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Successful Endovascular Management of an Aortic Rupture Following Stent Placement for Severe Atherosclerotic Stenosis: A Case Report

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Successful endovascular management of an aortic rupture following stent placement for severe atherosclerotic stenosis: A case report

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Aortic rupture during endovascular procedures is a devastating complication that mandates expedient intervention. The present report describes a case in which endovascular treatment was used to successfully manage an aortic rupture following placement of a covered stent graft for severe infrarenal aortic stenosis. Successful management of this case was the result of the procedure being performed in an operating room under appropriate anesthesia and close hemodynamic monitoring. Bilateral common femoral arterial access and use of covered aortic stent grafts also contributed to a favourable outcome.

Key Words: *Aortic rupture; Aortic stenosis; Aortic stent; Endovascular repair*

Endovascular management of major vascular disorders, including aortic aneurysms and stenoses, is quickly becoming a popular alternative to standard open techniques for patients who meet specific criteria. However, there are pitfalls occasionally encountered with these techniques that deserve attention. In the present report, we describe successful management of an aortic rupture following stent placement, maintaining a percutaneous approach.

CASE PRESENTATION

An 80-year-old Caucasian woman with severe, generalized atherosclerosis presented with severe, lifestyle-limiting claudication of her bilateral lower extremities. Her comorbidities included coronary artery disease, previous cerebrovascular accident, previous myocardial infarction, hypertension, hyperlipidemia and obesity. On physical examination, the patient did not have any palpable pulses in her lower extremities, but biphasic Doppler signals were noted at all levels, and ankle/brachial indices were 0.8 bilaterally. Her peripheral vascular examination suggested the presence of aortoiliac occlusive disease, and computed tomography (CT) angiography with runoff confirmed a high-grade, eccentric, calcified stenosis ending approximately 1 cm above the iliac bifurcation in the infrarenal aorta (Figure 1). Duplex colour flow imaging demonstrated patent infrainguinal vessels.

The aortic stenosis noted on CT angiography was consistent with what has been described as a 'coral reef' aortic lesion (1,2). The lesion had compromised the aortic lumen by approximately 90%, and there was a 50 mmHg gradient across the lesion. The native lumen of the aorta measured 19 mm and its size at the point of maximal stenosis was 2 mm. The iliac arteries, as well as the lower extremity runoff vessels, were patent.

The risk of surgical complication from open surgical endarterectomy or aortobifemoral bypass was considered too high. The calcified 'coral reef' lesion in the abdominal aorta was believed to be at high risk for rupture with use of a bare metal stent. Therefore, the patient was prepared for endovascular repair using covered stents in the operating room under general anesthesia.

Procedure

In the operating room, percutaneous cannulation of the right common femoral artery was performed, followed by insertion of a 0.35" Bentson wire, advancement of a 5 Fr sheath and insertion of a marker pigtail catheter. An aortogram was obtained, which demonstrated the calcific plaque located in the distal abdominal aorta (Figure 2). The common, internal and external iliac arteries, as well as the common femoral arteries, were again noted to be patent. A ProStar device (Abbott Laboratories, USA) was placed through the right common femoral artery, and the Bentson wire was exchanged for an Amplatz Super Stiff wire (Boston Scientific, USA). An 18 Fr sheath was advanced over the wire and placed in the proximal right common iliac artery. An aortic cuff (Excluder model, WL Gore and Associates, USA), 23 mm × 30 mm, was placed across the calcified plaque in the distal abdominal aorta. This was followed by dilation of the stent using a 26 mm balloon catheter (Z-Med, B Braun Medical Inc, USA), because 22 mm and 24 mm balloon catheters were not readily available. The 26 mm balloon was dilated up to 0.6 atm, which corresponded with balloon expansion up to 23 mm. Soon after deflation of the balloon, the anesthesiologist noted the patient was hypotensive (systolic blood pressure less than 80 mmHg). Angiography revealed extravasation of contrast, confirming the suspicion of an aortic rupture. The balloon was reinflated in the aorta above the level of the renal arteries, which restored hemodynamic stability. During this process, the patient was given two units of packed red blood cells.

