» Case Report «

Emergent Thoracic Endovascular Aortic Repair for Acute Type-B Aortic Dissection with Malperfusion by Matsui-Kitamura Stent Graft

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Acute type-B aortic dissection with malperfusion is a serious cardiovascular condition associated with high morbidity and mortality. Recent studies have investigated the efficacy of thoracic endovascular aortic repair (TEVAR) as treatment for acute aortic dissection. In this report, we present a case of acute type-B aortic dissection complicated with malperfusion, which was successfully treated with emergent TEVAR for entry closure by a Matsui-Kitamura stent graft (MKSG). MKSG is a flexible custom-made curved stent graft. The main advantages of MKSG for emergent TEVAR include flexibility, shape, and small profile when compressed.

Keywords: TEVAR, malperfusion, Matsui-Kitamura stent graft

INTRODUCTION

Approximately 30% of patients with aortic dissection develop organ malperfusion, and the prevalence of visceral organ malperfusion is closely related with surgical mortality and morbidity, ranging from 50% to 80%.¹⁾ Surgical intervention is necessary to improve the chance of survival and to reduce the severity of this condition among survivors. As compared to open surgical repair, the endovascular repair for emergency thoracic aortic dissection has a lower mortality rate (31.5% and 12%, respectively).^{2,3)} In this report, we present a case of acute Stanford type B thoracic aortic dissection complicated with malperfusion, which was successfully treated with emergent thoracic endovascular aortic repair (TEVAR)

for entry closure by Matsui-Kitamura stent graft (MKSG).

CASE REPORT

A 53 year-old man was admitted to our hospital because of back pain. He had a history of a poorly controlled hypertension with no history of collagen vascular disorders. Severe hypertension (185/77 mmHg in the right arm and 156/59 in the left arm) was observed on admission. Both the femoral arteries were palpable, and physical examination of the chest and abdomen showed no signs of visceral ischemia. Laboratory data indicated the elevation of white blood cell count (19770/mm³) and serum creatinine (1.62 mg/dL). Contrast enhanced computer tomography (CT) revealed an acute type-B aortic dissection extending from the descending aorta to the right common iliac artery. There was a relative severe stenosis of the true lumen at the descending thoracic aorta because of the dynamic obstruction caused by the extended false lumen. Blood to the celiac, superior mesenteric, and both the renal arteries was supplied from the true lumen (**Fig. 1**). Conservative therapy was started because he had no ischemic complain. Five hours after admission, he suddenly developed right leg pain. The laboratory data revealed progressive acidosis with pH, 7.310 and elevation

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Fig. 1 Preoperative enhanced CT (Axial images).
A: Upper thoracic level. *Arrow* shows the intimal tear.
B: Lower thoracic level. *Arrow* shows a severe stenosis of the true lumen by dynamic obstruction.
C: Upper abdominal level.
D: Lower abdominal level. *Arrow* shows the dissection extending to the right common iliac artery.

of serum lactate to 4.6 mmol/L. For this malperfusion of lower extremities, emergent TEVAR for an entry closure was planned. General anesthesia was administered, and the left femoral artery was exposed. By intra-vascular ultrasound (IVUS), a guide-wire was introduced to the true lumen. Preoperative angiography showed severe stenosis of the true lumen and entry of the descending thoracic aorta. An MKSG that was 30-mm diameter and 115-mm-length curved was delivered through an 18-Fr sheath. The deployment was successfully performed, and the entry was occluded. To achieve enough proximal landing zone, the left subclavian artery was sacrificed (**Fig. 2**). After the operation, there were no ischemic symptoms of the cerebral, abdominal organs, bilateral legs, or arms. One month after TEVAR, postoperative CT showed no migration of the MKSG or progression of the thrombosis in the false lumen at the descending thoracic aorta (**Fig. 3**).

DISCUSSION

There is a consensus that medical treatment is better

than surgery for uncomplicated acute type B aortic dissection.⁴⁾ The International Registry of Acute Aortic Dissection (IRAD) investigators have previously reported a hospital mortality rate of 32% for patients treated by open surgical repair, 7% for patients managed by TEVAR, and 10% for those who underwent conservative medical therapy alone.⁵⁾ However, patients with acute type B aortic dissection complicated by malperfusion or rupture constitute a very high-risk subset. Emergency treatment options include open surgical thoracic aortic graft replacement, interventional or surgical flap fenestration and true lumen stenting, catheter reperfusion or extra-anatomic surgical bypass, or TEVAR.

Minimally invasive approaches such as TEVAR are an attractive option for acute type B aortic dissection patients; however, severe device-related complications can nonetheless occur in these procedures. The complications of the endoluminal approach, including a secondary intimal tear as a result of the stent wires, retrograde type A aortic dissection, endoleaks, late reperfusion of the false lumen and arterial injury at the site of access, have been occasionally observed. Since these complications

Fig. 2 Intraoperative digital subtraction angiography (DSA) images.
A: Pre-deployment image. There was the entry tear at the distal site of left subclavian artery, and the dynamic obstruction of the true lumen.
B: Post-deployment image of the thoracic aorta.
C: Post-deployment image of the abdominal aorta.

Fig. 3 Postoperative CT (Multiplanar reconstruction image).

can occur early or late after TEVAR, stringent follow-up imaging is recommended in all patients with additional re-interventions as required.^{6, 7)} In Japan, two commer-

cially available devices (GORE® TAG®, Medtronic TALENT®) are commonly used for the follow up of these patients. However, these devices are not recommended for acute type B dissection patients. The edge of these commercially stent grafts is too hard for the fragile intima of acute aortic dissection.

The MKSG is a flexible custom-made stent graft.⁸⁾ The MK stent is made by using super-elastic nitinol wire 0.3–0.4 mm in diameter. The advantage for this ultra-flexible stent grafting technique is its ease of delivery and the gentleness for the fragile intima. The curved configuration of the MKSG accommodated into the aortic arch shape which reduced a late deformation or migration of the stent graft, thereby preventing the occurrence of an endoleak and minimizing injury to the intima.

The main cause of failure in the use of TEVAR for acute dissection is damage to the intima and access route caused by the device,⁹⁾ which occurs in 3%–15% of patients.¹⁰⁾ In general, commercially available stent graft repair requires a 20- to 24-F system, but the MKSG with < 36 mm diameter were deployed through an 18-F sheath. Because 18-F system was induced via the femoral artery without arterial cross-clumping, we could set the active coagulation time at a maximum of 180 to 200 s and prevent hemorrhage as much as possible.

In conclusion, a good result was obtained by using a curved MKSG for complicated, acute type-B aortic

dissection. The main advantages of MKSG for emergent TEVAR include its flexibility, shape memory, and small profile compared with commercially available devices. Further, we are planning a strict, long term follow-up for this patient.

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