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Massive retroperitoneal hemorrhage after external shock wave lithotripsy in a patient with a left ventricular assist device

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ABSTRACT

As left ventricular assist devices (LVADs) become more prevalent, it is increasingly likely that patients with LVADs will require non cardiac procedures. Peri-procedural anticoagulation management is challenging in these patients and requires balancing risks of bleeding and pump thrombosis. We present a case of a patient with a HeartWare LVAD who developed a massive retroperitoneal hemorrhage after external shock wave lithotripsy (ESWL) for an obstructing renal calculus and briefly review the literature regarding bleeding complications after ESWL as well as peri-procedural anticoagulation management of patients with LVADs.

Introduction

As the population of patients with advanced heart failure increases, the likelihood that non-cardiology providers encounter patients with left ventricular assist devices (LVADs) will increase. These patients have complex management issues that can complicate otherwise routine procedures. Physicians performing such procedures should be aware of the increased likelihood for complications in these patients due to abnormal physiology and the strict need for anticoagulation.

Case report

A 74 year old man with a history of nonischemic cardiomyopathy presented to our hospital for elective external shock wave lithotripsy (ESWL). He was supported with a HeartWare continuous flow left ventricular assist device (LVAD), implanted 2 years prior to his presentation. His past medical history was notable for an LVAD thrombus requiring pump exchange 8 months after implantation. One month prior to presentation, he was seen at a local hospital for dysuria where cystoscopy revealed an 8 mm obstructing calculus at the left ureteropelvic junction and a 7 mm renal calculus located at the lower pole of the left kidney. A ureteral stent was placed and he was scheduled for ESWL for the left renal calculus.

In preparation for the procedure, his warfarin was discontinued and bridging with low molecular weight heparin (enoxaparin) was initiated 5 days prior to ESWL. He was admitted on the day prior to the procedure and enoxaparin was changed to intravenous unfractionated heparin.

His unfractionated heparin was held on the morning prior to the procedure. International normalized ratio (INR) at this time was 1.5. He underwent successful ESWL, receiving 2500 shocks at 20 kV to the lower pole of the left kidney. Following ESWL, his ureteral stent was removed by cystoscopy. There were no apparent immediate complications and unfractionated heparin was resumed after ESWL.

Overnight, the patient became hypotensive, with Doppler blood pressures of approximately 60 mmHg that rebounded transiently with intravenous fluids. The following morning, the patient's hemoglobin level was 6 mg/dL, a decrease from 11 mg/dL on admission, and he complained of left lower quadrant abdominal pain. Activated partial thromboplastin time (aPTT) was 79.3 seconds. Heparin was discontinued. A non-contrast computed tomography (CT) scan of the abdomen and pelvis revealed a large left retroperitoneal hemorrhage comprised of 2 primary collections (Fig. 1). The dominant collection was centered within the left posterior pararenal space and measured 17 cm × 11 cm × 5 cm. A smaller collection arising from the left inferior renal pole measured 7 cm × 9 cm × 8 cm, with apparent extension through the Zuckerkandl fascia. There was inferior extension into the pelvis, with trace presacral hematoma. He stabilized after receiving 2 units of packed red blood cells and had no further episodes of hypotension. His warfarin was restarted without bridging after 4 days of clinical stability.

