



Acute Testicular Segmental Infarct Following Endovascular Repair of a Juxta-renal Abdominal Aortic Aneurysm: Case Report and Literature Review

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CASE REPORT

A 61-year-old male presented to our Accident & Emergency department with a 3-day history of nausea and vomiting. On examination, he had a soft non-tender abdomen but pronounced pulsation of his abdominal aorta. A computed tomography angiogram revealed a 6 cm juxta-renal abdominal aortic aneurysm with thrombus within the aneurysm sac and juxta-renal neck segment. There was also moderate atherosclerotic change of the common, internal, and external iliac arteries bilaterally. Given the lack of a suitable infrarenal sealing zone for the stent graft, he underwent a complex endovascular aortic aneurysm repair using a stent graft (Cook Medical, Limerick, Ireland) with suprarenal coverage with 4-vessel fenestrations (coeliac axis, superior mesenteric, and left and right renal arteries). Bilateral femoral artery surgical cut-down were performed for vascular access. The left and right renal, and superior mesenteric arteries were accessed, and covered stents deployed through the fenestrated aortic stent in these visceral vessels successfully. The coeliac axis fenestration was left open to allow perfusion of the coeliac axis. The distal seal zones of the bifurcated stent graft were in the common iliac arteries bilaterally, with preservation of patency of both internal iliac arteries. Following the procedure, there was good contrast opacification of all the abdominal visceral vessels and both internal iliac arteries on the completion angiogram, with no evidence of endoleak.

Twenty-four hours later, the patient complained of sudden onset swelling and pain of his right scrotum. There was no associated flank pain, dysuria, voiding dysfunction, or fever. Concern was raised of a possible expanding

postsurgical hematoma relating to the femoral vascular access site. Given the severity and acute onset of the symptoms, acute scrotal pathology such as a testicular torsion also had to be excluded. Conventional gray-scale and color ultrasound of the scrotum were initially performed on the same day, which revealed an enlarged and heterogeneous right testis with a hypoechoic, wedge-shaped area measuring $5 \times 3 \times 2$ mm with reduced color Doppler signal (Fig. 1). There was no evidence of an abscess, hematoma, or varicocele. The left testis was normal in shape, size, and reflectivity with no focal intratesticular lesions. A subsequent contrast-enhanced ultrasound (CEUS) examination, using SonoVue (Bracco SpA, Milan, Italy), a microbubble ultrasound contrast agent, was performed. The wedge-shaped area displayed no enhancement on CEUS and the remaining testicular parenchyma demonstrated normal perfusion (Fig. 2). While on the ward, the patient's symptoms settled and a week later, the patient was discharged with a view of Urology outpatient follow-up. In this case, the patient was managed conservatively with symptom control, after which the patient recovered well. An ultrasound of the testes performed 6 weeks later (Fig. 3) showed there was significant reduction in size of the focal testicular abnormality within the right testis. With all imaging and clinical findings considered, it was concluded that this patient had suffered from a testicular segmental infarct, most likely secondary to a thromboembolic event post-fEVAR.

DISCUSSION BY DR. ZEBARI AND DR. HUANG

EVAR is increasingly being adopted as the preferred intervention to prevent rupture of large abdominal aortic aneurysms in comparison to conventional open repair. While this is mostly attributable to significant reduction in early complication rates and mortality when compared to open repair, several new procedure-specific EVAR

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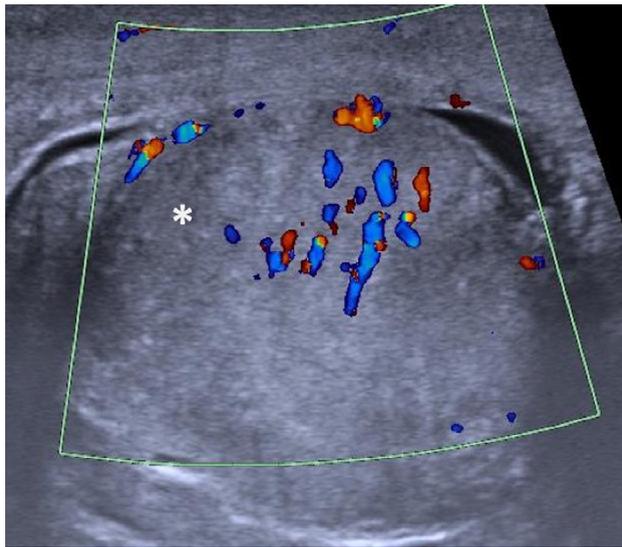


