CASE REPORT

Percutaneous Endovascular Repair of a Ureteroarterial Fistula with a Stent Graft

Jui-Hsun Fu[1], Huei-Lung Liang[1,2]*, Chia-Cheng Yu[3], Huay-Ben Pan[1,2], Chien-Fang Yang[1,2]

Departments of [1]Radiology and [3]Urology, Kaohsiung Veterans General Hospital, Kaohsiung, and [2]National Yang-Ming University School of Medicine, Taipei, Taiwan, R.O.C.

Ureteroarterial fistula is a rare but life-threatening cause of hematuria. The predisposing factors of a ureteroarterial fistula includes pelvic exenteration, radiation therapy, infection, primary vascular disease, vascular reconstructive surgery, and indwelling ureteral catheters or stents. We report a case of ureteroarterial fistula between the right ureter and a pseudoaneurysm originating from the right proximal external iliac artery in a female patient presenting with intermittent massive hematuria. She had previously undergone an operation for cervical cancer, radiation therapy, and ureteral stent placement. She was treated successfully by percutaneous endovascular stent graft placement to exclude the pseudoaneurysm. Percutaneous stent graft placement appears to be an effective and safe therapeutic alternative in the treatment of ureteroarterial fistula. [*J Chin Med Assoc* 2006;69(8):387–390]

Key Words: hematuria, stents, urinary fistula

Introduction

Ureteroarterial fistula is a rare cause of hematuria. Approximately 90 cases of ureteroarterial fistulas have been reported in the English language literature; nearly 2-thirds of these were reported during the last decade.[1] Preoperative diagnosis can be difficult because the fistula is probably occluded intermittently by blood clot that makes angiogram, ureterogram, and other diagnostic studies difficult to visualize.[1,2] Conventional therapies for the life-threatening condition are direct surgical intervention including local reconstruction, ligation with or without extraanatomic bypass, and ligation of the internal iliac artery.[1,3] In 1996, Kerns[4] reported the first attempt of endovascular treatment of ureteroarterial fistula with a vein-covered stent. To date, only limited case reports of ureteroarterial fistula managed by stent graft placement have been reported in the literature.[4–11] We herein report an additional case successfully managed by a percutaneous endovascular approach.

Case Report

A 58-year-old woman, who had undergone previous radical hysterectomy, bilateral pelvic lymph node dissection, and radiotherapy for cervical cancer 14 years previously, suffered from massive intermittent hematuria after the removal of her ureteral stents. She had radiation cystitis and bilateral ureteral stricture 2 years ago, and underwent frequent indwelling of Foley catheter and bilateral plastic ureteral stent placement thereafter. Under the clinical impression of radiation-induced hemorrhagic cystitis, embolization of bilateral internal iliac arteries was requested. During the procedure, a pseudoaneurysm of the right proximal external iliac artery was noted (Figure 1). Intermittent massive hematuria was found after the embolization of bilateral internal iliac arteries. Cystoscopic examination revealed massive pulsatile blood stream from the right ureteral orifice down into the bladder. Emergent tamponade at the right ureteral orifice with a Fogarty catheter was done by

*Correspondence to: Dr Huei-Lung Liang, Department of Radiology, Kaohsiung Veterans General Hospital, 386, Ta-Chung 1st Road, Kaohsiung 813, Taiwan, R.O.C.
E-mail: hlliang@isca.vghks.gov.tw • Received: November 17, 2005 • Accepted: May 4, 2006

