CASE REPORT

A case of endovascular treatment of blunt aortic bifurcation transection using a peripheral stent graft

J Pillai, BSc, MB BCh, FCS, CVS; **T B Rangaka**, MB BCh, MMed; **T Moraneng**, BDS, MB BCh, FCS; **C Yazicioglu**, BSc, BHSc (Hons); **M G Veller**, MB BCh, FCS, MMed

Division of Vascular Surgery, Department of Surgery, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Corresponding author: *C Yazicioglu (c_yazicioglu@yahoo.com)*

We present a case of endovascular management of aortic transection at the aortic bifurcation in a polytrauma patient.

S Afr J Surg 2015;53(1):30-31. DOI:10.7196/SAJS.2218

Blunt injury to the abdominal aorta is an uncommon but serious injury. Only 0.04% of blunt traumas affect the abdominal aorta, yet mortality may approximate 37%.[1] The injury may result in dissection, intramural haematoma, pseudoaneurysm or free rupture.[2]

Patients are usually polytrauma victims with multiple severe injuries.[3] Management options include observation, open surgical repair, endovascular repair and multimodal approaches.[2] Endovascular intervention is becoming more widely accepted, but has rarely been reported. It is accepted as being more expedient and less invasive than open surgical repair.

Case report

A 25-year-old male driver was involved in a motor vehicle accident. It was not known whether or not he was wearing a seat belt. He was unconscious and intubated on scene. His systolic blood pressure was 80 mmHg, pulse rate 110 beats per minute and his Glasgow Coma Scale score was 7/15. His abdomen was not distended. His right foot was pale and femoral pulses impalpable. The arterial blood gas testing showed a pH of 7.2, and haemoglobin concentration was 13.4 mg/dL.

A chest radiograph revealed a widened mediastinum. A computed tomography (CT) scan of the chest and abdomen showed an intact thoracic aorta with features of mediastinal venous injury. There was an aortic transection at the abdominal aortic bifurcation extending to the right common iliac artery (Fig. 1). The patient also sustained fractures of the left ulna and third lumbar vertebra.

A CT scan of the abdomen demonstrated free air in the peritoneal cavity, suggesting bowel injury. A CT scan of the brain showed a small subdural effusion in the frontal and left parietal lobes and a small subarachnoid haemorrhage in the left ambient cistern. There was no midline shift.

We opted to treat the abdominal aortic injury by using 'off-the-shelf' peripheral stent grafts rather than a standard endovascular aneurysm repair stent graft (EVAR device). This was followed by an exploratory laparotomy to repair the bowel injury.

Access was achieved via femoral artery 'cut downs', and two 9F sheaths were inserted into each femoral artery. Two stiff wires were navigated through the aortic bifurcation (hydrophilic wire exchange) from both femoral arteries. Three peripheral stent grafts were used to reconstruct the aortic bifurcation (Fig. 2):

- Aorta: 13 mm × 4 cm (Fluency Stent Graft, C R Bard Inc., USA)
- Right iliac: 7 mm × 6 cm (Fluency Stent Graft, C R Bard Inc., USA)
- Left iliac: 8 mm × 5 cm (Hameobahn, W L Gore and Associates Inc., USA)

The aortic stent was inserted first, followed by inlaying 'kissing stents' for the right and left iliac arteries (Fig. 2). Flow to the right femoral artery was restored.

This procedure was followed by a laparotomy. A left hemicolectomy was performed for a ruptured sigmoid colon. His condition improved steadily over 7 days, after which time burr holes were performed for a chronic subdural haematoma and hygroma. Lumbar vertebral fixation was planned for the future. No vascular complications were noted after 8 months of follow-up.

