Case Report

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Endovascular treatment of arterio-ureteral fistula with new-generation balloon-expandable stent graft using a 7-French system

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Abstract

Arterio-ureteral fistulas are relatively rare, but a potentially life-threatening condition because of the possible massive bleeding. An 82-year-old woman with a history of hysterectomy and irradiation for uterine cancer was treated with ureteric stents for recurrent bilateral ureteral stenosis. During the adjustments of the stent, removing the right ureteric stent immediately resulted in massive hematuria. Computed tomography showed that the right ureter coursed above and seemed to be connected to the right external iliac artery. From the clinical history and computed tomography findings, an arterio-ureteral fistula between the right external iliac artery and right ureter was strongly suspected. The GORE® VIABAHN® VBX Stent Graft was deployed from the common iliac artery to the external iliac artery via a 7-French femoral system, followed by post-dilatation. The patient did not develop any complications or recurrence of hematuria after the procedure during the 11-month follow-up. The VBX is a useful device, with a low- profile device and a size-adjustable balloon-expandable stent that depended on the individual vessel size for post-dilatation. However, there are several concerns, such as risk of infection, stent thrombosis/stenosis, and chronic outcome while using stent grafts for treatment. Patients with arterio-ureteral fistulas who were treated using stent grafts should be carefully followed up.

Keywords

Arterio-ureteral fistula, new-generation balloon-expandable stent graft, lower invasion, high-bleeding risk patient

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Introduction

Arterio-ureteral fistulas (AUFs) are abnormal connections between the blood vessels and the ureter. The presence of an AUF is a rare but potentially life-threatening condition because of the possible development of hematuria.[1] The main indications for AUFs are prior pelvic surgery, prior irradiation, and indwelling ureteric stent.[2] In recent years, endovascular treatment of AUFs has been reported.[3,4] However, these cases were treated using a relatively large profile self-expandable stent graft. Here, we reported the case with an AUF due to previous pelvic cancer and insertion of ureteric stents multiple times who was successfully treated with a size-adjustable balloon-expandable stent graft with a low-profile system.

Case report

The patient was an 82-year-old woman who underwent hysterectomy and irradiation for uterine cancer in 1992. In 2017, she underwent insertion of a ureteric stent for bilateral ureteral stenosis, and her ureteric stents were regularly changed.

In July 2019, she developed massive hematuria when her right ureteric stent was changed. The ureteric stent was immediately re-inserted and hematuria stopped. Cystoscopy did not reveal any abnormal findings of bleeding in the bladder, and computed tomography (CT) showed that the right ureter coursed above and seemed to be connected to the right external iliac artery (EIA); thus, the presence of AUFs between the right EIA and the right ureter was suspected (Figure 1(a) and (b)). The urologist consulted the personnel

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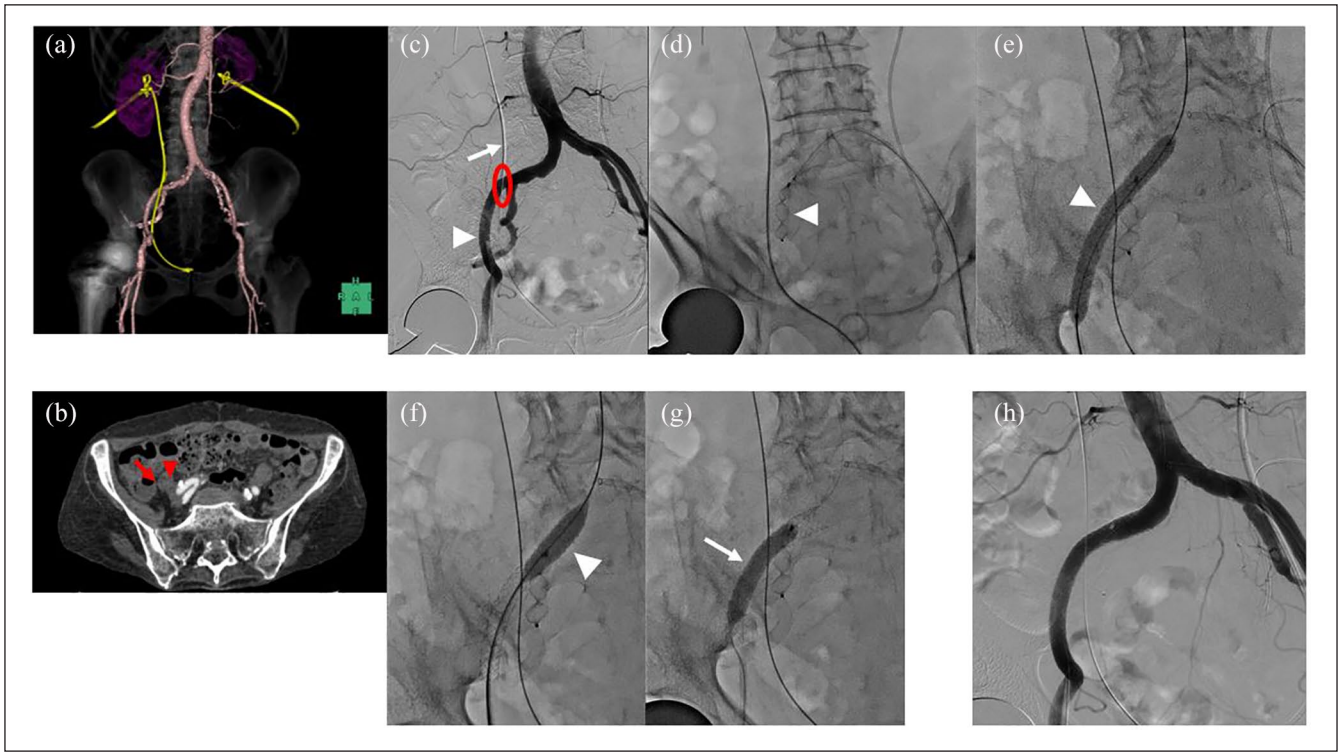