Additional access was obtained of the left common femoral artery by a limited cutdown. A 6 Fr sheath was then placed,

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Figure 1) *Preoperative computed tomography angiography demonstrating severe calcific stenosis of the distal aorta*

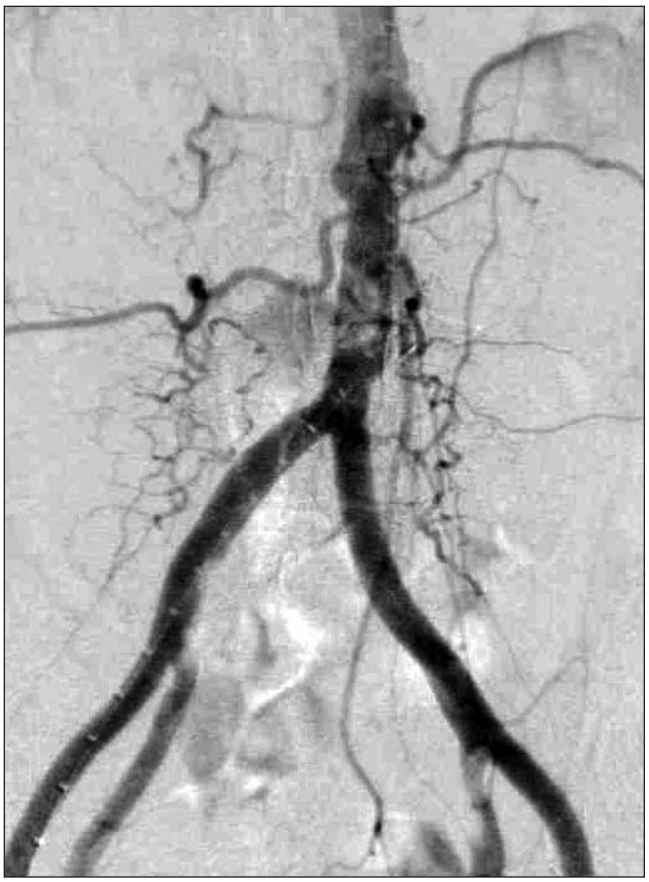

Figure 2) *Intraoperative aortography and pelvis arteriography*

followed by a pigtail catheter into the abdominal aorta. Opacification of the aorta and runoff vessels was obtained by serial injections through the left pigtail catheter, while the repair work was performed through the right groin access. Two additional 23 mm × 30 mm aortic cuffs were placed proximally and distally to the first stent with appropriate overlap. However, angiography revealed continued extravasation of contrast at the right lateral mid portion of the repair (Figure 3). A fourth 23 mm × 30 mm aortic cuff was then placed, overlapping the original stent, which resolved the leak (Figure 4). Balloon expansion of these stent grafts was carried out using a 20 mm × 40 mm long noncompliant balloon, alongside a 4 mm balloon in kissing fashion, for a total luminal expansion of 24 mm.

RESULTS

The patient maintained hemodynamic stability and had palpable pedal pulses postoperatively. The patient was admitted to the intensive care unit, where her hematocrit level and hemodynamics remained stable. Two days later, the patient was transferred to the telemetry unit. The remainder of the patient's hospital course was uneventful and she was discharged home on postoperative day 6 in stable condition. Before hospital discharge, a CT scan of the abdomen and pelvis with contrast was obtained, which showed an old retroperitoneal hematoma and no evidence of extravasation or endoleak. In postoperative follow-up, the patient had complete resolution of lower extremity claudication symptoms, and her ankle-brachial index scores were greater than 1.0 bilaterally.

