

Successful endovascular treatment using a covered stent for artery–ureteral fistula after surgery for abdominal aortic aneurysm

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ABSTRACT

Artery–ureteral fistula (AUF) is a rare condition but there is an increase in the number of reported cases. It is frequently difficult to treat. A 63-year-old male who had undergone a Dacron Y-graft placement for an infrarenal aortic aneurysm 3 years earlier, presented with hematuria. Contrast-enhanced computed tomography revealed a fistula located between the right common iliac artery and the right ureter at graft anastomosis. Endovascular treatment using a covered stent was performed successfully.

Key words: Artery–ureteral fistula, covered stent, endovascular treatment, ureteral obstruction

INTRODUCTION

Artery-ureteral fistula (AUF) is a relatively rare but life-threatening condition because of the potential of massive hemorrhage and hematuria. Risk factors for AUF include previous abdominal vascular surgery, previous extensive and radical oncologic treatment in the pelvis and chronic ureteral stenting. Because of the increased prevalence of these risk factors, the chances of encountering AUF are increasing.

Various treatment options have been reported to manage an existing fistula. Conventionally, AUF is treated by open surgery to close the fistula; however, this is associated with high mortality and morbidity rates because the surgical field often has adhesions from previous treatments such as surgery or radiotherapy. Recently, endovascular stent graft

placement for AUF has been employed as a less invasive and safer therapeutic option with satisfactory outcomes. Herein, we present a case of AUF after surgery for an abdominal aortic aneurysm, which was successfully treated with an endovascular procedure using a covered stent.

CASE REPORT

A 63-year-old male presented with intermittent gross hematuria and anemia. He had undergone a Y-graft surgery for an abdominal aortic aneurysm 3 years earlier. A computed tomography (CT), 1 year after Y-graft surgery revealed that the right ureter had crossed the distal anastomosis of the vascular graft. Two years after the surgery, the ureter was observed to be extrinsically compressed by fibrosis at the site of its crossing over the Y-graft and a ureteral stent was placed at another hospital, 7 months before presentation to us. Cystoscopy revealed hematuria from the right ureteric orifice, suggesting the possibility of AUF. The patient was transferred to our hospital after transfusion of four units of red cell concentrates. Laboratory data showed anemia with a hemoglobin concentration of 9.7 g/dL (normal, 13.5–17.0 g/dL), a hematocrit level of 28.9% (normal, 40–50%), an elevated serum creatinine level of 1.41 mg/dL (normal, 0.4–0.8 mg/dL) and a slightly elevated C-reactive protein concentration of 0.40 mg/dL (normal, 0.00–0.30 mg/dL). He was hemodynamically stable and a urine bacterial culture was negative. At the time of consultation at our hospital, contrast-enhanced CT of the abdomen revealed a possible fistula between the right common iliac artery and the ureter, although no flow of contrast medium to the ureter was detected [Figure 1a]. The CT showed that the

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process originated at the level of the distal anastomosis of a vascular Y-graft [Figure 1b and c]. Right hydronephrosis with intraureteral blood clots were present. The patient was diagnosed with AUF associated with the Y-graft. An elective endovascular surgery was performed by vascular surgeons following embolization of the right internal iliac artery to prevent endoleak caused by backflow from the right internal iliac artery. Arteriography at the operation detected no leak from the artery to the ureter [Figure 2]. A stent covered by expanded polytetrafluoroethylene (Fluency Plus, Bard Inc., Covington, GA, USA; diameter 10 mm; length, 80 mm) was placed via the right femoral artery. The right ureteral stent was removed after the treatment. Extrinsic obstruction caused by inflammatory fibrotic change was considered to be so dense that it was impossible to treat the ureteral stricture. Neither antiplatelet nor anticoagulation drugs were prescribed. Two weeks after treatment, contrast-enhanced CT showed disappearance of the fistula and improvement of right hydronephrosis. Six months after the endovascular surgery, severe right hydronephrosis was observed with an elevated serum creatinine level of 1.42 mg/dL. Retroperitoneoscopic nephrectomy was performed because we were concerned about recurrence of the fistula. No bleeding from the right residual ureter has been observed.

DISCUSSION

Ureteral obstruction is a relatively frequent complication after abdominal aortic reconstructive surgery. Urological complications after vascular surgery were previously considered to be rare because a unilateral hydronephrosis may not produce symptoms, mild obstruction may not be identified and no systematic follow-up after vascular surgery was performed. However, it is now known that ureteral obstruction occurs in 10–20% of all bypass operations.

