SHORT REPORT

Combined Surgical and Endovascular Repair of Type B Thoracic Aortic Dissecting Aneurysm after Failed Endovascular Treatment

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Introduction

Endovascular stent grafting is an innovative technique for the treatment of acute type B aortic dissections. Proper patient selection, with regard to treatment as well as the use of experienced centers is necessary for successful results. We present a case in which a 50-year-old male patient who suffered from an acute type B dissection was treated by endovascular repair in another hospital. Due to the insertion of an undersized proximal stent graft, improper sealing was obtained resulting in a type I endoleak. The patient was transferred to our hospital where a combined surgical and endovascular repair was successfully performed to treat the endoleak. We suggest considering this combined approach when the thoracic dissections/aneurysms involve the aortic arch.

Case Report

We report a case of a 50-year-old male patient who, whilst hospitalized elsewhere, suffered from an acute type B aortic dissection. Past history included hypertension, an anxiety disorder and peptic disease. The patient suffered from excruciating interscapular back pain. A spiral computer tomography angiography (CTA) of the thorax and abdomen demonstrated a type B thoracic aortic dissection. The total diameter of the descending aorta was 48 mm, with an intimal tear adjacent to the origin of the left subclavian artery. The true lumen fed the superior mesenteric and renal arteries, whereas, the cæliac artery received its blood supply from the false lumen.

Treatment of his hypertension was optimized, and endovascular treatment was scheduled. Under general anaesthesia, via a right common femoral artery a 34 mm diameter Talent endoluminal stent graft (Medtronic Inc. Minneapolis, MN, USA) was placed in the descending aorta distal to the origin of the left subclavian artery. This stent graft was fixed by an additional 38 mm stent graft distally in the descending aorta. Completion angiography demonstrated improper sealing, as a continuous leak from the original intimal tear was noted in the inferior part of the aortic arch. To treat this type I endoleak, a third 32 mm Talent stent graft was inserted proximally, covering the origin of the left subclavian artery. However, the smaller stent graft did not succeed in treating the type I endoleak due to luminal disparity in comparison to the diameter of the native aorta (30 mm) and the first stent graft. After the 3rd stent graft deployment and persistent larger type I endoleak, the procedure was terminated (Fig. 1).

During the procedure, a mild left hemiparesis occurred which improved thereafter. It may be important to note that the patient’s anti-platelet therapy had been ceased prior to the aortography due to active peptic ulcer disease. The patient was transferred to our medical center for further treatment. Sizing of the thoracic aorta and the existing stent grafts was determined by CTA and aortography.

We chose a combined surgical and endovascular procedure. In order to adequately seal and treat the endoleak by means of an endovascular procedure, coverage of the arch vessels would be required with
two 38 mm diameter stent grafts. Prior to stent graft insertion, an ascending aortic arch to innominate and left subclavian bypass had to be performed.

A midline sternotomy was performed. After exposure of the heart and aortic arch, hooks from the previous stent grafts were seen to partially protrude through the adventitia of the aorta. Partial aortic clamping was attained while a Dacron (18–9 mm) bifurcated bypass was performed posterior to the left innominate vein, from the proximal ascending arch (end to side) to the innominate and left common carotid artery (CCA), end to end. The stumps of the innominate and left CCA were ligated. The chest remained open and left transfemoral arteriotomy was performed in preparation for stent graft insertion. Aortography confirmed the type I endoleak. While marking the exact location of the bypass on the beating aorta, the first stent graft of 38 mm was deployed just distal to the bypass, covering the entire arch. Another 38 mm stent graft was inserted distally to the previous stent graft repair. A completion aortography showed no endoleak, and a patent bypass. The false lumen was thrombosed while the blood supply to celiac artery was via the true lumen presumably through a natural distal fenestration (Fig. 2).

No intraoperative complications were observed. Prior to discharge the patient underwent a CTA which demonstrated no leak, a thrombosed false lumen, and a true lumen feeding all visceral arteries (Fig. 3).

Discussion

Endovascular stent grafting is an innovative technique for treatment of acute type B aortic dissection. Few studies have shown that this technique may be safer than conventional surgery. However, as seen in our case, appropriate indications as well as a competent and expertise endovascular team are necessary requirements for successful endovascular procedures. Complications encountered after endovascular treatment for aortic dissection may include incomplete sealing (endoleak) of the entry site, as was the case in our patient due to insertion of a mistakenly under-sized proximal stent graft in the initial procedure. In addition, other complications include a type A dissection due to injury to the aortic arch by the endograft, intramural hematoma, and anterior spinal artery syndrome.

Secondary conversion to surgery occurs in 4–20% of these cases, due to type A aortic dissection secondary to damage by the stent graft, continuous bleeding, or endoleak that was not successfully treated by endovascular stenting. The surgical procedures in these patients include replacement of a segment of the aortic arch and the intimal tear point. Morbidity and mortality for surgery of the aortic arch are considerable.

In our patient, the primary endovascular stenting of the acute Type B aortic dissection resulted in a significant endoleak. Management options included the following:

1. Conservative treatment—persistent endoleak in
acute type B aortic dissection could carry a higher complication rate, taking into account the patient’s age (50 years) and size of dissecting aneurysm,
2. Surgical repair and removal of stent graft,
3. Combined surgical and endovascular treatment—including a bypass to the aortic arch branches (off cardiopulmonary pump) followed by endovascular insertion of a stent graft in the aortic arch for proper sealing.

In the combined procedure, the rationale was to attain adequate sealing of the leak by a stent graft in the aortic arch proximal to the intimal tear while occluding the aortic arch branches. Therefore, an ascending aorto-left carotid and aorto-inominate bypass was performed prior to the stent graft insertion.

We were concerned about blood supply to the celiac artery after occluding the false lumen and considered an endovascular fenestration if necessary. At the end of the repair, the aortogram showed a natural fenestration and celiac flow was supplied through the true lumen.

Stent graft repair seems to be a safe method for the treatment of thoracic aortic aneurysms in experienced hands. Exclusion criteria for endovascular repair includes lack of a sufficiently long proximal neck, which excludes most of the cases located in the aortic arch. Procedures for overcoming this problem include branched stent grafts, and open stent-graft methods. The use of a combination of bypass surgery or transposition and stent graft repair is safer than surgical repair, especially when there is a need to remove previously inserted stent grafts. This method also excludes the use of extracorporeal circulation, and therefore carries fewer complications.

In our patient, no symptoms of left limb ischemia were present although the left subclavian artery was sealed by the initial procedure. In our experience, as well as in other centers, sealing of the left subclavian...
artery is usually well tolerated by patients and is usually asymptomatic.\textsuperscript{4}

**Summary**

Endovascular treatment for acute dissections requires proper selection with regard to indications for treatment in centers of experience. The combination of endovascular treatment and bypass surgery may be a possible solution for dissections/aneurysms involving the aortic arch. In the future, fenestrated grafts may be a possible alternative to open repair.

**References**


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