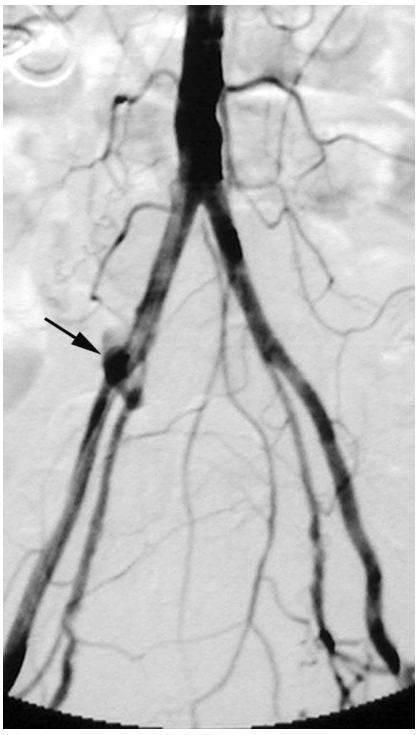

Figure 1. Digital subtraction angiogram during embolization of bilateral internal iliac arteries demonstrated pseudoaneurysm of the right proximal external iliac artery (arrow). No evident fistulization with right ureter or contrast extravasation was present.

Figure 2. Computed tomography demonstrated the proximity of the pseudoaneurysm (arrow) and right ureter (arrowhead).

our urologist. Abdominal contrast-enhanced computed tomography (CT) confirmed a pseudoaneurysm of the right proximal external iliac artery adjacent to the right ureter (Figure 2), and ureteroarterial fistula was suspected. Open surgery was considered inappropriate for this patient owing to extensive retroperitoneal scarring from previous exploration and radiation. Therefore, a percutaneous endovascular approach was chosen. A 38 mm long, 6–12 mm in diameter JOSTENT Peripheral Stent Graft (Abbott Laboratories, Abbott Park, IL, USA), hand-mounted on a 6 × 40 mm angioplasty balloon, was delivered through a 9F sheath via a right femoral arterial route. The stent graft was deployed across the pseudoaneurysm, covering both the right distal common and proximal external iliac arteries. The proximal end of the stent graft was further dilated with an 8 × 20 mm angioplasty balloon to accommodate to the larger diameter of the common iliac artery. Immediate follow-up angiography showed complete exclusion of the pseudoaneurysm (Figure 3). The patient was discharged 4 days later with a percutaneous nephrostomy catheter left for further urine diversion. This patient had no recurrent episodes of hematuria or any infectious symptoms thereafter. Unfortunately, she had sudden urosepsis and died 6 months after the stent graft deployment.

Discussion

Ureteroarterial fistula is rare. Approximately 90 cases of ureteroarterial fistulas have been reported in the English language literature; nearly 2-thirds of these were reported during the last decade.[1] The increasing incidence may be related to the increased frequency and duration of ureteral stent placement.[6] The predisposing factors in the development of a ureteroarterial fistula include pelvic exenteration, radiation therapy, infection, primary vascular disease, vascular reconstructive surgery, and indwelling ureteral catheters or stents.[2,4,6] The stent acts as a firm strut, which may transmit arterial pulsations to a compromised ureter. Pressure necrosis and fistulization can ensue.[4,6] In our case, pelvic exenteration, radiation therapy, and the presence of an indwelling ureteral stent could have led to fistula and pseudoaneurysm formation.

Prompt diagnosis and treatment are crucial in this life-threatening disorder. Before the 1970s, the

