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## Case Report

## Total aortic arch replacement after wire protrusion of thoracic endovascular aortic repair for aortic dissection: A case report

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## Case presentation

A 72-year-old man was transferred via a helicopter to our trauma center owing to a massive car accident. The patient presented with severe back pain and multiple traumas. Chest computed tomography (CT) revealed an aortic rupture at the proximal descending thoracic aorta, with a massive hemomediastinum and hemothorax in the left pleural cavity. Abdominal CT revealed a retroperitoneal hematoma and hip joint dislocation. After consultation with the intervention cardiologist and chest radiologist, we determined that the orifice of the left subclavian artery was intact and the landing zone for thoracic endovascular aortic repair (TEVAR) was sufficient. Therefore, we decided to perform TEVAR (Valiant 38 × 38 × 200 mm) in zone 2 (Fig. 1).

After TEVAR, a large amount of blood (1700 mL) was drained via a left chest tube. The patient's systolic blood pressure dropped to 50–70 mmHg (Fig. 2). Emergency surgery was performed via a median sternotomy, using a femoral approach. Cardiopulmonary bypass was initiated through the femoral artery and vein, and an extended thoracotomy was performed through the left 4th intercostal space. The bleeding site was located at the lesser curvature of the aortic arch, with the wire protruding to the outside of the aorta at the proximal landing zone (Fig. 3). With circulatory arrest, total arch replacement was performed using a branched Hemashield (30 mm, Hemashield Platinum), with a three-branched arch graft (12 × 8 × 8 mm, Hemashield Platinum). Since bleeding continued around the anastomotic sites, with prolonged coagulation time, temporary wound closure was performed with gauze packing around the anastomotic areas. Three days later, the packed gauze was removed, and re-exploration was performed for bleeding control. Wound closure was performed layer by layer. Even though the patient had to be reoperated with a vacuum suction drainage because of a superficial wound infection, he was moved to the ward for rehabilitation on postoperative day 82, with complete recovery of consciousness and motor functions.

TEVAR has been the primary management choice for traumatic aortic rupture, over open thoracotomy. However, TEVAR may have complications such as leakage and fracture failure, especially in the area around the aortic arch. We report a case of successful arch

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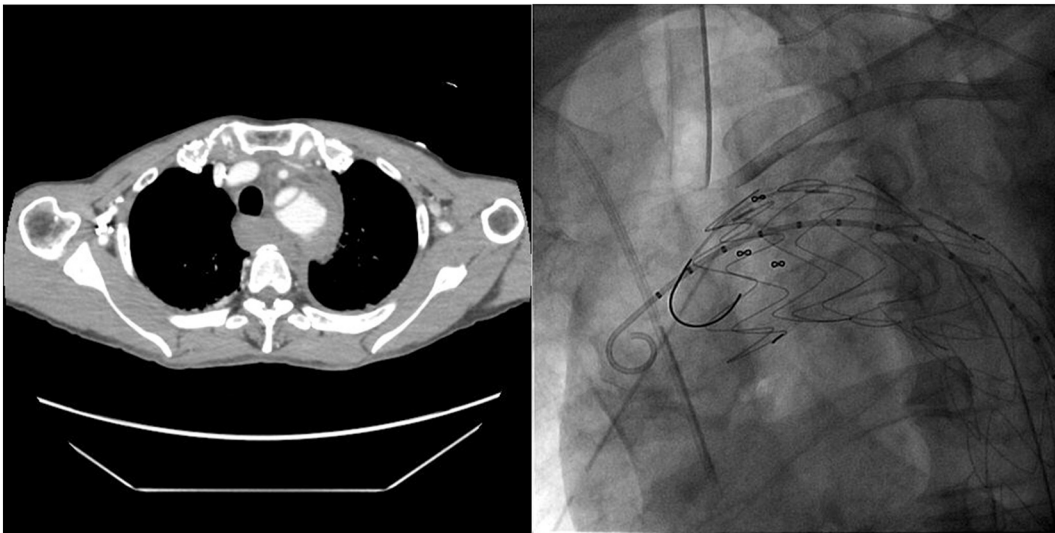


Fig. 1. Type B traumatic acute aortic dissection, for which emergent thoracic endovascular aortic repair was performed at zone 2.

