute limb ischemia is discussed. Considerations in primary stenting for acute arterial occlusions are presented. We briefly review the role of computed tomographic angiography (CTA) in the evaluation of patients with acute limb ischemia.

KEYWORDS: Acute arterial occlusion, limb ischemia, mechanical thrombectomy, stent, computed tomographic angiography

Objectives: Upon completion of this article, the reader should be able to identify nonpharmacological options in the percutaneous treatment of acute arterial occlusions and understand the role that computed tomographic angiography plays in the diagnosis of acute lower extremity arterial ischemia.

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Acute lower extremity ischemia due to vascular occlusion requires urgent treatment to prevent the need for amputation or possible loss of life. Rapid diagnosis is therefore vital, and computed tomographic angiography (CTA) has become a useful tool in evaluation of patients with this problem. Surgical bypass or thrombectomy, as well as interventional treatment with thrombolysis and, usually, adjunctive angioplasty and stent placement are standard therapies. Mechanical thrombectomy has also become available for arterial occlusions but is usually used in conjunction with thrombolysis. Although little data are available regarding primary stenting, this tech-

nique has been used successfully in the treatment of acute occlusions.

CASE REPORT

An 88-year-old man presented to the emergency department with complaint of severe right leg and foot pain that began earlier in the day. On presentation, the patient rated the pain as "10 out of 10." The patient reported that he was a generally active man and routinely played golf. The patient denied chest pain, dyspnea, or palpitations. The patient had been a smoker for many

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years, and his past medical history included hypertension, laryngeal carcinoma, and chronic obstructive pulmonary disease. On physical examination, he had atrophic skin changes in both feet, and the right foot was pale and cool to the touch. He had no palpable pulses in the right lower extremity, a weak but palpable left common femoral pulse, and nonpalpable left leg distal pulses. Doppler signals were detected in the left foot but not in the symptomatic right foot. Gross motor and sensory functions were intact in the symptomatic leg

and foot. No blood pressure could be obtained on the right side; the ankle-brachial index on the left was 0.47. A CTA was obtained that demonstrated occlusion of the right common iliac artery (CIA) (Fig. 1A,B). There was chronic infrainguinal vascular disease bilaterally. The patient was considered to be a high risk surgical candidate due to multiple medical comorbidities, and interventional radiology was consulted for treatment.

The patient was brought to the angiography suite and sheaths were placed in both common femoral

Figure 1 Computed tomography angiography obtained upon admission. (A) Axial computer tomography image shows occlusion of right common iliac artery. (B) Volume-rendered image shows reconstitution of right external iliac artery. Left common iliac artery stenotic disease is noted.

Figure 2 Angiography after crossing occlusion.

arteries (CFAs). The right CIA occlusion was traversed with a 0.035-inch angled Glidewire (Terumo, Somerset, NJ) and a 5F catheter with little resistance. Angiography confirmed occlusion of the right CIA (Fig. 2). After heparinizing the patient, a 6F AngioJet catheter (Possis Medical, Minneapolis, MN) was advanced; several passes were made through the occlusion, but no apparent recanalization was achieved. So-called kissing stents were therefore deployed across the aortic bifurcation. Subsequent angiography demonstrated excellent bilateral flow and no significant residual stenosis (Fig. 3). Strong palpable pulses were noted at both groins at the completion of the procedure, good arterial Doppler signals were detected in both feet, and the patient reported complete relief of his symptoms.

DISCUSSION

Patients with acute lower extremity ischemia are often the most difficult vascular patients to treat. They are usually elderly patients with multiple medical problems who do not fare well during prolonged thrombolytic infusions that can require intensive care unit stays of up to several days. These patients often have difficulty during lengthy procedures that may require them to lie stationary while angiography is performed to map their occlusions and then interventional treatment is initiated. Percutaneous options for treatment of acute arterial occlusions have expanded with the development mechanical methods of clot removal that rapidly restore patency, shorten thrombolytic infusions, and help avoid

Figure 3 Angiography after placement of so-called kissing stents demonstrates widely patent vessels.

the hemorrhagic complications that can accompany thrombolysis. Another strategy that deserves further study is primary stent placement for treatment of acute iliac occlusions. In addition, noninvasive vascular imaging with CTA can now be used to plan an interventional treatment before the patient is brought to the angiography suite, making the process more rapid and efficient. Pharmacological thrombolysis remains the mainstay of percutaneous treatment for acute vascular occlusions. However, these recent developments have already increased our arsenal of therapies and in the future may become the predominant methods of treatment.

