Amako et al., J Clin Case Rep 2016, 6:6
DOI: 10.4172/2165-7920.1000809

Journal of Clinical Case Reports

Case Report Open Access

A Case of Re-Endovascular Repair in Acute Phase after Endovascular Aortic Repair for Acute Type B Aortic Dissection Complicated by Visceral, Renal and Lower Limb Malperfusion

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Abstract

We describe a case of re-endovascular aortic repair after endovascular aortic repair for acute type B aortic dissection, complicated by visceral, renal, and leg malperfusion. We performed endovascular aortic repair to cover the primary entry tear at the distal thoracic aortic arch in a 62-year-old male with visceral, renal, and leg malperfusion, after 4 days of conservative therapy. After the first operation, the pressure differential between upper and lower limbs disappeared. However, bilateral leg ischemia appeared at postoperative day 2. CT showed that the true lumen was severely compressed again by a thrombosed false lumen and two re-entries appeared at the level of the proximal celiac artery and infra-renal abdominal artery, respectively. The distal edge of the stent graft was intact with no new stent graft-induced entry. We once again performed endovascular aortic repair by means of thoracic and abdominal stent grafts covering the re-entry tears at the level of proximal celiac artery and infra-renal abdominal artery. After the procedure, the leg ischemia, renal ischemia and mesenteric ischemia improved, and the patient was transferred back to the local hospital without paraplegia.

Keywords: Complicated acute type B aortic dissection; Endovascular; Malperfusion

Background

Acute type B aortic dissection complicated with malperfusion or ischemia must be treated by emergency operation, but current outcomes are not satisfactory. In particular, cases involving malperfusion with mesenteric ischemia can be fatal.

Urgent endovascular repair is indicated when the patient has complications of malperfusion or rupture of an acute dissection [1,2]. Previously, treatment options have included direct open repair, extra-anatomic bypass for lower extremity ischemia, and percutaneous fenestrations for visceral malperfusion [3,4]. More recently, endovascular stent graft treatment of acute type B aortic dissections has established as a potential minimally invasive alternative to conventional aortic surgery [5]. We describe a case of re-endovascular repair after endovascular aortic repair for acute type B aortic dissection complicated by visceral, renal and leg malperfusion.

Case Report

A 62-year-old man was urgently transported to our hospital. Enhanced computed tomography (CT) demonstrated an acute type B aortic dissection without complications, and conservative therapy was started (Figure 1). However, bilateral leg and abdominal pain appeared on day 4 with acute leg ischemia, acute renal failure (anuria), acute lung injury and significant acidosis (Blood gas analysis: PH: 7.25, PaO_2: 85.5 mmHg, $PaCO_2$: 28 mmHg, HCO_3: 16 mEq/l, BE: -7.7 mEq/l. Emergency CT of Figure 2 showed that a false lumen was compressing the true lumen from the descending aorta, and that the true lumen was narrowed at the level of the celiac artery (CA) and superior mesenteric artery (SMA). We performed emergency endovascular aortic repair to close the entry tear, and exploratory laparotomy for acute type B aortic dissection complicated with visceral and renal malperfusion, and leg ischemia.

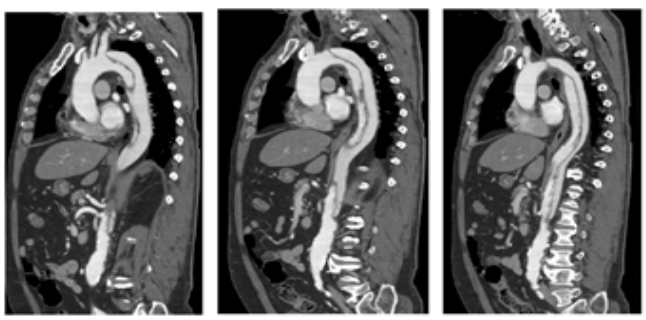

Figure 1: CT images on admission. CT shows acute type B aortic dissection without malperfusion. CA, SMA and lt. RA supplied from the true lumen. Rt. RA supplied from the pseudo lumen.

