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CASE REPORT

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VASCULAR DISEASE

Thoracoscopic resection of residual aneurysm following hybrid aortic arch repair to prevent secondary aorto-oesophageal fistula in cases of severe oesophageal compression

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Abstract

Secondary aorto-oesophageal fistulas after thoracic endovascular aortic repair are a severe complication associated with high mortality rates. We present a case of staged oesophageal decompression performed via thoracoscopic resection of a residual aneurysm following thoracic endovascular aortic repair to prevent secondary aorto-oesophageal fistulas in a patient with a distal arch aneurysm causing significant oesophageal compression. A 70-year-old woman with a 3-month history of hoarseness was referred to our hospital. Computed tomography revealed a penetrating ulcer in the aortic arch, complicated by a 60 mm pseudoaneurysm causing significant oesophageal compression. Owing to multiple comorbidities, the patient had high perioperative risk, rendering total arch replacement unfeasible; therefore, endovascular repair was selected. After Zone 1 hybrid thoracic endovascular aortic repair, complete thrombosis of the aneurysm was confirmed. Staged residual aneurysm resection was performed via thoracoscopy through a small left thoracotomy relieve oesophageal compression. Two years postoperatively, computed tomography revealed aneurysmal reduction, complete resolution of the oesophageal pressure drainage and no evidence of secondary aorto-oesophageal fistula or stent graft infection.

Keywords: secondary aorto-oesophageal fistula • thoracic endovascular aortic repair • thoracoscopic aortic aneurysm

Secondary aorto-oesophageal fistula (sAEF) following thoracic endovascular aortic repair (TEVAR) for a thoracic aortic aneurysm is a rare but catastrophic complication with an incidence of 1.9% [1]. Once developed, the only curative treatment requires a multistage radical oesophagectomy and extensive aortic reconstruction, placing a significant burden on the patient. Therefore, sAEF prediction and prevention are paramount.

In the case reported herein, oesophageal staged decompression via thoracoscopic residual aneurysm resection following hybrid TEVAR was performed to prevent sAEF in a patient with a distal arch aortic aneurysm causing severe oesophageal compression.

CASE PRESENTATION

A 70-year-old woman with a 3-month history of hoarseness was referred to our hospital for surgery after computed tomography (CT) revealed a saccular aortic arch aneurysm. CT aortography showed a penetrating ulcer in the aortic arch, complicated by a 60-mm pseudoaneurysm (Fig. 1A). The patient had a low activity of daily living status with a performance status of 3, associated with two previous strokes and comorbidities, including hypertension, severe emphysema and chronic heart failure. These multiple comorbidities made conventional total aortic arch replacement infeasible. Hybrid TEVAR was selected for basic aortic treatment. CT showed severe oesophageal compression (Fig. 1B); thus, thoracoscopic resection of the residual aneurysm was performed to prevent sAEF after hybrid TEVAR. In addition, we considered the need to avoid intraoperative haemorrhage caused by endoleaks after TEVAR during thoracoscopic aneurysm resection. Therefore, we adopted a two-stage approach after confirming the absence of postoperative endoleaks.

Hybrid TEVAR was performed under general anaesthesia. The procedure involved successfully completing zone 1 proximal landing hybrid TEVAR with a bypass of the right axillary artery bypass to the left common carotid artery and left axillary artery; esophagogastroscopy was performed after. Findings revealed lower oesophageal compression caused by an aneurysm from the oesophagus' ventral side. Mild passage obstruction, but no significant signs of mucosal blood flow impairment, was observed (Fig. 2).

The postoperative course was uneventful, and the absence of endoleaks was carefully confirmed using CTA and aortography. Consequently, additional resection of the residual aortic aneurysm was performed 26 days after TEVAR.

