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# Retrograde Type A Acute Aortic Dissection With Cerebral Malperfusion Six Years After Thoracic Endovascular Aortic Repair

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## Abstract

A 59-year-old male with prior thoracic endovascular aortic repair presented with altered mental status. Magnetic resonance imaging showed cerebral infarction, and subsequent computed tomography revealed acute type A aortic dissection and right carotid artery occlusion. He underwent total arch replacement with right carotid artery bypass. After successful intervention, he was transferred to a rehabilitation facility for further improvement.

**Keywords:** Retrograde type A acute aortic dissection, Thoracic endovascular aortic repair, Carotid artery bypass

## 1. Introduction

Although thoracic endovascular aortic repair (TEVAR) is a well-established treatment modality for various aortic pathologies, it is associated with potential complications, including vascular injury, rupture, embolism, and stent-graft induced new entry [1]. Among these complications, retrograde type A aortic dissection requires prompt surgical intervention [2]. We present a case of retrograde type A aortic dissection six years after TEVAR.

## 2. Case report

A 59-year-old male was transferred to an emergency department with loss of consciousness. At presentation, the patient's Glasgow Coma Scale was E4V5M6. The patient had undergone TEVAR (cTAG 45 mm + TX2 34 mm + TXD 36 mm) with a right axillary-left axillary bypass (FUSION 8 mm) and left subclavian artery coiling (Amplatzer Vascular Plug2, 14 mm) for type B acute aortic dissection, complicated by mesenteric ischemia six years ago. Magnetic resonance imaging of the head revealed a high

intensity at the right frontal lobe as well as parietal lobe, which suggested acute brain infarction. A contrast-enhanced computed tomography scan revealed type A acute aortic dissection (AAAD) that had extended to the arch vessels (Fig. 1A). In addition, the true lumen of the patient's right common carotid artery (RCCA) was not opacified (Fig. 1B). Under general anesthesia, RCCA was exposed via a cervical incision. Cardiopulmonary bypass was established with left femoral artery perfusion and vena cava drainage, and the patient was then subjected to hypothermia and circulatory arrest, with the rectal temperature at 25 °C. After opening the ascending aorta under circulatory arrest, an intimal tear was discovered at the inner curvature of the arch, proximal to cTAG (Fig. 2A). The aortic arch was transected between the left common carotid artery (LCCA) and the left subclavian artery and trimmed. A branched graft (Triplex 30 mm, Terumo Corp, Tokyo, Japan) was anastomosed to the arch, and the LCCA and innominate artery were reconstructed respectively. However, direct ultrasonography revealed no antegrade flow of the RCCA. The branch of the graft was introduced to the right cervical area, and anastomosed to the distal RCCA to

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ensure antegrade flow (Fig. 2B) (Fig. 3). The patient was weaned off CPB and transferred to the intensive care unit. The duration of CPB, circulatory arrest, and antegrade cerebral perfusion were, 333, 75, 113 min, respectively. On postoperative day 2, the patient demonstrated successful weaning from the ventilator. Despite the lack of obvious paralysis, the patient demonstrated a slight decrease in the mobility of their left upper extremity. Moreover, it was observed that the patient's condition was accompanied by frontal lobe dysfunction, manifested by discernible attention deficits and a noticeable decline in organizational abilities. These symptoms gradually improved. Upon stabilization, the patient was transferred to a rehabilitation facility. Currently, the patient is being followed in our outpatient clinic regularly and remains stable with no neurological complications in the one-year follow-up.

#### Abbreviation

TEVAR	Thoracic endovascular aortic repair
AAAD	Type A acute aortic dissection
RCCA	Right common carotid artery
LCCA	Left common carotid artery
CM	Cerebral malperfusion

### 3. Discussion

TEVAR has emerged as a highly efficacious treatment modality for a wide range of thoracic aortic pathologies, including degenerative disorders, traumatic aortic injuries, and aortic dissection [3,4]. This minimally invasive technique has several advantages over open surgical repair, including reduced operative morbidity and a shorter recovery time [5]. However, it is not without potential complications, such as procedural-related rupture,

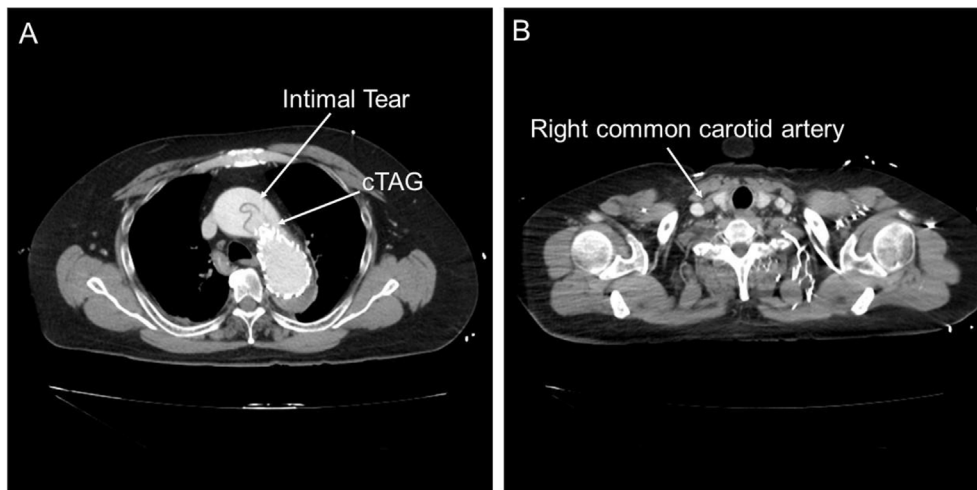


Fig. 1. Preoperative compute tomography. A. An intimal tear located close to cTAG. B. The right common carotid artery was not opacified.