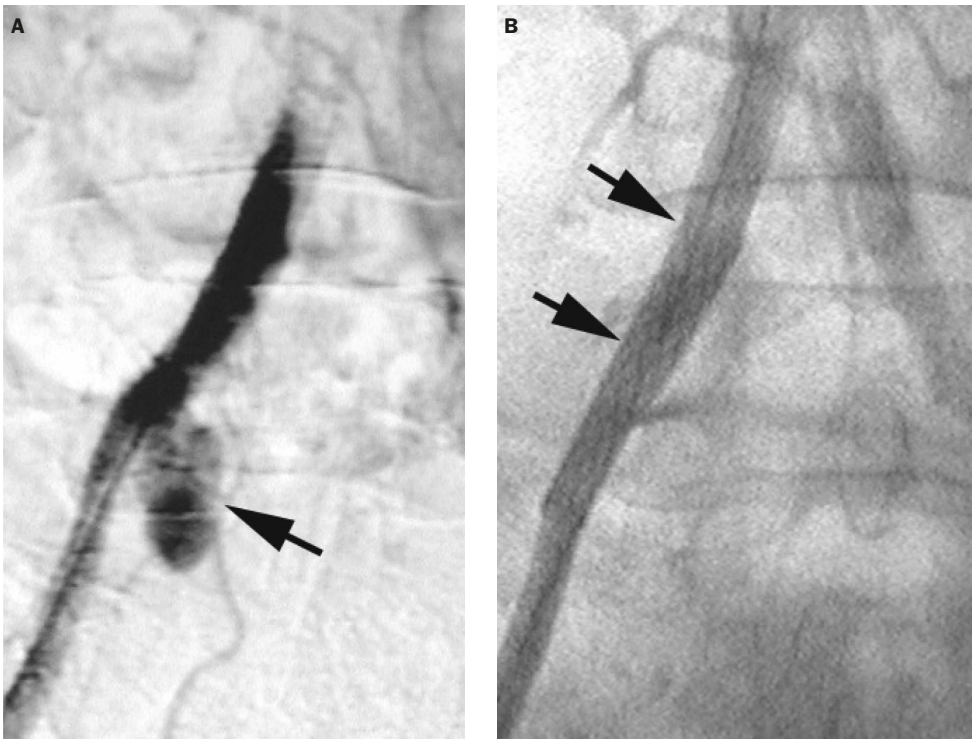

Figure 3. (A) Arrow indicates the pseudoaneurysm before stent graft deployment. (B) The pseudoaneurysm was completely excluded by the stent graft. Note the larger diameter (arrows) of the proximal end of the stent graft expanded by an 8 mm angioplasty balloon.

mortality rate was reported to be 64%, with the majority of diagnoses made during postmortem or after unsuccessful nephrectomy.[12] In spite of recent advances in critical care and diagnostic modalities, the contemporary mortality rate remains about 40%.[10]

Ureteroarterial fistulas have 2 parts. One is the arterial side, the other is the ureteral side. The arterial side must be treated expeditiously because failure to do so can lead to exsanguination.[1] The usual management approach of the arterial side of the fistula includes surgery and embolization. Surgical intervention is technically challenging because of the presence of adhesions, which are observed in most patients with ureteroarterial fistula. Iliac artery embolization seems to be less invasive, but crossover femoral–femoral bypass surgery is often required in this situation.[13]

Recently, percutaneous endovascular stent graft repair has been confirmed to be effective for the treatment of ureteroarterial fistula.[4–11] Endovascular stent graft management offers advantages over open surgical repair or radiologic embolization in: closure of the fistula, maintenance of prograde iliac flow, avoidance of subsequent procedures to revascularize the leg, no risk for the affected ureter or other adjacent structures, and earlier recovery of the patient.[11] However, its long-term success is not yet known. Of note is the procedure's potential for stent occlusions and graft infections.[1] Also, a mycotic pseudoaneurysm is not suitable for stent graft treatment because of the possible risk of infection of the graft fabric. Kwon et al[14] suggest that the infection should be cured or brought under control by antibiotic therapy before stent graft placement.

The JOSTENT is balloon-expandable, which facilitates precise placement and the ability to adjust the stent graft's luminal diameter to match the adjacent vessel.[15] This design matched our need to place the stent graft across the bifurcation of the common iliac artery. The proximal end of the stent graft at the common iliac artery was expanded to 8 mm and the distal end at the external iliac artery was expanded to 6 mm in diameter. This helped to prevent possible endoleak or migration of the stent graft.

There is no consensus on whether or not the ureteral side needs to be treated after endovascular stent graft deployment. We opted not to treat the ureteral side because continued urine diversion through percutaneously placed nephrostomy catheters may provide adequate drainage, and the severely fibrotic tissues around the fistula may prevent urine leakage.[1] For this patient, as no follow-up abdominal CT images or pyelogram were available, we were not sure about the cause of urosepsis 6 months after stent graft placement. It could be attributed to ascending urinary

infection, wound infection due to long-term percutaneous nephrostomy catheter placement, or urine leakage of the fistula with secondary infection.