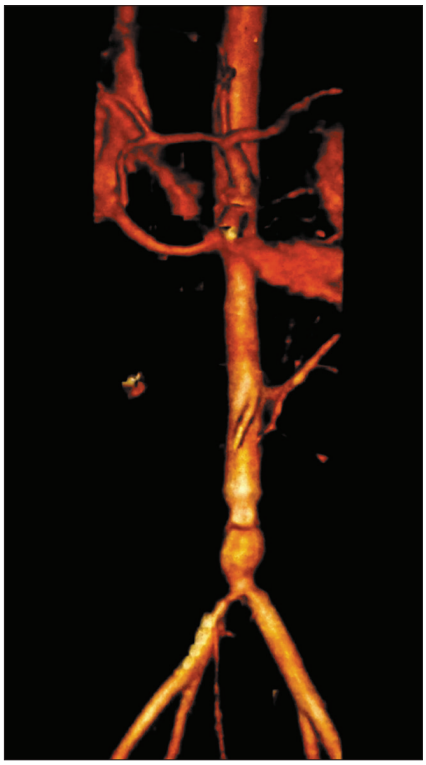

Fig. 1. CT angiography showing transection of the distal abdominal aorta and right common iliac artery.

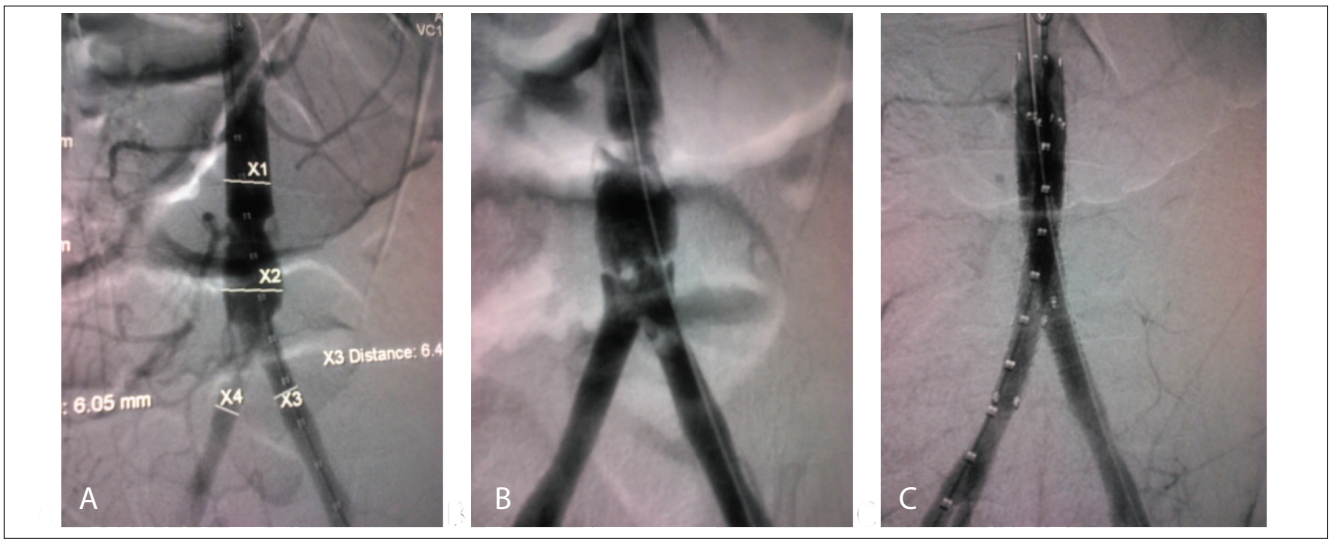

Fig. 2 . A) Intraoperative angiogram showing transection of aortic bifurcation with 'on-table' measurement for stent graft placement. B and C) Postprocedure angiogram after insertion of three peripheral stent grafts (aortic stent graft and two iliac kissing stents).