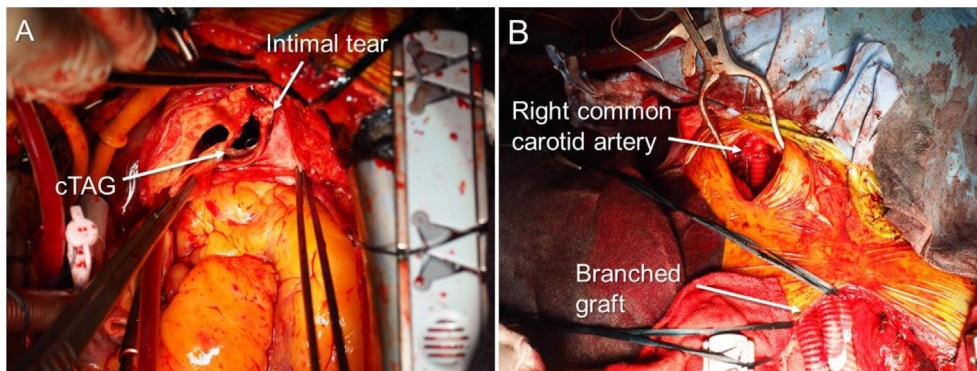


Fig. 2. Intraoperative findings. A. Intimal tear locating close to cTAG. B. The branch of the graft anastomosed to the right common carotid artery from the mediastinum.

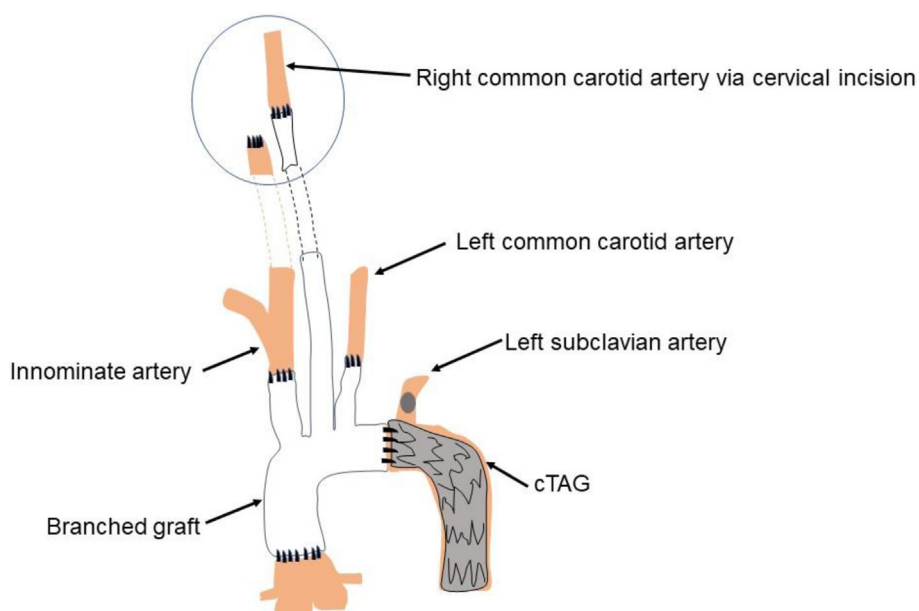


Fig. 3. Schematic drawing of the procedure.

embolism, vascular injury, and stent graft-induced new entry tear [1]. One of the most formidable complications associated with TEVAR is retrograde type A aortic dissection [2]. The incidence of retrograde type A aortic dissection after TEVAR has been reported to be 2.5 % with pooled estimates for incidence and mortality of 37.1 %, respectively [6]. Proximal bare stent, aortic wall vulnerability, and aortic diameter may be associated with the onset of AAAD after TEVAR.

Cerebral malperfusion (CM) is among the most serious complications associated with AAAD [7,8]. In the present case, we meticulously exposed RCCA via a right neck incision prior to performing median sternotomy, with the intent of exploring the possibility of carotid artery bypass. We assessed the flow in RCCA using direct ultrasonography after total arch replacement, which showed persistent collapse and no antegrade flow in the true lumen. Given this finding, we opted for an arch graft-carotid artery bypass using the branch to ensure antegrade flow to RCCA. Direct ultrasonography is an easy and non-time-consuming method for surveilling the carotid artery.

#### 4. Conclusions

Retrograde type A aortic dissection is a rare and grave complication that can arise even in the long-term following TEVAR. In the context of cerebral malperfusion associated with AAAD, carotid artery bypass offers a promising therapeutic approach for securing antegrade cerebral blood flow.

#### Author contribution

Conception and design of Study: HS, YN. Literature review: HS, MA. Acquisition of data: YN, YS. Analysis and interpretation of data: YN, SK. Research investigation and analysis: SK, YS. Data collection: HS, YS. Drafting of manuscript: HS. Revising and editing the manuscript critically for important intellectual contents: HS, MA. Data preparation and presentation: YN, SK. Supervision of the research: HS, MA. Research coordination and management: YN, SK. Funding for the research: SK, YS.

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#### Conflicts of interest

All authors have no conflict of interest.

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