

Stent Graft Repair of a Ruptured Aberrant Right Subclavian Artery after Open Repair

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Abstract

An aberrant right subclavian artery arising from the proximal portion of the descending thoracic aorta is the most common congenital anomaly of the aortic arch. Open repair is typically performed in such cases; however, it may be associated with a high rate of neurological complications and mortality, particularly in patients contraindicated for major open vascular reconstruction. We successfully treated a ruptured aberrant right subclavian artery using stent grafts in an 81-year-old female patient who had previously undergone open aortic arch repair. The stent graft technique is useful for patients without vascular ring symptoms who require repeat thoracotomy.

Keywords: Kommerell diverticulum; Aberrant right subclavian artery; Stent graft

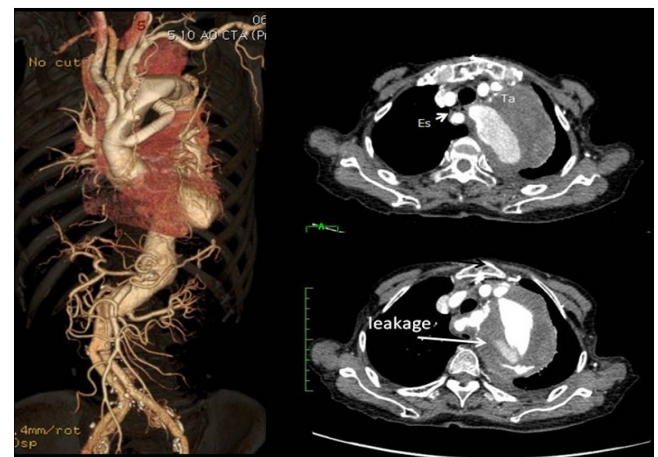
Introduction

An aberrant right subclavian artery (ARSA) arising from the proximal portion of the descending thoracic aorta is the most common congenital anomaly of the aortic arch. This irregularity occurs in 0.5-1% of the population. Degenerative aneurysmal changes may occur in the proximal portion of an ARSA or at its aortic origin. This abnormal vessel passes posterior to the esophagus, and, in rare cases, may cause dysphagia or massive hemoptysis if associated with vasculitis or an aneurysmal diverticulum of Kommerell. Open repair is typically performed for such patients; however, this procedure may be associated with a high rate of neurological complications and a mortality of up to 30%, particularly in patients contraindicated for major open vascular reconstruction. In addition, open repair may be contraindicated in patients with a history of thoracotomy. Because thoracotomy and aortic clamping are the most crucial steps of open repair, a combination of aortic endografting and extra-anatomic bypass is particularly appealing for the management of this condition. We report the successful repair of a ruptured ARSA after open repair in an 81-year-old patient without vascular ring symptoms.

Case Report

An 81-year-old patient was hospitalized at our facility with anemia and a respiratory disorder. Two years back at another hospital, she had undergone total aortic arch and abdominal aortic graft replacement because of aneurysmal changes. On presentation, the patient was suspected to have digestive tract bleeding. However, a plain chest radiograph showed an abnormal increase in the cardiothoracic ratio. Computed tomography angiography (CTA) was performed under the suspicion of aortic insufficiency. CTA showed a large mass with contrast enhancement near the aortic arch. In addition, an ARSA was observed behind the esophagus (Figure 1). Before surgery, we suspected two rupture sites; one distal to the descending aorta anastomosis and one ARSA anastomosis. CTA detected contrast material leakage in both the right subclavian artery (RSCA) and the descending aorta anastomosis site (Figure 2). The patient's records for the previous surgery indicated that she had not undergone the elephant trunk method. She underwent emergency surgery because of imminent systemic instability. A left inguinal incision of approximately 2 cm and a right inferior subclavian incision of approximately 5 cm were placed to insert the stent graft

sheet. We initially performed angiography of the descending aorta; however, we could not detect contrast material leakage. Therefore, we first deployed a stent graft (GORE TAG®; WL Gore Associates, Flagstaff, AZ, USA) at the descending aorta. Angiography indicated contrast material leakage from anastomotic rupture of the ARSA. We also deployed a stent graft for the RSCA, with a contra leg device (GORE Excluder®; WL Gore Associates) for the abdominal aortic aneurysm (Figure 3) to cover the ARSA anastomosis site. No endoleakage appeared after deployment of the stent grafts. The hemodynamics of



Es: Esophageal; Ta: Thoracic Aortic Arch; RSCA: Right Subclavian Artery

Figure 1: The RSCA is visualized behind the esophagus.

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Figure 2: Contrast agent leaked from the vasculature of the right subclavian artery anastomosis site.