The patient was positioned in the right lateral decubitus under general anaesthesia. For aneurysm dissection via video-assisted

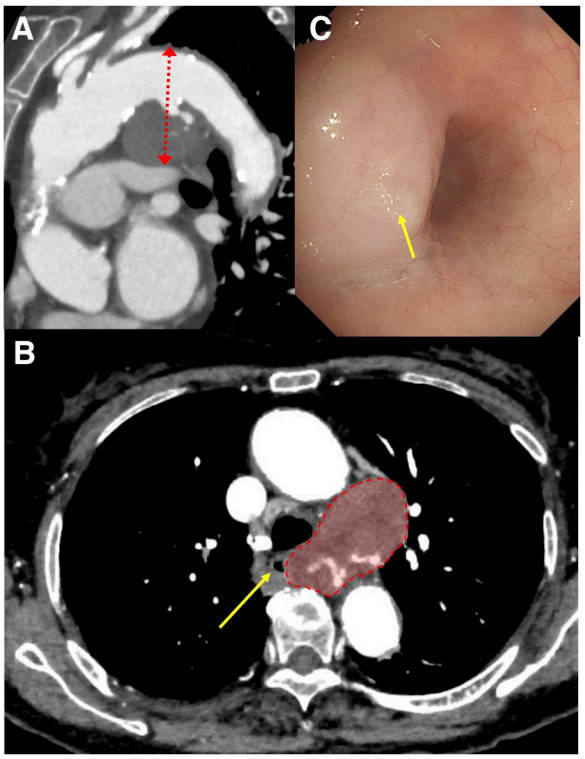

Figure 1: Preoperative computed tomography and esophagogastroscopy. (A) Preoperative computed tomography revealed a penetrating ulcer in the aortic arch, complicated by a 60-mm pseudoaneurysm. Penetrating ulcer complicated by pseudoaneurysm (red arrow). (B) Preoperative computed tomography revealed severe oesophageal compression. Compressed oesophagus (yellow arrow), thrombosed aortic aneurysm (red dotted area). (C) Esophagogastroscopy revealed compression of the lower oesophagus caused by an aneurysm from the ventral side of the oesophagus, mild passage obstruction and no significant signs of mucosal blood flow impairment. Compression of the lower oesophagus caused by the aneurysm (yellow arrow)

thoracoscopic surgery, a 6 cm axillary incision was made anterior to the fourth intercostal space, and a camera port was placed below the sixth intercostal suprasellar process. Partial resection of the anterior aneurysm wall was performed using a 23 cm LigaSureTM Maryland (Medtronics, Minneapolis, MN). The aneurysm entry was identified, and both fresh and old thrombi were observed within the aneurysm. No haemorrhage was noted. Intra-aneurysmal thrombi were removed as extensively as possible until the stent graft was fully exposed (Fig. 2A and B). The total operative time was 90 min. The postoperative course was uneventful, and the patient was discharged on the 30th postoperative day after completing a postoperative rehabilitation period, which included swallowing function recovery due to hoarseness. Six months postoperatively, CTA showed a trend towards aneurysmal reduction and improvement in oesophageal compression. Two years postoperatively, CT showed further aneurysmal reduction and complete resolution of oesophageal compression (Fig. 2C).

DISCUSSIONS

sAEF develops due to oesophageal wall vulnerability primarily from two mechanisms: ischaemia from reduced blood flow and mechanical compression. Ischaemia occurs when the stent graft covers aortic branches supplying the oesophagus, reducing