Figure 1. (a) CT angiography (coronal plane). (b) CT scan showing that the right ureter (red arrow) coursed above the right EIA (red arrowhead) and was in contact with the EIA. (c) Aortogram showing no contrast leak in the right ureter. The crossing point (red oval) of the right ureteral stent (white arrow) and the right EIA (white arrowhead) indicates the presence of an AUF. (d) The right IIA is embolized using a 10 × 7 mm vascular plug (white arrowhead) to prevent endoleak. (e) The 7 × 79 mm GORE® VIABAHN® VBX Stent Graft (white arrowhead) inserted with nominal pressure with its proximal apposition site within the CIA and the distal apposition site within the EIA. (f) Post-dilatation performed at the CIA with a 10 × 20 mm balloon catheter (white arrowhead). (g) Post-dilatation performed at the EIA with an 8 × 40 mm balloon catheter (white arrow). (h) No contrast leakage. Moreover, the IIA is well embolized, and the VBX is well dilated.
CT = computed tomography, EIA = external iliac artery, AUF = arterio-ureteral fistula, IIA = internal iliac artery, CIA = common iliac artery.

at the Cardiology Department regarding the indications of endovascular therapy.

The patient was in a stable condition, despite massive hematuria; hence, endovascular therapy was not performed. However, 1 month after the first episode of massive hematuria, her hemodynamic status became unstable secondary to hemorrhagic shock caused by recurrent massive hematuria. Hence, with the obtained informed consent, emergency endovascular therapy under local anesthesia was performed using the GORE® VIABAHN® VBX Stent Graft system, which can be deployed with a lower profile system as compared to the previously used covered stents. Since the patient was old and moderately frail, there was a higher risk of bleeding complications related to the access site.

A 7-French-long sheath was inserted in the right common femoral artery (CFA), and a 4-French-short sheath was inserted in the left CFA. Aortography (AOG) was performed via a 4-French pigtail catheter (Figure 1(c)). AOG did not reveal any connections and bleeding between the right iliac artery and the right ureter. Next, the right internal iliac artery (IIA) was investigated using a 0.035-inch guidewire from the left-side system. Subsequently, a 4-French sheath was exchanged with a sheathless guiding catheter over the wire, and the sheathless guiding catheter was advanced to the right IIA. The guidewire was withdrawn, and a 10 × 7 mm vascular plug was deployed using the sheathless guiding catheter, following embolization of the right IIA to prevent type II endoleak (Figure 1(d)). The sheathless guiding catheter was withdrawn slightly from the right common iliac artery (CIA), and a 0.014-inch guidewire was advanced to the right CFA. An intravascular ultrasound system was advanced over the wire. However, no findings of an absent vessel wall were evaluated because the vessel diameter was too large. The 0.035-inch guidewire was advanced via the right femoral 7-French sheath, followed by a 7 × 79 mm GORE VIABAHN VBX Stent Graft (catheter length: 80 cm; GORE, Arizona, USA). The VBX Stent Graft was inserted with nominal pressure covering the CIA and the EIA, crossing over IIA (Figure 1(e)). The VBX at the CIA was post-dilated with a 10 × 20 mm balloon catheter (Figure 1(f)), and the VBX at EIA was dilated with an 8.0 × 40 mm balloon catheter (Figure 1(g)). Final angiogram did not reveal any findings of AUFs. The IIA was well embolized, and the VBX was well expanded (Figure 1(h)). Bleeding at the right CFA was resolved using a 7-French ExoSeal™ vascular closure system (Cordis,

Ohio, USA). There were no complications during the procedure. Hematuria resolved immediately after the procedure. Ceftriaxone sodium hydrate (2 g/day) was administered as antibiotics for 7 days after the procedure. Single anti-platelet therapy (APT) was continued using 100-mg aspirin. Recurrence of hematuria and other signs of infection were not seen in our patients at 11-month follow-up.