Figure 1. Color Doppler ultrasound confirming area of low echogenicity with reduced color Doppler signal (*) in comparison to the rest of the testis. (Color version available online.)

complications have been reported over the last decade. A few of these include endoleak, stent migration or occlusion, delayed aneurysm rupture, contrast-related nephrotoxicity, and ischemia.¹ Though they may seem a rare occurrence, Maldonado et al² found that ischemic complications after EVAR have been documented in 3%-10% of patients post-EVAR. These have been secondary to stent graft occlusion or atheroembolization and included bladder, spinal cord, and colon, with the commonest being acute limb ischemia. To date, only a few case reports of

testicular infarction following EVAR have been documented in the literature.³⁻⁸ A summary of the reported cases is presented in [Table 1](#).

The first case report of testicular infarction was reported by McKenna et al³ in 2009. The patient presented with left testicular pain 6 weeks following EVAR for an aortoiliac aneurysm and duplex ultrasound revealed no perfusion within the entire left testis and no flow in the left testicular artery. The patient subsequently underwent an emergency left orchidectomy. Cases with a more acute clinical presentation were also reported subsequently. Finnerty et al,⁴ Hall et al,⁵ and Thomas⁶ reported cases of patients who presented 2, 6, and 2 days following EVAR, respectively, with testicular pain following testicular ischemia. An accurate clinical diagnosis may be difficult to obtain in the acute setting, as in the case reported by Pathmarajah et al⁷ where an acute testicular infarction post-EVAR was mistaken for a torsion resulting in orchidectomy. Conversely, testicular infarction post-EVAR may also present without acute painful symptoms thus mistaken as an incidental testicular tumor. Milburn et al⁸ reported a case of subacute testicular infarction which presented as an incidental focal testicular lesion 2 months following EVAR. This was incorrectly diagnosed as a testicular tumor, leading to orchidectomy.

The precise pathophysiology of testicular ischemia following EVAR is not known. The testicular arteries typically arise directly from the infrarenal aorta. The differential artery and the cremasteric artery, from the superior vesical artery and the inferior epigastric artery, respectively, also contribute to testicular flow. Covering the gonadal arteries, which occurs in all fenestrated endovascular aneurysm repair (fEVAR) with suprarenal coverage, during a abdominal aortic aneurysm (AAA) repair, coupled with an absence or delayed development of adequate collateral iliac blood flow, may be related to the patient's symptoms. A late presentation may suggest a

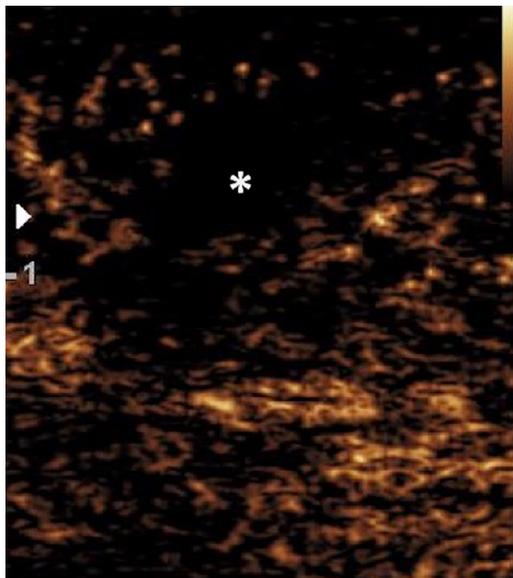


Figure 2. Contrast-enhanced ultrasound of the right testis confirming no vascular enhancement within the focal abnormality (*) in keeping with a segmental testicular infarct. (Color version available online.)