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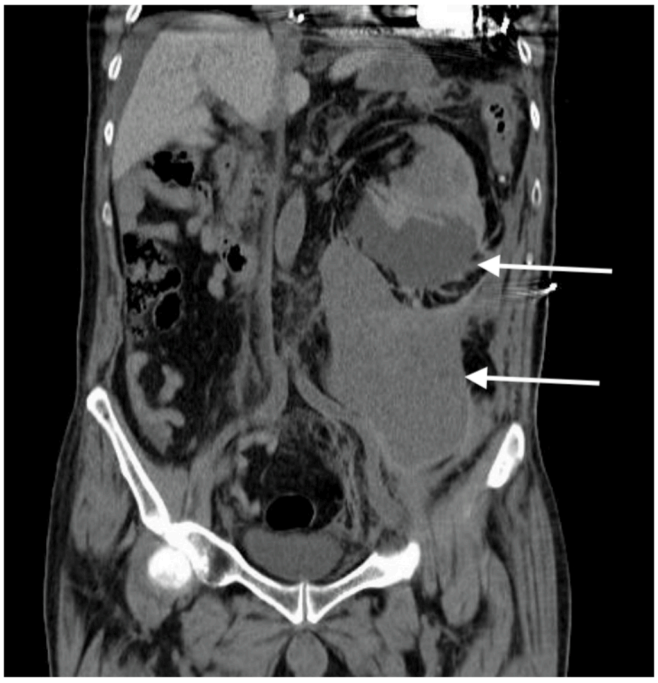

Fig. 1. A massive left retroperitoneal hematoma is seen, composed of two primary collections (arrows).

Discussion

While ESWL is a safe and effective percutaneous technique for management of symptomatic renal and ureteral calculi, complications are possible. The most serious complications following ESWL involve renal parenchymal damage, which can result in life-threatening bleeding. This damage is thought to be caused by cavitation of tiny bubbles that are created as the shock wave passes through the renal parenchyma. As the bubbles collapse, they give rise to high-velocity liquid microjets that can pierce neighboring blood vessels. The rate of symptomatic perinephric hematoma (PNH) following ESWL in a broad population of patients has been estimated at between 0.5% and 4%, though the rate of asymptomatic bleeding can be as high as 30% when evaluated with CT or MRI.[1] The risk of hemorrhage increases with the number of shocks delivered, and the most significant patient-specific risk factors are hypertension, obesity, and advanced patient age.[1] The risk of PNH can be fourfold higher in anticoagulated patients.[2] There are no data regarding the rates of subcapsular or retroperitoneal hemorrhage after ESWL in LVAD patients, and to our knowledge, ours is the first such case reported in the literature.

Peri-procedural anticoagulation management for patients with LVADs is complicated due to associated thrombotic and hemorrhagic complications. Thrombus formation on the LVAD impeller can result in stroke, and if sufficiently large, can obstruct impeller motion, resulting in decreased cardiac output and possible hemodynamic collapse. Pump thrombosis often requires surgery to exchange the motor, exposing the patient to additional surgical risk. As many as 10% of patients suffer pump thrombosis, even with optimal anticoagulation management.[3] The risk of pump thrombosis is even higher in patients who have anticoagulation held for a period of time.

LVAD patients are also prone to bleeding complications, both as a result of their requirement for anticoagulation as well as from an independent effect of high molecular weight vonWillebrand factor multimer destruction due to the impeller. In LVAD patients undergoing noncardiac surgery, rates of postoperative bleeding requiring transfusion as high as 36% have been reported.[4] Despite this risk, society guidelines offer little guidance in the perioperative management of LVAD patients undergoing noncardiac surgery, advising only that physicians consider the bleeding risk of the procedure when deciding on a preoperative anticoagulation management strategy.[5] However, no data are available on the appropriate duration to hold anticoagulation preoperatively in patients undergoing noncardiac procedures or when to restart anticoagulation postoperatively.

Management of bleeding complications in LVAD patients is similar to that in other patients with strict indications for anticoagulation. Once bleeding is diagnosed, anticoagulation should be held. The decision to reverse anticoagulation should be based on the clinical trajectory of the patient, the location of the bleeding, and likelihood of ongoing active extravasation. In our case, there was low suspicion for active extravasation and the patient had clinically stabilized by holding anticoagulation alone. Given the risk of pump thrombosis, we did not attempt to normalize the patient's INR.

Conclusion

As the population of patients with advanced heart failure supported with LVADs increases, the likelihood that an LVAD patient will require noncardiac surgery will increase as well. Peri-procedural anticoagulation management of these patients is complex and requires a delicate balance between avoiding bleeding complications and avoiding pump thrombosis. More research is required to guide physicians on the optimal way to manage such patients.

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