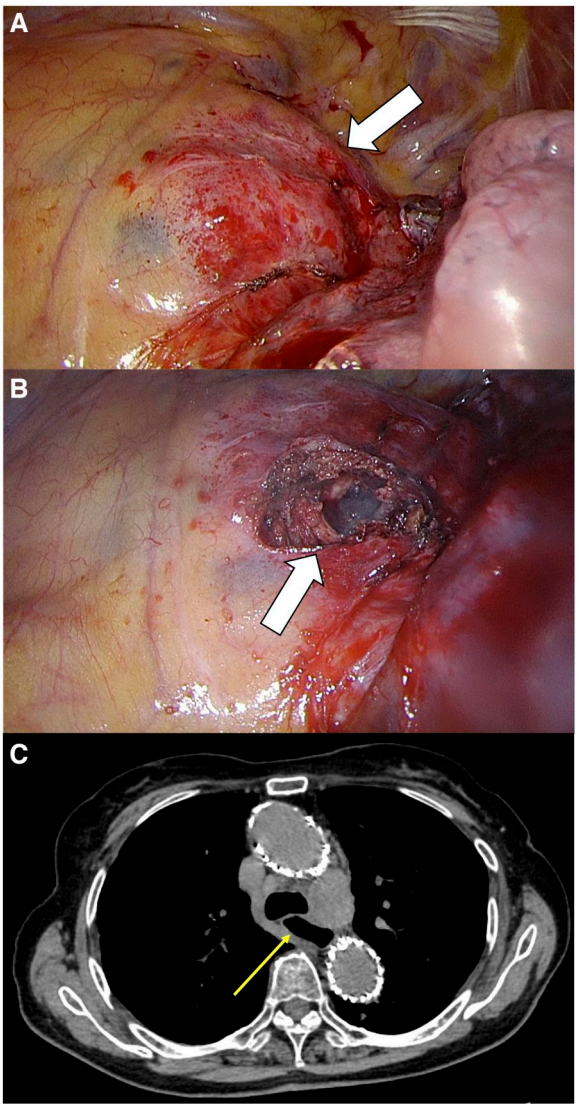

Figure 2: Thoracoscopic image and postoperative computed tomography. (A) Thoracoscopic whole image. Residual aortic aneurysm in the distal arch (white arrow). (B) Partial resection of the anterior wall of the aneurysm. Partial aneurysm resection (white arrow). (C) Postoperative computed tomography. Decompressed oesophagus (yellow arrow)

blood flow to the oesophageal wall [2]. Mechanical factors include direct erosion from the stent graft, residual haematomas in the mediastinum or pressure from remaining large aneurysms post-TEVAR [3, 4]. The European registry reports a higher sAEF risk in urgent TEVAR cases involving mediastinal haematomas, potentially due to increased pressure and inflammation in the area surrounding the oesophagus, leading to secondary ischaemia [3]. Oesophageal hypoperfusion may create a substrate for sAEF development, with external mechanical stimuli potentially initiating a final pathway of ischaemia and secondary fistula formation [2, 3].

Preventive measures for high-risk patients centre around minimizing external pressure, such as removing haematomas and relieving aneurysmal pressure [1]. Previously, posterior mediastinal drainage via left thoracotomy prevented sAEF [2]. For patients with remaining large aneurysms post-TEVAR, early aneurysm resection to relieve pressure on the oesophagus may prevent sAEF; this

approach may also limit local inflammation, minimizing oesophageal tissue damage.

For aneurysm resection, a left thoracotomy approach is generally preferred, albeit invasive; video-assisted thoracoscopic surgery offers a feasible and safe minimally invasive alternative. Potential complications include stent graft migration, endoleaks, bleeding, infection and pneumothorax. In this case, no complications occurred, although ongoing monitoring is essential. Further rigorous evaluation of aneurysm resection as a preventive measure for sAEF is necessary.

CONCLUSION

Thoracoscopic resection of residual aortic aneurysms can be safely performed to prevent sAEF after hybrid aortic arch repair in patients with severe oesophageal compression.

FUNDING

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CONFLICT OF INTEREST

None declared.

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DATA AVAILABILITY

The data underlying this article will be shared upon reasonable request to the corresponding author.

ETHICAL STATEMENT

This case report was approved by the institutional Ethics Committee of Osaka University (Reference no. 08218–6; Date of approval: 13 January 2015).

INFORMED CONSENT STATEMENT

Written informed consent was obtained from the patient.

Author contributions

Fumio Yamana wrote the draft of the article. Kazuo Shimamura revised the article. All authors (Soichiro Funaki and Shigeru Miyagawa) read and approved the final article.

Reviewer information

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REFERENCES

[1] Wilson WR, Bower TC, Creager MA *et al.* Vascular graft infections, mycotic aneurysms, and endovascular infections: a scientific statement from the American Heart Association. Circulation 2016;134:e412–60.
[2] Katahira S, Kawamoto S, Masaki N *et al.* Oesophageal mucosal blood flow changes after thoracic endovascular stent graft implantation using a novel sensor probe. Interact CardioVasc Thorac Surg 2018;26:487–93.
[3] Czerny M, Eggebrecht H, Sodeck G *et al.* New insights regarding the incidence, presentation and treatment options of aorto-oesophageal fistulation after thoracic endovascular aortic repair: the European Registry of Endovascular Aortic Repair Complications. Eur J Cardiothorac Surg 2014;45:452–7.
[4] Hance KA, Hsu J, Eskew T, Hermreck AS. Secondary aortoesophageal fistula after endoluminal exclusion because of thoracic aortic transection. J Vasc Surg 2003;37:886–8.

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