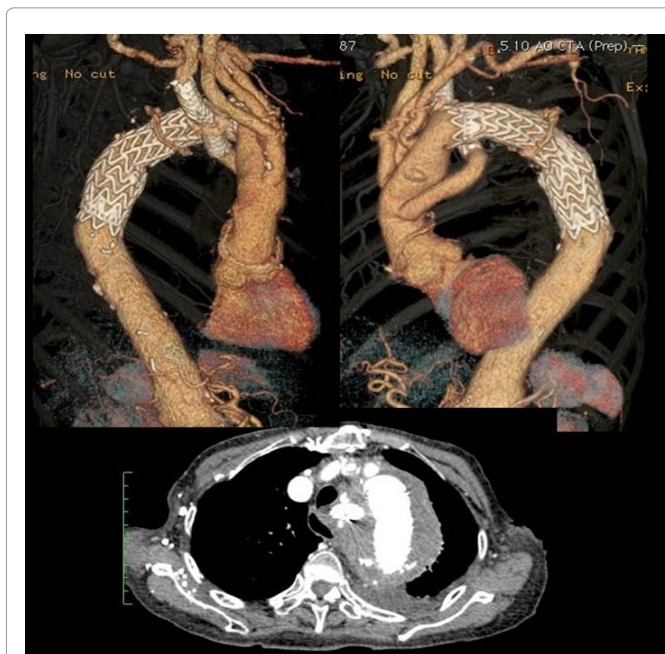


Figure 3: Postoperative three-dimensional computed tomography angiography shows no endoleakage and the two deployed stent grafts.

the patient stabilized, anemia did not progress, and performance status improved. The patient was discharged on postoperative day 7.

Discussion

An ARSA arising from the proximal portion of the descending thoracic aorta is the most common congenital anomaly of the aortic arch and occurs in 0.5-1% of the population. Kommerell described this anomaly in 1936, when a patient suffering from dysphagia was found to have a left aortic arch and ARSA [1]. Degenerative aneurysmal changes in the proximal portion of the ARSA or its aortic origin may occur in up to 60% patients [2]. In our case, enlargement of the Kommerell diverticulum necessitated the initial open repair procedure. Open repair is typically performed through a supraclavicular incision and thoracotomy, following which the ARSA is divided through a right supraclavicular incision. However, this patient did not undergo such a procedure during the first surgery because reconstruction was performed behind the esophagus. Degenerative tissue may have

remained at the graft anastomosis site, and this led to eventual rupture. Grafts should be anastomosed to normal tissue, while an ARSA should not be anastomosed behind the esophagus, as was done in the first surgery. This is because reconstruction of a rupture at this site is very difficult. The vessel passes posterior to the esophagus, and, in rare cases, may cause dysphagia or massive hemoptysis if associated with vasculitis or an aneurysmal diverticulum of Kommerell [3-5]. Open repair may be associated with high rates of neurological complications and mortality, particularly in patients who are too unstable for open vascular reconstruction. Thoracotomy and aortic clamping are the most crucial steps of open repair, with an associated mortality of as high as 30% [6]. In addition, open repair may be contraindicated in patients with a history of thoracotomy. A combination of aortic endografting and extra-anatomic bypass surgery is particularly appealing for the management of this condition. Patients with ARSA have been recently treated by endovascular or hybrid treatment. Joseph et al. reported hybrid treatment for a ruptured diverticulum of Kommerell [7]. We would not have selected a stent graft procedure for our patient if vascular ring symptoms such as dysphagia were present. We divided the RSCA from near the origin and anastomosed the distal end of the subclavian artery to the right common carotid artery. We selected endovascular repair (EVAR) for our patient because she did not have vascular ring symptoms and required a re-thoracotomy. Because only two leg devices (Excluder and Zenith) were available as small stent graft devices for EVAR in Japan at that time, we selected the Excluder leg device because it is more flexible. We operated only one time on this patient, who required immediate improvement because of older age and the emergency situation. We deployed another GORE TAG device according to the schedule before surgery. This site on the distal aortic arch was the site of the graft and native anastomosis used previously. After stent grafting, the patient's systemic condition improved immediately because rupture of the RSCA anastomosis influenced this case. Although we were concerned about vascular ring symptoms, they never appeared. However, this patient required careful follow-up.

In summary, we experienced a rare case of an ARSA after aortic arch graft replacement. An ARSA should not be rerouted behind the esophagus. In the present patient, residual vulnerable tissue left after the first surgery for proximal RSCA led to rupture of the graft anastomosis site. Our stent graft technique is useful for patients without vascular ring symptoms who require re-thoracotomy.

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