Interesting Case

Acute renal failure caused by unilateral renal artery thromboembolism

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Introduction

Thromboembolic obstruction of major renal arteries is a rare but serious clinical problem. A diagnosis is not usually established until irreversible renal parenchymal damage occurs. Emboli to the major renal arteries are associated with cardiac diseases and arrhythmia, among which atrial fibrillation is a major cause. The clinical manifestations of renal artery thromboembolism vary substantially, depending on whether the embolic occlusion affects both renal arteries or the artery of a solitary kidney, or occurs in a single kidney with a contralateral functioning kidney. We describe here a case of chronic atrial fibrillation and congestive heart failure complicated with right renal artery thromboembolism and acute renal failure, which initially presented as acute abdomen and was diagnosed incidentally by contrast-enhanced computerized tomography (CT) of the abdomen. The patient received intra-arterial thrombolytic treatment with urokinase, and regained his renal function after successful revascularization.

Case report

An 83-year-old male was sent to our emergency room due to the sudden onset of pain in his right middle and lower abdomen, nausea and vomiting for 7 days. He had also had chronic atrial fibrillation and congestive heart failure since 1969. Physical examination disclosed blood pressure 156/94 mmHg, temperature 36.7°C, respiration 20/min and pulse 89/min. Auscultation showed irregular heartbeats without cardiac murmur. The abdomen was distended with tenderness over the right middle and lower abdomen and bowel sounds were hypoactive. Laboratory data showed white blood cell count 8800/mm³, haemoglobin 14.6 g/dl, platelets 173 000/mm³, blood urea nitrogen 26 mg/dl, creatinine 1.8 mg/dl, sodium 138 meq/l, potassium 4.3 meq/l and lactate dehydrogenase 428 IU/l (normal range 95–213 IU/l). Mild proteinuria was noted on urinalysis. A KUB film disclosed dilated loops of large and small bowel. Colonoscopy was performed to rule out ischaemic bowel syndrome but was unsuccessful due to a poorly prepared colon. Because of persistent right middle and lower abdominal pain, a contrast-enhanced abdominal CT was performed. The results showed a decreased uptake in the right kidney (Figure 1). An acute embolism of the right renal artery was suspected. Renal artery angiography further confirmed a total occlusion of the

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right renal artery (Figure 2A). Intra-arterial thrombolytic therapy was performed by continuous infusion of urokinase (loading dose 300,000 IU for 30 min) via the intra-arterial catheter. Immediate follow-up angiography showed an improvement of renal parenchymal perfusion. The catheter was changed to a Cobra sidehole with the tip placed in the right renal artery. Continuous intra-arterial infusion was performed with the maintenance dose of urokinase being: 4000 IU/min for 2 h, 2000 IU/min for 2 h and then 1000 IU/min for 20 h. In addition, heparin was administered intravenously at a dose of 1000 U/h for concomitant anticoagulation. Repeat angiography on the next day showed the patency of the right renal artery without any filling defects (Figure 2B).

The patient’s renal failure did not improve immediately after revascularization. Serum levels of creatinine and lactate dehydrogenase started to decrease 3 days after revascularization, and then returned to baselines. His urine output also increased at the same time. On the fifth day after revascularization, a follow-up renal Doppler sonogram showed no evidence of renal artery stenosis. During thrombolytic therapy and anticoagulation, this patient’s course was complicated with bleeding from a gastric ulcer, which was treated with omeprazole (Losec®, Astra, Sweden), and the bleeding did not recur. Coumadin was started, and overlapped with heparin for 3 days. Long-term use of coumadin was suggested to prevent the recurrence of thromboembolism in this patient.

Discussion

Acute renal artery thromboembolism is a critical problem requiring rapid diagnosis and treatment. In 94% of patients, systemic emboli commonly originate in the heart. Among contributing cardiac disorders, atrial fibrillation, myocardial infarction (post-infarction thrombi) and rheumatic mitral stenosis are the most important ones [1].

Early diagnosis of renal artery thromboembolism is difficult. It is not usually diagnosed at the onset of symptoms, and early identification is made in <30% of the patients [2]. The initial differential diagnoses should include: nephrolithiasis, pyelonephritis, acute myocardial infarction and congestive heart failure. Moreover, patients with a renal artery thromboembolism have been mistakenly diagnosed as having acute cholecystitis, which has led to unnecessary cholecystectomy [2], or as having renal colic secondary to a calculus [3]. Our patient was initially diagnosed as having an ischaemic bowel syndrome based on unexplained abdominal pain and dilated loops of bowel. Right renal artery thromboembolism was found incidentally by contrast-enhanced CT of his abdomen. The suspicion was supported by an elevation of lactate dehydrogenase (one of the renal enzymes) and acute decline in renal function. Finally, it was confirmed by renal artery angiography.

Acute renal failure in association with unilateral renal artery thromboembolism is usually ascribed to acute tubular necrosis due to renal hypoperfusion, which often accompanies the vascular catastrophe. Occasionally, contrast nephropathy following angiography may itself lead to acute renal failure. An additional cause has been reported: reflex vasospasm of the contralateral kidney [4]. Such a mechanism for acute renal failure in the setting of unilateral renal artery thromboembolism was originally described by Levin et al. [4]. Accordingly, acute renal failure in our patient secondary to reflex vasospasm of the contralateral kidney is a possibility. However, as renal function did not improve immediately after successful revascularization, contrast nephropathy and
prolonged ischaemia may have contributed to his renal failure.

A high degree of suspicion is a prerequisite for diagnosing acute renal artery thromboembolism in patients who present with unexplained abdominal pain, acute renal failure and history of cardiac arrhythmia, recent myocardial infarction, valvular heart disease, bacterial endocarditis or peripheral arterial occlusion disease. Intra-arterial thrombolytic treatment is an additional therapeutic option in carefully selected patients with acute renal artery occlusion. It is relatively safe, may not interfere with subsequent surgery, and can restore normal renal function in some, but not all, cases.

**Conclusion**

When confronted with a patient suffering from acute renal failure and unexplained abdominal pain, especially one who had high risk factors, we recommend screening for renal artery thromboembolism by contrast-enhanced CT of the abdomen. Early diagnosis and optimal thrombolytic treatment can sometimes restore renal function without the need for surgical intervention.

**References**


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