Mechanical thrombectomy devices can be broadly divided into those that macerate clot and those that macerate and remove clot.¹ Devices in the former category, which either create a fluid vortex in the vessel or physically disrupt the clot, are not being used in the arterial system due to the potential for distal embolization and the risk of endothelial damage. Devices in the latter category create a high-velocity fluid jet within the catheter that removes thrombus by the Venturi effect and in the process macerates the clot. The AngioJet catheter has been approved by the Food and Drug Administration for use in the arterial system. Mechanical thrombectomy does not appear to replace pharmacological thrombolysis completely in most cases.¹ The extent of recanalization that can be achieved by thrombolytic infusion often cannot be achieved by mechanical thrombectomy alone, and distal small vessel occlusions are not well treated by this method. The thrombectomy device is usually used

with the goal of debulking the thrombus to decrease the length of infusion and amount of thrombolytic agent administered.¹ The use of these devices may result in more rapid initial reperfusion to the ischemic limb even if thrombolysis is also required.¹ In patients with large clot burden, care must be taken to avoid prolonged use of these devices due to the risk of fluid overload and hemolysis.¹ Despite limitations, the benefits of incorporating mechanical thrombectomy into the overall treatment of acute arterial occlusions appear to be significant.

Although clinical trials have shown the efficacy of pharmacological thrombolysis for acute arterial occlusions, there is little data looking at primary stent placement in this setting.² A small series published by Berczi et al reviewed seven cases in which primary stenting was performed in patients with acute iliac occlusions similar to the patient in our case report.³ Recanalization was successful in all seven patients, with clinical improvement in five of the seven. The main concern in this approach is the risk of distal embolization. Similar concerns for embolization existed in the setting of primary stenting for chronic iliac occlusions, but several series demonstrated very low rates of embolization.⁴ Chronically occluded vessels, however, do not contain the soft fresh clot present in acute occlusions. Despite this fact, Berczi found no evidence of distal embolization in any of his patients. In our patient, mechanical thrombectomy may have played a role in preventing distal embolization, even though it did not appear to result in any recanalization prior to placement of the stents.

In our practice, we have found CTA to be extremely valuable in the evaluation of patients with acute lower extremity arterial insufficiency. Studies have shown this modality to be reliable in evaluating peripheral arterial disease.⁵ In the acute setting, the CTA can be performed more rapidly than catheter angiography, and the patient's vascular anatomy can be demonstrated before any invasive procedure is initiated. In our department, the examination is performed on a 64-slice multidetector CT scanner. We typically inject 100 to 150 mL of iodinated contrast at a rate of 4 mL per second and use bolus tracking software to initiate spiral scanning, which is performed from the level of the T12 vertebral body down to the feet. Images are reviewed on a workstation, where appropriate postprocessing is performed. Multiplanar reformatting and axial imaging are our main workhorses for evaluation of these cases. It is vital to view the images with optimal window and level settings, especially in patients with calcified vessels, which can be difficult to evaluate on CTA. Maximum intensity projection and volume rendering are helpful in demonstrating vascular anatomy and for communicating with the

referring physician.⁶ We have found that all necessary diagnostic information can be demonstrated by CTA, and we use catheter angiography primarily in patients who we are going to treat by interventional methods. In these cases, the extra iodinated contrast given is kept to a minimum because limited additional angiography is required during the procedure. CTA is often useful in determining the optimal site of vascular access. In patients who are best treated with surgery, all necessary angiographic information can be obtained with CTA and arterial access can be avoided. CTA is a valuable tool that allows rapid determination of what type of procedure is needed and is extremely useful in planning the procedure.

CONCLUSION

Mechanical thrombectomy devices are beginning to assume an important role in the treatment of acute arterial occlusions but mostly as an adjunct to standard thrombolytic infusion. The role of primary stent placement in the appropriate setting is also exciting and should be evaluated further. These developments, as well as the use of CTA, have already improved the interventional treatment of patients with acute limb ischemia and have the potential to reduce significantly the morbidity associated with this difficult condition.

REFERENCES

1. Kasirajan K, Haskal ZJ, Ouriel K. The use of mechanical thrombectomy devices in the management of acute peripheral arterial occlusive disease. *J Vasc Interv Radiol* 2001;12:405-411
2. Ouriel K, Veith FJ, Sasahara AA. A comparison of recombinant urokinase with vascular surgery as initial treatment for acute arterial occlusion of the legs. Thrombolysis or Peripheral Arterial Surgery (TOPAS) Investigators. *N Engl J Med* 1998;338:1105-1111
3. Berczi V, Thomas SM, Turner DR, Bottomley JR, Cleveland TJ, Gaines PA. Stent implantation for acute iliac artery occlusions: initial experience. *J Vasc Interv Radiol* 2006;17:645-649
4. Reyes R, Maynar M, Lopera J, et al. Treatment of chronic iliac artery occlusions with guide wire recanalization and primary stent placement. *J Vasc Interv Radiol* 1997;8:1049-1055
5. Ofer A, Nitecki SS, Linn S, et al. Multidetector CT angiography of peripheral vascular disease: a prospective comparison with intraarterial digital subtraction angiography. *AJR Am J Roentgenol* 2003;180:719-724
6. Fishman EK, Ney DR, Heath DG, Corl FM, Horton KM, Johnson PT. Volume rendering versus maximum intensity projection in CT angiography: what works best, when, and why. *Radiographics* 2006;26:905-922