In conclusion, ureteroarterial fistula is a rare and often fatal entity that requires a high degree of suspicion for diagnosis. Percutaneous stent graft placement appears to be an effective and safe therapeutic alternative, especially in patients who frequently present surgical risk factors.

References

1. Madoff DC, Gupta S, Toombs BD, Skolkin MD, Charnsangavej C, Morello FA Jr, Ahrar K, et al. Arterioureteral fistulas: a clinical, diagnostic, and therapeutic dilemma. *AJR* 2004;182:1241–50.
2. Quillin SP, Darcy MD, Picus D. Angiographic evaluation and therapy of ureteroarterial fistulas. *AJR* 1994;162:873–8.
3. Bergqvist D, Parsson H, Sherif A. Arterio-ureteral fistula—a systematic review. *Eur J Vasc Endovasc Surg* 2001;22:191–6.
4. Kerns DB, Darcy MD, Baumann DS, Allen BT. Autologous vein-covered stent for the endovascular management of an iliac artery-ureteral fistula: case report and review of the literature. *J Vasc Surg* 1996;24:680–6.
5. Gibbons M, O'Donnell S, Lukens M, Meglin A, Costabile RA. Treatment of a ureteroiliac artery fistula with an intraluminal endovascular graft. *J Urol* 1998;159:2083–4.
6. Feuer DS, Ciocca RG, Nackman GB, Siegel RL, Graham AM. Endovascular management of ureteroarterial fistula. *J Vasc Surg* 1999;30:1146–9.
7. Sherif A, Karacagil S, Magnusson A, Nyman R, Norlen BJ, Bergqvist D. Endovascular approach to treating secondary arterioureteral fistula. *Scand J Urol Nephrol* 2002;36:80–2.
8. Kato N, Kawaguchi T, Kondo T, Hasegawa Y, Ishida M, Sakuma H, Kawamura J, et al. Re: ureteroarterial fistula: endovascular repair with a stent-graft. *Cardiovasc Intervent Radiol* 2002;25:158–9.
9. Uzieblo MR, Rubin BG. Simultaneous bilateral iliac artery-to-ureter fistulae—an unusual case report. *Vasc Endovascular Surg* 2004;38:189–92.
10. Baldwin ZK, Sokoloff MM, Gerber GS, Schwartz LB. Ureteroarterial fistula with ruptured anastomotic pseudoaneurysm: successful management with vascular exclusion, extra-anatomic bypass and nephrectomy—a case report. *Vasc Endovascular Surg* 2005;39:203–6.
11. Bilbao JI, Cosin O, Bastarrika G, Rosell D, Zudaire J, Martinez-Cuesta A. Treatment of ureteroarterial fistulae with covered vascular endoprostheses and ureteral occlusion. *Cardiovasc Intervent Radiol* 2005;28:159–63.
12. DePasquale SE, Mylonas I, Falkenberry SS. Fatal recurrent ureteroarterial fistulas after exenteration for cervical cancer. *Gynecol Oncol* 2001;82:192–6.
13. Wheatley JK, Ansley JD, Smith RB, Trulock TS, Campbell D. Ureteroarterial fistula. *Urology* 1981;18:498–502.
14. Kwon K, Choi D, Choi SH, Koo BK, Ko YG, Jang Y, Shim WH, et al. Percutaneous stent-graft repair of mycotic common femoral artery aneurysm. *J Endovasc Ther* 2002;9:690–3.
15. Appel N, Duncan JR, Schuerer DJ. Percutaneous stent-graft treatment of superior mesenteric and internal iliac artery pseudoaneurysms. *J Vasc Interv Radiol* 2003;14:917–22.