Discussion

AUFs are classified as either primary or secondary. Primary AUFs account for 15% of fistulas[2] and usually develop with erosion of an aneurysm into the ureter.[5] Secondary fistulas are more common, account for 85% of cases, and are often observed in patients who have undergone surgery for pelvic cancer.[2] Other causes include vascular surgery involving the CIA or EIA, urinary diversion surgery, and urinary stenting.[6] The symptoms of AUFs commonly include gross hematuria, followed by back pain, urinary tract infection, and urinary retention.[6] AUFs are rare but potentially life-threatening entities. The mortality rate is generally 13%. However, it is the hemodynamic instability due to AUFs that leads to the high mortality rate of up to 23%.[1] Moreover, a high mortality rate of 58% has been reported for patients with delayed diagnosis.[5,7]

Many different surgical and endovascular treatments have been described for the treatment of AUFs. Since most patients with AUFs have a history of complications including pelvic surgery and/or malignancy, surgery is not feasible.[5] Endovascular treatment with arterial coil embolization has been described in patients with IIA involvement. However, coil embolization is usually not considered[5] as most of AUFs affect the CIA or EIA.

Endovascular treatment of AUFs with covered stents has also been previously described.[3,4] Endovascular treatment with stents is less invasive and provides rapid control of life-threatening bleeding.

In this case, the indication of stent graft treatment should be discussed because the angiogram did not reveal the presence of an AUF. However, several reports have shown that the preoperative diagnosis of AUFs was very difficult because AUFs are positive in 69%[5] of angiographies and positive in 22%[1] of CT urographies. Moreover, this patient had a history of surgery for pelvic cancer, irradiation, and urinary stenting, which indicates high risk of AUFs.[2,6] CT showed that the right ureter coursed above and seemed to be connected to the right EIA. Therefore, we decided to implant a stent graft because we suspected that her hemodynamic instability was due to an AUF. After the procedure, the patient did not experience any subsequent episodes of hematuria, thus confirming the diagnosis of an AUF.

The VBX is generally used to improve the blood flow of the iliac artery due to arteriosclerotic lesions. Bismuth et al. reported that this device was safe and useful in treating 134 patients (213 limbs) with arteriosclerotic lesions in a prospective designed study.[8] In this case, we used the VBX with a lower profile to treat the AUF because this case was of an older female and had a higher risk for bleeding in relation to the access site as previously reported.[9]

The GORE VIABAHN VBX Stent Graft can be used via a low-profile, 7-French system. Moreover, the VBX has a balloon-expandable system, which can be flexibly expanded using a post-dilational balloon according to individual arterial diameters (e.g. a 7-mm VBX can be expanded to maximum 11 mm). As reported, the VBX is less invasive and can be safely used for arteriosclerotic lesions and for vascular injury. Although several devices can be used in the treatment of fistulas, we can use the VBX stent graft only as balloon-expandable devices and other balloon-expandable stent grafts/covered stents are not approved in Japan. Hence, in this case, we chose the VBX.

There are several concerns about the treatment using the VBX system for AUFs. First, with the use of covered stents, there is a concern of graft infection due to contamination by bacteria present in the urinary tract. Although infection has not been commonly reported as a complication in the existing literature,[5] and no signs of infection were seen in our case, infection was still a possibility. Unfortunately, use of antibiotics and its duration are unclear. Although there is no consensus for use of prophylactic antibiotics in patients with ureteroarterial fistula (UAF) treated with stent graft, administration of antibiotics for 6 weeks after the procedure is recommended, and lifelong antibiotics may not be unreasonable.[10] Second, for the VBX, using dual APT is generally recommended to reduce the risk of edge re-stenosis. However, in this case, single APT was selected because she experienced life-threatening bleeding, and she was planned to undergo a bleeding procedure, nephrostomy, by Urology service. At the outpatient department, there were no findings of associated thrombotic and re-stenotic events due to the stent graft. Although a systematic review of 32 cases showed that 9% of patients had thrombosis of the stent,[1] it is possible that single APT can be used safely after VBX implantation because the iliac artery is larger in size and has better blood flow than the femoropopliteal, preventing ischemic events. Finally, there are limited data on the long-term outcome of stent graft placement in AUFs. Okada et al. reviewed AUF cases and reported that 36% patients had recurrent hematuria at a mean follow-up of 18.3 months. Moreover, they reported that AUF-related and overall mortality rates at 2 years were 14.3% and 45.1%, respectively.[11] Hence, AUF patients treated with stent grafts must be followed up carefully.

Conclusion

We report a case of AUF successfully treated with new-generation balloon-expandable stent graft via a slender system. The VBX is a useful and safe device because it is less invasive, and it can be dilated to optimal diameters for individuals and lesions. In contrast, there are limited data regarding the use of antibiotics, risk of stent thrombosis/stenosis, and outcome at the chronic phase. Further studies are required to determine the optimal treatment for AUFs.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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