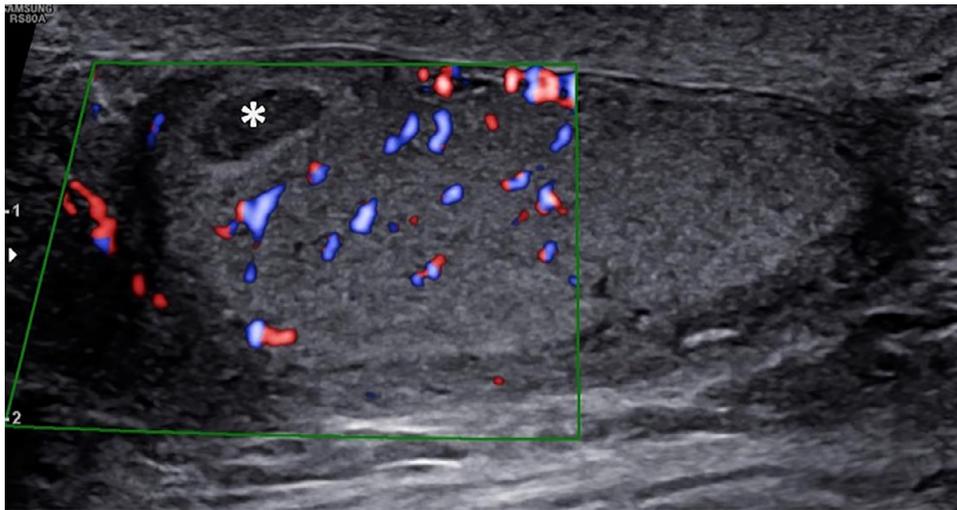


Figure 3. Color Doppler ultrasound of the right testis performed 6 weeks following fEVAR demonstrate a significant interval size reduction of the focal abnormality (*) with reduced vascular flow signal, in keeping with the diagnosis of a resolving testicular segmental infarction. (Color version available online.)

delayed thrombosis of the feeding vessels. A thromboembolic event, including cholesterol embolization, is also a possible cause. There is, potentially, an increased risk of an embolic event in prolonged cases such as in complex fEVARs, or with an aneurysm sac with large volume of thrombus.

As in some of the cases described, diagnosis of testicular infarction on conventional ultrasonography may not be reliable. Bilagi et al⁹ analyzed conventional ultrasound features of segmental testicular infarcts over 6 years. They describe a segmental infarct as typically being a solid wedge or round-shaped focus of mixed or low echogenicity with reduced or absent color Doppler signal. However, difficulty arises when the area of abnormality demonstrates a mass effect or some vascular flow, as this can mimic a hypovascular testicular tumor. In this instance, Bilagi et al suggest contrast-enhanced magnetic resonance imaging as the next imaging of choice to further characterize the area. Typically, the infarcted area does not enhance centrally following contrast but there is perilesional rim enhancement and this is particularly helpful in equivocal cases.¹⁰ However, contrast-enhanced magnetic resonance imaging has its own limitations such as exclusion of patients with renal insufficiency, and it may be an impractical and expensive first-line choice for patients presenting acutely in the emergency department.

Similar to that presented by Finnerty et al, our patient presented with acute testicular pain 24 hours following EVAR. CEUS allowed improved confidence for an accurate diagnosis to be made. The amount of testicular blood flow, which is important in the management as a complete testicular infarction is likely to require surgical interventional whereas surgery may be unnecessary in resolving segmental infarcts, is more precisely defined by CEUS. Furthermore, the improved

ability of CEUS to accurately differentiate segmental testicular infarcts from small testicular tumors may prevent unnecessary orchiectomy.¹¹ In the early stage cases where it is difficult to accurately distinguish a small hypovascular tumor from an infarct, serial conventional ultrasound and CEUS could be adopted to show interval changes. Bertolotto et al¹² were the first to review the use of CEUS in differentiating segmental testicular infarcts from tumors in 20 patients who presented with acute scrotal pain and no lesion palpable on clinical examination. Within 24 hours, lesions had at least 1 non-enhancing avascular lobule on CEUS. At 2 to 17 days following symptom onset, CEUS again showed the majority had at least 1 non-enhancing lobule with intervening areas of visible parenchyma. On long-term follow-up, at least 1 month following symptom onset, CEUS demonstrated that the infarcted areas were mostly hypovascular and over time, the size of the infarct reduced with return of intralesional vascular enhancement. Patel et al¹³ further elaborated on the usefulness of CEUS to help diagnose bilateral segmental testicular infarcts in a 33-year-old male who presented with acute testicular pain. CEUS performed shortly after demonstrated no flow within the lesions but there was some peripheral hyperemia. On follow-up CEUS over a 50-day period, the lesions became inconspicuous with a gradual reduction in peripheral hypervascularity. Similar patterns were reported by Bertolotto et al.