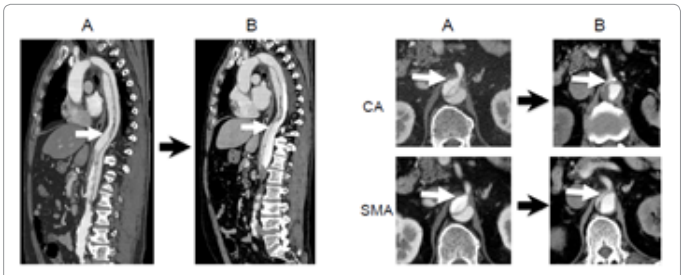

Figure 2: CT images compared on admission and 4 days later. A: Sagittal images show narrowing at the true lumen. B: Axial images at the CA and SMA level. The true lumen of CA and SMA are compressed by the false lumen. CA: celiac artery, SMA: superior mesenteric artery.

The patient was placed in a supine position under general anesthesia with full hemodynamic monitoring. The right femoral artery was

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Received May 30, 2016; **Accepted** June 13, 2016; **Published** June 18, 2016

Citation: Amako M, Morita Y, Ohsumi M, Kamiya S, Yamada H, et al. (2016) A Case of Re-Endovascular Repair in Acute Phase after Endovascular Aortic Repair for Acute Type B Aortic Dissection Complicated by Visceral, Renal and Lower Limb Malperfusion. J Clin Case Rep 6: 809. doi:10.4172/2165-7920.1000809

exposed and the delivery system was inserted. A 34 × 150 mm Gore Tag endograft (Gore and Associates Inc) was deployed to cover the primary entry tear and was placed over left subclavian artery (LSA) without revascularization. Blood flow to the false lumen disappeared and we confirmed that the bilateral femoral arteries were palpable. Exploratory laparotomy was performed, but no obvious intestinal ischemia was observed. After the operation, urine volume increased and the patient's condition improved. However, 2 days after the first operation the pulse suddenly disappeared again in both legs, despite aggressive control of arterial blood pressure under mechanical ventilation for management of acute lung injury. Emergency CT (Figure 3) showed that the true lumen was re-compressed by the false lumen at the CA and SMA level. Re-entry tears appeared at the descending aorta and infra-renal abdominal aorta without endograft collapse or new endograft-induced entry.

We performed emergency endovascular aortic repair for re-entry closure. The right femoral artery was exposed again and the delivery system was inserted. A 28 × 150 mm Gore Tag endograft (Gore and Associates Inc) was deployed covering the re-entry at the descending aorta, and a 28 × 36 mm Zenith aortic cuff endograft (Cook, Bloomington, Ind.) was deployed covering the re-entry at the infra-renal abdominal aorta (Figure 4). We confirmed that the true lumen

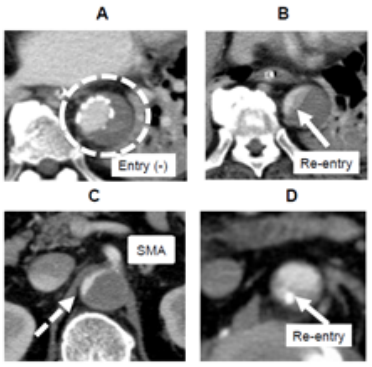

Figure 3: CT images on postoperative day 2. A: There is no new entry at the distal point of the endograft. B, D: Re-entries appeared at the descending aorta and infra-renal abdominal aorta. C: The true lumen had narrowed due to compression by thrombosed false lumen at the SMA level. (A: distal point of endograft, B: descending aorta, C: SMA level, D: infra-renal abdominal aorta) CA: celiac artery, SMA: superior mesenteric artery.

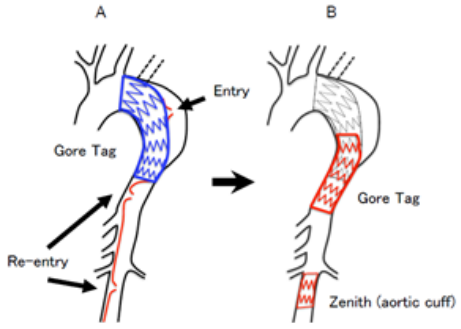

Figure 4: The schema of endovascular procedure A) The true lumen was compressed by thrombosed false lumen at the CA and SMA level. Re-entries are seen at the descending aorta and infra-renal abdominal aorta. B) A Gore Tag endograft was deployed covering the re-entry at the descending aorta, and a Zenith aortic cuff endograft (Cook, Bloomington, Ind) was deployed covering the re-entry at the infra-renal abdominal aorta. CA: celiac artery, SMA; superior mesenteric artery.

