Prostate artery embolization in a patient with left ventricular assist device

Jay Vasani a,*, Sanghun Kim b, Kieran Hynes c, Charles Pound d, Issam Kably d

a Department of Interventional Radiology, University of Mississippi Medical Center, 2500 N State St. Jackson, Mississippi, 39216, USA
b Department of Diagnostic Radiology, University of Mississippi Medical Center, 2500 N State St. Jackson, Mississippi, 39216, USA
c Department of Surgery Division of Urology, University of Mississippi Medical Center, 2500 N State St. Jackson, Mississippi, 39216, USA
d Department of Interventional Radiology, University of Miami/ Jackson Memorial Hospital, 1400 NW 12th Ave, Miami, FL, 33136, USA

Keywords:
Benign prostatic hyperplasia
Lower urinary tract symptom
Prostate artery embolization
Left ventricular assist device
Interventional radiology

Abstract

Increased number of left ventricular assist device placement in patients with end stage heart failure as well as years of survival increases the likelihood of need for non-cardiac procedures. Prostate artery embolization is a safe, minimally invasive procedure performed in the setting of lower urinary tract symptoms or refractory gross hematuria of prostatic origin. These patients require a multidisciplinary approach to weigh the benefits and risks of the procedure and provide optimal periprocedural care. We report a case of technically successful prostate artery embolization performed in a patient with HeartWare HVAD presenting with refractory hematuria of prostatic origin (RHPO).

Introduction

Increased survival in end stage heart failure patients with left ventricular assist devices (LVAD) has led to an increased need for non-cardiac procedures. Gross hematuria in the setting of benign prostatic hyperplasia (BPH) can be treated with prostate artery embolization. Patients with LVAD must be carefully evaluated for perioperative complications related to anticoagulation. Compared to traditional surgery, minimally invasive catheter directed therapy offer increased safety especially in patients with chronic anticoagulation, and therefore should be considered as first line treatment option when indicated.

Case presentation

A 73-year-old male with a history of paroxysmal atrial fibrillation on warfarin status post dual chamber implantable cardioverter defibrillator placement and nonischemic cardiomyopathy with HeartWare HVAD system (LVAD) as destination therapy implanted in an outside hospital 2 years prior to presentation.

The patient was seen at an outside hospital for gross hematuria and dysuria for one week which was conservatively managed with Foley catheter and antibiotics. The patient returned to the outside hospital after the completion of an antibiotic regimen with persistent hematuria. Continuous bladder irrigation was started during which the patient received 2 units of packed red blood cells for acute blood loss anemia.

The patient was eventually transferred to our medical center for cystoscopy given the patient’s complex medical history and the probable requirement for cardiac anesthesia during the procedure.

CT urogram obtained prior to cystoscopy showed marked prostatic-megaly measuring approximately 175 cc with median lobe projecting into bladder neck and significant clot burden within the bladder lumen. Warfarin was held and therapeutic heparin was started. Cystoscopy performed under anesthesia showed severe trilobar hypertrophy of the prostate with friable enlarged median lobe consistent with BPH. The formed clot was evacuated, and the following re-examination of the bladder showed normal-appearing mucosa without evidence of urothelial cancer. Interventional radiology was consulted for prostate artery embolization (PAE). Prior to having hematuria, the patient’s international prostate symptom score (IPSS) was 18 and the quality of life score (QOL) was 3 which were managed with alpha-blockers. On the day of the procedure, transfemoral approach prostate artery embolization was performed under general anesthesia using 300–500 μm embospheres (Fig. 1). The procedure was technically successful without acute complications and an estimated blood loss of less than 5 ml. Hematuria completely resolved and CBI was stopped on postoperative day (POD) 2. The patient was able to spontaneously void on POD 3 with postvoid residual (PVR) of approximately 300ml and was then discharged home on POD 5 after resuming warfarin. At the post discharge follow up at the cardiology clinic, the patient reported good activity tolerance without issues with LVAD, ICD, or hematuria. At 2 weeks follow up with urology,

* Corresponding author.
E-mail address: jvasani@umc.edu (J. Vasani).

Received 30 December 2020; Accepted 26 January 2021
Available online 29 January 2021

https://doi.org/10.1016/j.eucr.2021.101588

© 2021 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
hematuria remained completely resolved while on anticoagulation, along with significant improvement of urinary stream with PVR of 90ml (previously 300ml). At 3 month follow up with IR, he remained asymptomatic and reported significant improvement of IPSS 1 (mild LUTs) previously 18 (moderate LUTs), and QOL 0 (delighted), previously 3 (mixed) and PVR of 9ml (previously 90 at 2 weeks follow up) (Fig. 2).