DISCUSSION

Open aortic endarterectomy, or aortobifemoral bypass grafting, has long been the standard treatment for severe atherosclerotic infrarenal aortic stenoses. However, in the past decade, there were many reports of endovascular therapy being used as the primary modality of treatment in properly selected patients (3-9). Although percutaneous stent placement in these cases is still considered to be an 'off-label' use, it is becoming increasingly popular with vascular surgeons and interventional radiologists. Likewise, patients who meet criteria find it an attractive option. For this patient, we used the Excluder covered stent-graft (WL Gore and Associates, USA), which has been demonstrated to be safe and effective in clinical trials for the endovascular management of abdominal aortic aneurysm disease (10-13).

Unfortunately, there continues to be reports of complications associated with these procedures, causing significant patient morbidity and mortality. Such complications include wound infection (4,14), pseudoaneurysm (4), distal embolization (4-6,8), iliac artery thrombosis (8), endograft fracture or rupture (15,16), immediate or delayed aortic rupture (17-21), residual or restenosis (3-6,8,21), endoleak (10-14,22), endograft migration (10,11,17) and endograft thrombosis (22). The present case reports an intraoperative aortic rupture following stent placement. The 'coral reef' lesion in the aorta is speculated

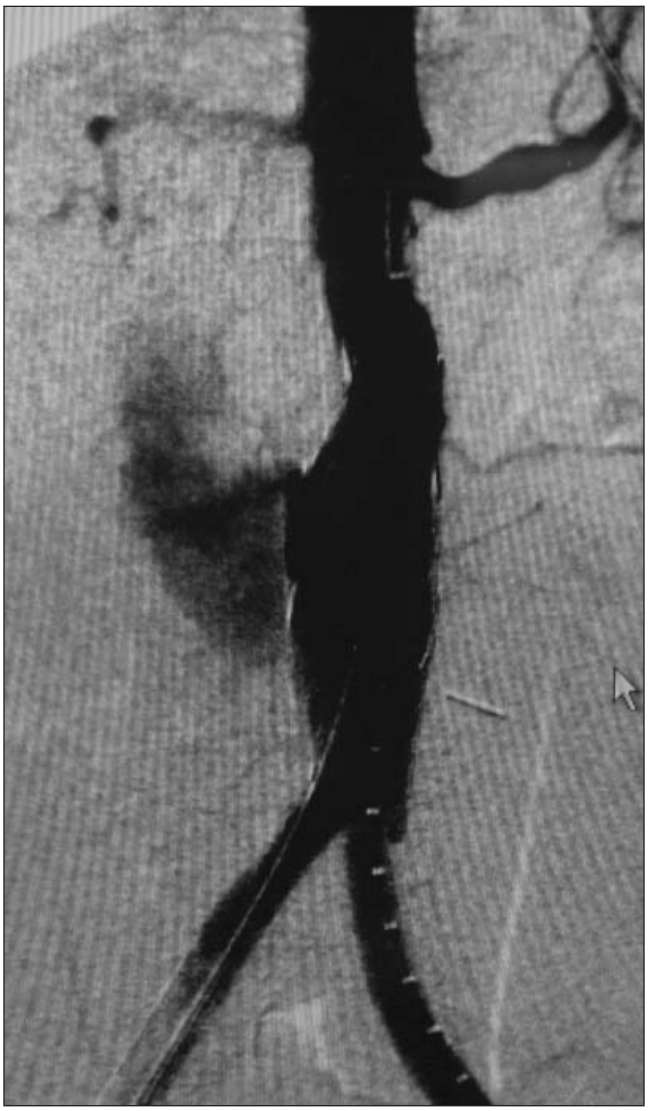

Figure 3) *Angiography revealing an extravasation at the mid-portion of repair*

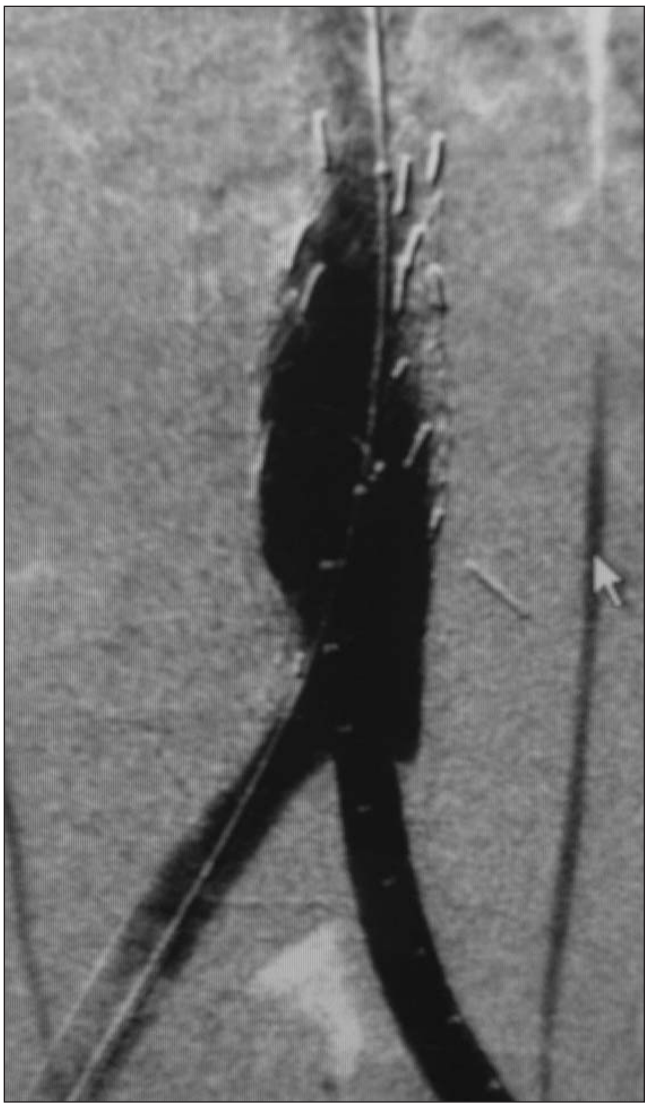

Figure 4) *Resolution of the aortic leak with an overlying covered stent*

to have cut through the endograft on the luminal aspect and through the aortic wall on the outer aspect upon inflation of the balloon. Although we did not have the exact size balloon catheter to match the stent graft, we used the next best size available, and inflated it to the appropriate diameter by adjusting the pressure according to manufacturer guidelines. One could argue that rupture of the graft and aorta may have been avoided if the balloon catheter and stent graft were equally matched in size.

