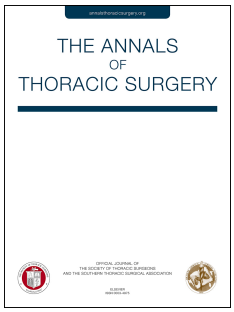

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Endovascular Repair for Kommerell Diverticulum with Type A Aortic Dissection

Running Head: Endotherapy for Kommerell Diverticulum

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Abstract

Total endovascular repair remains challenging for Kommerell diverticulum with chronic type A aortic dissection. We reported the first total endovascular repair for a Kommerell diverticulum with chronic retrograde type A aortic dissection. We conducted total endovascular repair with a unibody single-branched stent-graft combined with chimney technique for reconstruction of both subclavian arteries. Completion angiography showed complete exclusion of the primary entry tear without endoleak and patency of all stent-grafts, and CTA at follow-up showed significant remodeling of the false lumen. In this case, we show that total endovascular repair is feasible and safe in selective patients of this kind.

Aberrant right subclavian artery (ARSA) is a rare anatomical variant of the origin of the right subclavian artery (RSA) that occurs in 0.4% to 2% of population[1]. Although most ARSA is asymptotic, literature reported that around 60% may lead to aneurysm at the origin of ARSA[2], which was described as Kommerell diverticulum.

Surgery is occasionally used to treat Kommerell diverticulum complicated with type B aortic dissection, while endovascular repair or hybrid procedure is increasingly applied recently[3]. However, total endovascular repair for Kommerell diverticulum complicated with chronic retrograde type A aortic dissection (RTAD) has not been reported yet. This paper reported our initial application of unibody single-branched stent-graft combined with chimney technique to treat a Kommerell diverticulum complicated with RTAD.

A 39-year-old male with one-year history of RTAD was referred to our center. The patient complaint of a sudden onset of chest pain while lifting a heavy item one year ago. After admission to a local hospital, the patient was diagnosed as acute type A aortic dissection by computed tomographic angiography (CTA), and optimal medical therapy with analgesia and control of heart rate and hypertension was given. The patient came to our hospital for further treatment one year after onset. CTA in our hospital confirmed with a Kommerell diverticulum complicated with a chronic RTAD, with a maximum diameter of 48 mm. The right common carotid artery (RCCA) and left common carotid artery (LCCA) originated in a common trunk, of which the distal edge

was involved by the chronic retrograde dissection. The distance between orifices of the LCCA and the left subclavian artery (LSA) was 14 mm (Fig. 1). Endovascular repair was offered to the patient after a written informed consent was obtained.

The patient was placed under general anesthesia. The left common femoral artery and left brachial artery were accessed by Seldinger technique, while the right brachial artery was accessed by cutdown. The angiography confirmed CTA findings, and showed that the right vertebral artery was occluded, when the left vertebral artery was patent. The primary entry tear of dissection was close to the orifice of LSA (Fig. 2A), and the dissection extended distally to the aortic bifurcation.

A 4-F MP catheter was introduced through the left brachial artery, and then into a large sheath previously placed in the left common femoral artery. The large sheath was then withdrawn through a Back-up meier guidewire inserted previously, with the MP catheter captured and pulled out from the left common femoral artery. Next, a unibody single-branched Castor stent-graft (C322610-2003015, MicroPort Endovascular MedTech, China) was placed on the table, with the main body advancing through the Back-up meier guidewire and the embedded guidewire of the single branch inserting into the MP catheter and being pulled out from the left brachial artery. Subsequently, the frontier of the main body was advanced to the distal edge of the common trunk of the RCCA and LCCA, with the single branch pulled into the LSA. Later, a Viabahn stent (11 mm×100 mm, Gore, USA) was introduced through the right brachial artery into the aortic arch. The frontier of the Viabahn stent was placed 1 cm exceeding the frontier of the Castor stent graft, while the distal end landed in the

ARSA. The main body of the Castor stent graft and the single branch were successively deployed, followed by deployment of the Viabahn stent. Completion angiography showed complete exclusion of the primary entry tear without proximal endoleak (Fig. 2B), well positioning and patency of all stent grafts. The patient returned to the ordinary ward after operation with an uneventful recovery, and was discharged 8 days postoperatively without any complications.

CTA at 1 month and 6 months (Fig. 3) after operation demonstrated patent blood flow in both LSA and ARSA after reconstruction with stent grafts. Complete thrombosis in the false lumen was observed in the whole stented thoracic aorta, and 6 cm and 9 cm below the distal end of the aortic stent graft at 1 and 6 months follow-up, respectively.

Comment

Increasing Kommerell diverticulum patients were treated with endovascular repair or hybrid procedure. However, ARSA originates in the aortic arch distal to the orifice of the LSA, the proximal landing zone in some patients was compromised. Since coverage of LSA without revascularization may increase the risks of neurological complications[4], LSA revascularization after intentional coverage is recommended in aortic arch pathologies[5]. Samura and colleagues reported the first case of using chimney technique for LSA revascularization in acute type B aortic dissection complicated with Kommerell diverticulum[6]. This primary report indicated that total endovascular repair for acute type B aortic dissection with ARSA was feasible and

safe.

Although this patient with chronic RTAD was rather young, he refused open surgery and preferred total endovascular repair. Since the right vertebral artery was occluded, both subclavian arteries intentionally covered had to be reconstructed. Thus, a Castor stent-graft, a domestic unibody single-branched stent graft, and a chimney graft were chosen to reconstruct the LSA and the ARAS, respectively. To the best of our knowledge, this may be the first application of a unibody single-branched stent-graft combined with chimney technique to treat a Kommerell diverticulum complicated with RTAD, and represents a feasible strategy for complex cases of this kind. Nevertheless, this young patient should under intense follow-up to observe possible long-term complications, and highly selective cases should be treated with this strategy before it can be applied more widely.

In summary, we reported the first successful case of total endovascular repair of RTAD with Kommerell diverticulum with single branched stent graft and chimney technique for reconstruction of both subclavian arteries. Long-term follow-up and more experience are required before this technique is widely applied in chronic type A aortic dissection with Kommerell diverticulum.

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Figure Legends

Figure 1: Patient's initial CTA shows chronic retrograde type A aortic dissection with Kommerell diverticulum. A: Arrow indicates the Kommerell diverticulum. B-C: The lateral projections illustrate the anatomy of the aortic arch and supra-aortic branches. D: The maximum diameter of aorta was 48 mm, and the distance between orifices of LCCA and LSA was 14 mm. CTA, Computed Tomographic Angiography; LCCA(LC), Left Common Carotid Artery; LSA(LS), left subclavian artery; RC, right common carotid artery; RS, right subclavian artery; FL, false lumen.

Figure 2: A: Intraoperative angiograph shows the primary entry of aortic dissection was closely distal to the orifice of the LSA (arrow). B: Complete coverage of the primary entry tear without proximal endoleak was observed on completion angiography. LSA, left subclavian artery.

Figure 3: Follow-up CTA shows complete exclusion of the primary tear and significant remodeling of the thoracic aorta, yet the distal false lumen (*) persisted. CTA, Computed Tomographic Angiography.