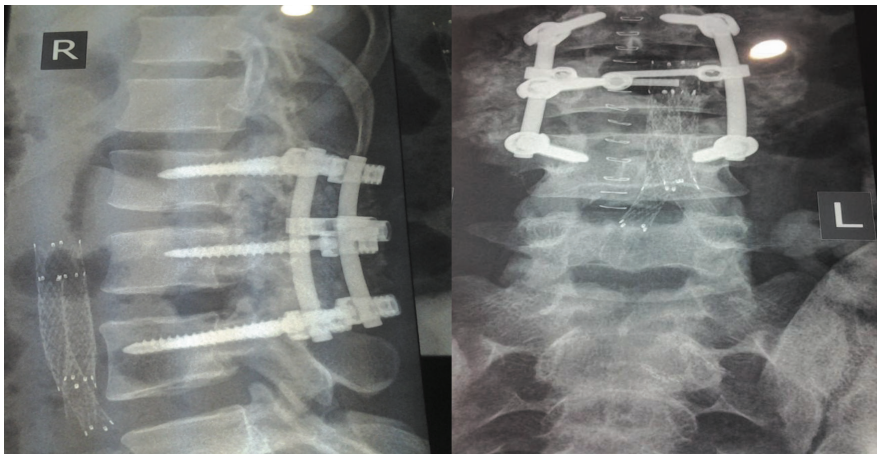

Fig. 3. Plain X-ray showing stents in aorta and iliac arteries at 8 months follow-up.

Discussion

Three peripheral stent grafts were used to treat transection of the abdominal aortic bifurcation rather than a standard EVAR device. These are easier to insert than aneurysm stent grafts, are less expensive, and are better size-matched to the smaller arterial diameter of younger patients. Unstable patients may also benefit from the less-invasive procedure. Graft sepsis incidence associated with placing an interposition graft in the presence of bowel rupture may be reduced.

Seatbelt trauma, especially in children where the belt crosses the smaller abdomen, has been suggested as a possible aetiological mechanism.[3] The abdominal aorta is fixed against the vertebral column by the lumbar and iliac arteries, and direct hyperflexion rather than acceleration forces may cause the aortic injury.[4]

The injury to the adjacent structures in the patient discussed, namely the sigmoid colon, aortic bifurcation and compression fractures of the L3 vertebra, suggests localised compression/hyperflexion forces. Patterns of aortic injury include dissection, intimal tears, intramural haematomas, pseudoaneurysms and free rupture.[2] Pseudoaneurysms have been reported years after the initial injury.[4]

Shalhub *et al.*[2] produced the biggest study series over 14 years, looking at patients with blunt abdominal trauma. Abdominal aorta zones of injury were classified into three different zones according to surgical approaches: zone I (diaphragmatic hiatus to superior mesenteric artery (SMA)), zone II (includes SMA and renal arteries) and zone III (from the inferior aspect of the renal arteries to the aortic bifurcation). The study population comprised a majority of young males (68%) with predominant zone III injuries.

Free rupture of the aorta results in 100% mortality. Infrarenal aortic injury is most common in the region of the inferior mesenteric artery (IMA) (30 - 40%), followed by the renal artery region (24%) and then between the IMA and the bifurcation (19%).

In the patient discussed, there were no complications at 8 months. However, the long-term results of placing aortic bifurcation stent grafts in young individuals are unknown. One needs to be mindful of complications such as stent graft sepsis, migration and occlusion.

Conclusion

Blunt abdominal aortic injury is rare and associated with other severe injuries that may be lead to high mortality. Endovascular repair is considered a minimally invasive procedure and can be performed more rapidly than open abdominal aortic repair. Further studies are needed to assess long-term outcomes.

REFERENCES

1. Voellinger DC, Saddakni S, Melton SM, Wirthlin DJ, Jordan WD, Whitley D. Endovascular repair of infrarenal aortic transection: A case report and review. Vasc Surg 2001;35(5):385-389. [http://dx.doi.org/10.1177/153857440103500509]
2. Shalhub S, Starnes BW, Tran NT, et al. Blunt abdominal aortic injury. J Vasc Surg 2012;55(5):1277-1285. [http://dx.doi.org/10.1016/j.jvs.2011.10.132]
3. Aidinian G, Karnaze M, Russo EP, Mukherjee D. Endograft repair of traumatic aortic transection in a 10-year-old: A case report. Vasc Endovascular Surg 2006;40(3):239-242. [http://dx.doi.org/10.1177/153857440604000310]
4. Lim CH, Lim J, Tan YS. Traumatic pseudoaneurysm of the abdominal aorta. Asian Cardiovascular Thorac Ann 1999;7(2):135-137.