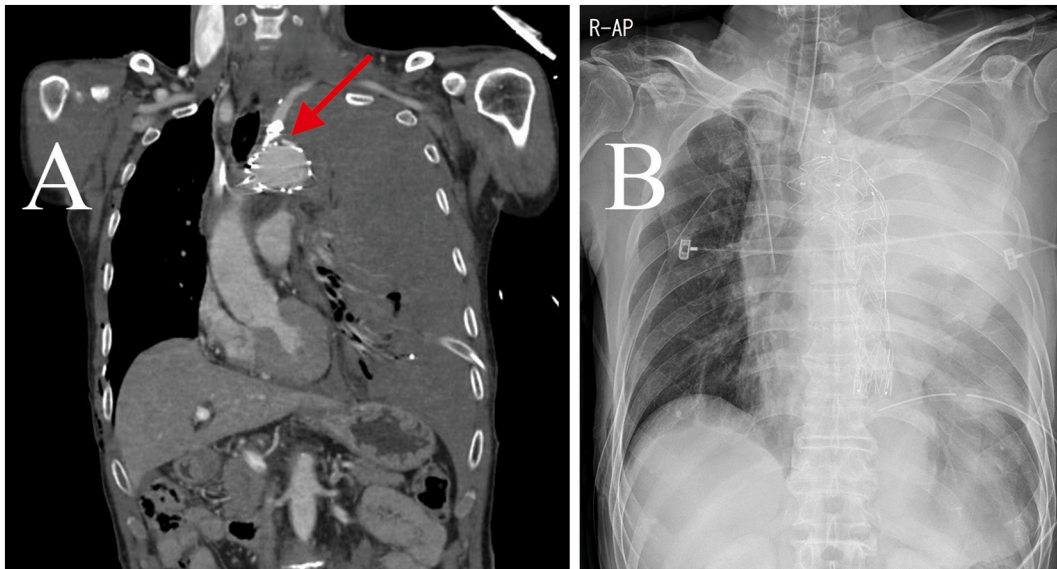


Fig. 2. Chest computed tomography and radiography following thoracic endovascular aortic repair, showing profuse bleeding from the wire protruding outside the aorta at the proximal landing zone of the thoracic endovascular aortic repair.

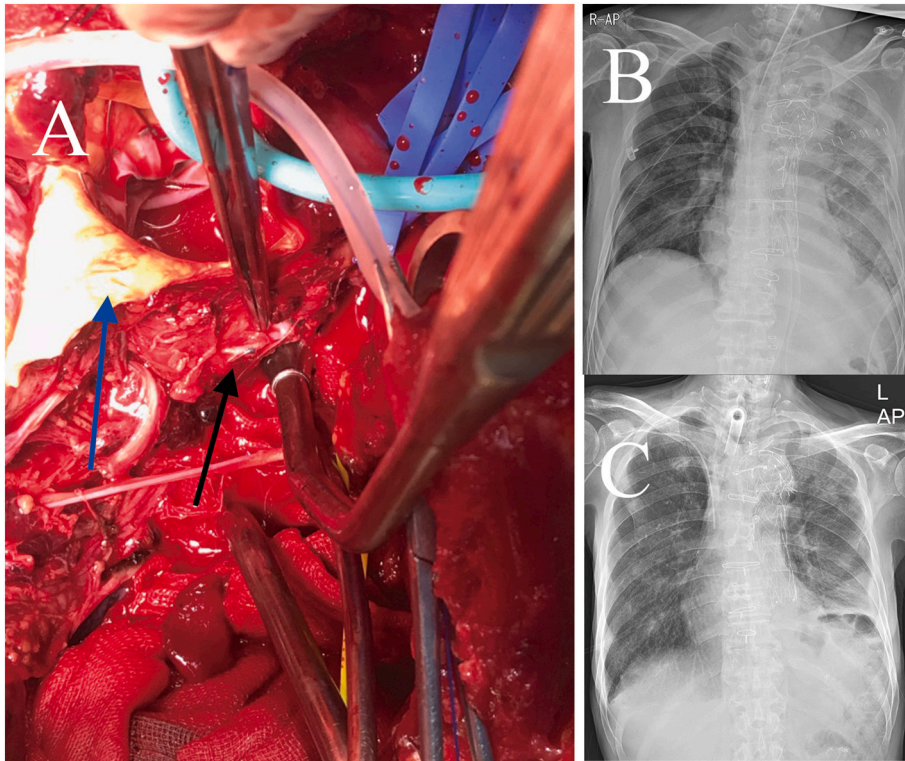
replacement of an aortic rupture, following wire protrusion at the proximal landing zone of TEVAR, performed for traumatic aortic rupture.

### Discussion

TEVAR has become the preferred treatment, over open surgery, for thoracic aortic diseases, including traumatic type B aortic dissection [1–3]. TEVAR has several advantages over open surgery, such as reduced surgical mortality and morbidity and adequate control over bleeding problems in patients with multi-organ trauma. However, the disadvantages of TEVAR include the inability to apply a stent graft owing to narrow or tortuous femoral or iliac arteries and procedural complications that may necessitate conversion to open surgery.

Several complications related to the endograft device and systemic complications [4–6], including endograft leakage or migration, cerebrovascular events, organ ischemia, and fracture failure, especially at the aortic arch portion, have been reported.

Retrograde aortic dissection is also a catastrophic complication of TEVAR [5,6], with its exact cause being unknown. Several



**Fig. 3.** A: Operative view of aortic arch replacement. The aorta was already opened at the distal ascending aorta (blue arrow), and the tip of the wire penetrating outside the lesser curvature of the aortic arch at the proximal landing zone of the thoracic endovascular aortic repair (black arrow) is seen. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

studies have reported that retrograde aortic dissection may be associated with wire and catheter intrusion into the weak wall of the diseased aorta and the balloon dilation process of TEVAR.

This catastrophic complication of TEVAR, which is wire protrusion outside the aortic wall at zone 2 of the proximal landing zone, is an extremely rare case in the TEVAR procedure for managing acute type B aortic dissection.

We encountered a challenging case of successful arch replacement of an aortic rupture, which had catastrophic bleeding due to stent wire protrusion at the proximal landing zone, after TEVAR.

#### Disclosure of funding

Not applicable.

#### Ethics approval and consent for publication

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. The patient has provided informed consent and waived the use of data.

#### Availability of data and materials

Not applicable. The data and materials cannot be made available as they contain sensitive information related to another ongoing research project.

#### Declaration of competing interest

None.

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