To conclude, we report a case of acute segmental testicular infarction following a fenestrated EVAR, to raise the awareness of this rare complication for the multidisciplinary team involved in the care of these patients. In light of advancements in endovascular techniques, this may become more important in the future. The addition of CEUS both at time of presentation and in follow-up may improve diagnostic confidence and potentially facilitate a

Table 1. Summary of cases in literature

Author (y)	Age of Patient	Presentation	Preoperative Imaging Findings	Procedure	Discharge	Postoperative Symptoms	Management for Testicular Symptoms	Outcome
McKenna et al, (2009)	67	Asymptomatic AAA	6.5 cm infrarenal AAA with a 3 cm left common iliac artery aneurysm	EVAR with internal iliac artery embolization	6 d postoperative	6 wk post-EVAR complained of sudden onset left scrotal pain. Duplex ultrasound: absent vascular flow in left testis, absent flow in left testicular artery	Left orchidectomy	Histopathology report: ischemic necrosis of left testis secondary to thrombus in left testicular artery.
Hall et al, (2010)	74	Symptomatic AAA	4.3 cm AAA, associated with left internal iliac artery occlusion	EVAR	1 d postoperative	6 d postoperatively developed acute left scrotal pain and swelling. Duplex ultrasound: left central testicular ischemia with absent venous and arterial flow; no hematoma.	Conservative (patient declined orchidectomy)	At 2 wk: reduced testicular swelling and pain At 6 mo: complete infarction of left testicle, patient asymptomatic.
Milburn et al, (2010)	62	Asymptomatic AAA	5.5 cm infrarenal AAA	EVAR with internal iliac artery embolization	2 d postoperative	Right scrotal swelling 2 mo pre-EVAR. Clinically thought to be epididymal cyst. Routine duplex ultrasound 10 d post-EVAR: right epididymal cyst, and 2.6 cm solid mass with malignant appearance in left testis. Normal tumor marker assays.	Left orchidectomy	Histopathology: small interstitial vessels showing cholesterol emboli causing a left subacute segmental testicular infarction.
Finnerty et al, (2014)	72	Asymptomatic AAA	No documentation	EVAR	<24 h postoperative	2 d history postoperative of worsening right abdominal and right testicular pain. Duplex ultrasound: mildly enlarged right testis with reduced echogenicity and reduced blood flow.	Conservative with symptom control Repeat duplex: stable blood flow	Discharged 3 d later with improved symptoms.
Thomas et al, (2017)	68	Asymptomatic AAA	5.8 cm infrarenal AAA	EVAR	—	Day 1 postoperative patient developed abdominal pain and diarrhea. CT angiogram: left colon ischemia, type 1b endoleak from right iliac limb perfusing right inferior mesenteric artery. Day 2 postoperative, developed severe left testicular pain and swelling: Duplex ultrasound: absent blood flow in left testis. Reviewed by urology team — treated for testicular ischemia.	Left orchiectomy	1 wk postorchiectomy, patient underwent open repair of AAA and correction of endoleak. Colon ischemia resolved.
Pathmarajah et al, (2017)	75	Asymptomatic AAA	5.4 cm infrarenal AAA	EVAR	—	Immediately postoperatively, patient developed right inguinal canal and scrotum pain; managed with pain control initially. Duplex ultrasound the next day: abnormal lie of right testis with reduced flow, consistent with torsion.	Right scrotal exploration and right orchiectomy	Right testis found to be necrotic, no evidence of torsion. Histopathology revealed patchy testicular infarction.
Zebari et al, (2018)	61	Symptomatic AAA	6 cm juxta-renal abdominal aortic aneurysm with thrombus within the aneurysm sac and juxta-renal neck segment	EVAR, with suprarenal coverage with 4-vessel fenestrations	—	24 h later, the patient developed sudden onset swelling and pain of his right scrotum.	Conservative management	Discharged 1 wk post-EVAR. Follow up 6 wk later with Urology, and outpatient CEUS which demonstrated a significant decrease in the size of the segmental testicular infarct.

CEUS, contrast-enhanced ultrasound; CT, computed tomography.

conservative management approach to avoid unnecessary orchiectomy.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.urolgy.2018.11.030](https://doi.org/10.1016/j.urolgy.2018.11.030).

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