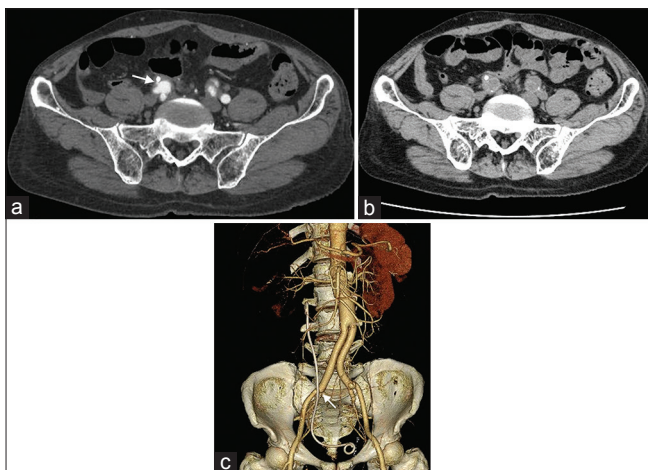


Figure 1: (a) Contrast-enhanced computed tomography (CT) in arterial phase shows a minimal process (arrow) that was a possible fistula between the right common iliac artery and the right ureter. (b) and (c) CT and 3D-CT angiography show that the right ureter with a ureteral stent crosses the distal site of anastomosis of the vascular graft (arrow)

Patients with ureteral obstruction are significantly more likely to have graft complications, including AUF, compared with those without ureteral obstruction. In particular, delayed ureteral obstruction, as observed in the present case, appears to be a marker for current or impending graft complications.^[1]

It is important to recognize the predisposing risk factors for AUF, and the urologist should suspect AUF in any patient with hematuria and the predisposing risk factors. The pathogenesis of AUF is closely related to inflammatory or ischemic changes in the ureter, vessels or both. The predisposing factors from the outside of the ureter that could cause the pathogenesis are previous genitourinary or pelvic oncologic surgery, previous vascular surgery, radiotherapy and an underlying vascular disease. In addition, chronic ureteral stenting is a strong predisposing factor from the inside of the ureter. Chronic ureteral stenting acts as a counter-brace to facilitate the transmission of arterial pulsations to a fragile ureter, producing pressure necrosis and resulting in fistula formation. In a previous study assessing a large patient cohort, 85 of 139 AUF patients (61%) had chronic ureteral catheterization prior to the fistula formation.^[2]

AUF in a patient who underwent vascular graft surgery is often located at the level of the proximal or distal anastomosis of the vascular graft. This is because anastomosis is most fragile in the artery. In the review of 139 AUF cases, a significant portion of the fistulas originated at the level of the anastomosis of the vascular graft.^[2] Consistent with this, the fistula in the present case was located at the level of the distal anastomosis.

The treatment of AUF in an arterial lesion is either via an open procedure or via an endovascular procedure. Endovascular treatments are less invasive and safer than open procedures because they avoid direct procedures on areas damaged



Figure 2: Arteriography shows no leak of contrast medium to the right ureter. A ureteral stent is located in the right ureter

during previous radiation or surgery. Fox *et al.* reported that the overall endovascular success rate of no recurrent hemorrhage was 85% (12 of 14 cases), including 11 patients with endovascular stents with fewer complications than with open procedures.^[3] Endovascular treatment is classified into two categories: The first using angiographic vascular occlusion and the other using a covered stent. The former procedure requires extra-anatomical vascular repair to maintain antegrade blood flow to the lower extremity. However, an endovascular procedure using a covered stent does not require revascularization; therefore, this treatment option can be considered less invasive than open procedures or endovascular treatment using angiographic vascular occlusion. Although endovascular treatment using a covered stent has some disadvantages, such as not dealing with fistula formation, severe complications such as stent occlusion or stent graft infection are very rare.^[4,5] Additional cases and longer follow-ups are likely to demonstrate the further utility of endovascular procedures with covered stents.

In conclusion, in a patient with history of treatment of aortic aneurysm, a ureteral stent should not be placed for

a long time, and endovascular treatment of AUF using a covered stent could become the preferred treatment modality because of its less invasiveness and safety.

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