Discussion

Left ventricular assist device (LVAD) is an implantable device that has been introduced in 1990s to bridge patients with end stage heart failure refractory to maximal medical therapy to heart transplant. Continued development and resulting improvement of hemodynamics, end organ function, and quality of life in patients with LVAD has led to its usage as long term mechanical circulatory support in non-transplant patients as a destination therapy. LVAD also shows clinically significant improvement of survival benefit over optimal medical therapy at 1 or 2 years after device implantation. Prior studies have shown that 20–50% of patients with LVAD undergo non-cardiac surgical procedures. Hematuria is the presence of red blood cells in the urine accounting for 4–20% of inpatient urology consultations and hospitalizations. Common causes of hematuria include malignancy, benign prostatic hyperplasia, urinary tract infection, and urolithiasis. Prostatic hyperplasia can be considered a cause of hematuria after the patient has been evaluated for urologic malignancy. Gross hematuria, defined as blood visible in urine, especially in adults is highly suspicious for urologic malignancy thus appropriate imaging and cystoscopic evaluations are necessary in establishing the diagnosis. Hematuria in the setting of prostatic hyperplasia can result from the increased expression of

Fig. 1. A: Right internal iliac angiogram showing right prostate artery (Red arrow) arising from right obturator artery. B: Right prostate artery angiogram opacifying branches supplying median and lateral lobes of the right side of prostate gland. C: Intra-procedure CT scan showing enhancement of right hemi-prostate gland with no enhancement of adjacent organs. D: Left internal iliac angiogram showing left prostate artery (red arrow) arising as a common origin with inferior vesicle artery. E: Left prostate artery angiogram showing branches supplying the left hemi-prostate. F: Cone beam CT showing enhancement of the left side of the prostate gland without enhancement of adjacent structures. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)
vascular endothelial growth factor, anticoagulation, Foley catheterization, and infection. The management of hematuria encompasses continuous bladder irrigation, fulguration, and embolization.

Prostate artery embolization (PAE) is a minimally invasive procedure in which bilateral prostate arteries are embolized in the setting of moderate or severe lower urinary tract syndrome (LUTS) refractory to medications. PAE along with catheter directed arterial embolization of other pelvic vessels can also be performed to treat severe hematuria in high risk population whose conventional therapies have failed. Technical success, defined as bilateral prostate artery embolization, can be achieved at 100% with very low recurrence rate at one year when cone beam computed tomography is used during the procedure. CBCT can help visualize the prostatic arteries and detect accessory or collateral supplying vessels and in turn decrease the risks of non-target embolization. In addition to recurrence of hematuria, questionnaires such as international prostate symptoms score (IPSS) and quality of life score (QOL) are used to assess the outcome of the procedure.

Continuous flow LVADs are at increased risk of nonsurgical bleeding from arteriovenous malformations in gastrointestinal tract and acquired von Willebrand disease secondary to nonphysiological sheer stress on blood components and reduced pulse pressure. This, coupled with thrombotic risk from the mechanical circulatory device, poses a clinical dilemma in physicians performing endovascular procedures.

Conclusion

Prostate artery embolization can be performed safely with favorable outcome for patients with left ventricular assist device presenting with hematuria refractory to conventional therapy. PAE should also be considered as an alternative treatment option in patients with moderate LUTS secondary to BPH, especially in those patients who are on chronic anticoagulation.

Consent

Informed consent was obtained from the patient and patient information was de-identified prior to submission of the case report.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

None.

References

1. Rose EA, Gelijns AC, Moskowitz AJ, et al. Long-term use of a left ventricular assist device for end-stage heart failure. N Engl J Med. Nov 2001;345(20):1435–1443. https://doi.org/10.1056/NEJMoa012175.
2. Hwang KY, Hwang NC. Facilitating noncardiac surgery for the patient with left ventricular assist device: a guide for the anesthesiologist. Ann Card Anaesth. 2018;21(4):351–362. https://doi.org/10.4103/aca.ACA_239_17. Oct-Dec 2018.
3. Bj L, SA B. Management of Emergency Bleeding, Recalcitrant Clots and Hemorrhagic Cystitis. AUA Update Series 342015.

4. Tapping CR, Macdonald A, Hadli M, et al. Prostatic artery embolization (PAE) for benign prostatic hyperplasia (BPH) with haematuria in the absence of an upper urinary tract pathology. *Cardiovasc Intervent Radiol*. Aug 2018;41(8):1160–1164. https://doi.org/10.1007/s00270-018-1941-0.

5. Suarez J, Patel CB, Felker GM, Becker R, Hernandez AF, Rogers JG. Mechanisms of bleeding and approach to patients with axial-flow left ventricular assist devices. *Circ Heart Fail*. Nov 2011;4(6):779–784. https://doi.org/10.1161/CIRCHEARTFAILURE.111.962613.