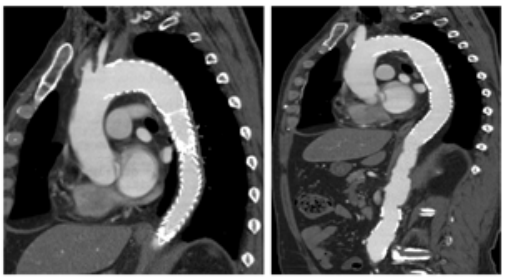

Figure 5: CT (postoperative at 6 months) The postoperative CT showed that the false lumen had disappeared completely.

was expanded and that the pressure gradient between the descending aorta and the right external iliac artery was equal during surgery.

The patient needed temporary dialysis for 6 days and a ventilator for 7 days, however he was discharged 21 days after the second operation. The postoperative CT at 6 months showed that the false lumen had disappeared completely (Figure 5).

Discussion

Despite improvements in surgical techniques, perioperative care, and endovascular techniques, Murashita and Trimarchi reported the mortality in complicated acute type B aortic dissection remains high between 23.5% and 29.3%, respectively. 6.7 Thoracic endovascular aortic repair (TEVAR) as a first choice for patients with type B aortic dissection is considered lifesaving in the setting of complications such as contained rupture or malperfusion syndrome [1-4]. Two ischemic mechanisms of malperfusion have been described; dynamic compression due to an aortic true lumen collapse; and static compression related to direct extension of aortic dissection into an aortic branch [5-8]. Therefore it is ideal that primary entry closure with TEVAR be performed in malperfusion cases [9].

In planning an endograft treatment for the patients with type B aortic dissection, the proximal end must be placed in healthy aorta to ensure an adequate proximal landing zone and to prevent retrograde dissection. In management of LSA, the Society of Vascular Surgery strongly recommends LSA revascularization in patients undergoing TEVAR with coverage of the LSA in elective cases but it is exception in emergency case [10]. In the present case, we placed an endograft over the LSA to ensure an adequate proximal landing zone without revascularization of the LSA. It is difficult to determine the distal landing zone of the stent graft. In cases of aortic dissection type 3a with local dissection, the stent graft can be placed in healthy aorta relatively easily. However, in the case of aortic dissection type 3b, the distal landing zone is at the dissected aorta, so the distal edge of the stent graft may cause new entry tears and re-dissection. Shih-Hsien reported that the frequency of distal stent graft-induced new entry was 27% in cases of aortic dissection that underwent TEVAR. Twenty-nine percent of these patients required intervention [11]. In our case, the patient had no stent graft-induced new entry and no re-dissection, but malperfusion re-occurred due to narrowing of the true lumen after TEVAR. It was considered that changes had occurred in false lumen blood flow from re-entry tears and aortic branches such as the intercostal artery, increasing the pressure in the false lumen and causing the false lumen to compress the true lumen. Therefore, we believe that covering the re-entries by endograft aortic repair in the second operation was successful. However, the grafts should not be implanted between the primary and re-entry sites from the initial operation because of the wide variety in the number and location of re-

entries, and the need to prevent spinal cord ischemia. In malperfusion cases, we think that it is better to place the distal landing zone in the straight descending aorta, using as short an endograft as possible.

Richard reported that 6 (12%) of 50 patients with complicated type B aortic dissection required additional device implantation, and that one patient (2%) received open distal fenestration resulting in persistent flow in false lumen post-operatively for 2 days in acute phase [12]. In Jennifer's experience, 13 patients (26%) required reinterventions, but no patients required treatment for re-malperfusion in acute phase [13]. Though we did not observe stent malposition, stent migration or stent induced new entry reintervention was required at 2 days after the initial operation in our case.

Conclusions

We describe here a case of re-endovascular repair in acute phase after endovascular aortic repair for acute type B aortic dissection complicated with visceral, renal, and leg malperfusion. After re-endovascular aortic repair the false lumen thrombosis disappeared, and CT at 6 months after the operation showed no sign of recurrence.

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