Fortunately, in the majority of endovascular cases, complications that occur during or after stent placement can be successfully managed by endovascular means, but there are times when open conversion is indicated. In cases of acute aortic rupture, one could easily validate the decision to convert to an open procedure. However, for a patient with severe comorbidities, such as ours, the procedure would have been poorly tolerated. For this reason, many centres are now performing endovascular treatment of acute aortic rupture as an alternative to open surgery in high-risk patients (22-28).

The authors credit several factors in the success of this emergent complication. First, the procedure was performed in an operating room with the patient under appropriate monitoring. Second, the anesthesiologist monitoring the patient quickly recognized a drop in blood pressure and instituted resuscitation measures. We then quickly diagnosed the problem and restored hemodynamic stability endovascularly by deploying an intra-aortic balloon and sealing the leak with overlapping covered stents. Bilateral access allowed for the diagnostic catheter to be inserted from the left common femoral artery while the device was placed from the right common femoral artery.

CONCLUSION

Aortic rupture during an endovascular procedure is a devastating complication that mandates quick intervention. In such emergencies, open conversion is not always mandated, as demonstrated in the present case. Cases of this nature are best managed in the operating room with close hemodynamic monitoring by an anesthesiologist. In addition, we recommend the use of covered instead of bare metal stents for cases involving severe, high-grade, atherosclerotic lesions, such as 'coral reef' lesions, in which a high potential for aortic rupture exists.

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