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Acute Thrombotic Occlusion of Left Internal Jugular Vein Compressed by Bypass Graft for Thoracic Endovascular Aortic Repair Debranching Procedure

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Thoracic endovascular aortic repair has become a widespread alternative treatment option for thoracic aortic aneurysm. The debranching of arch vessels may be required to provide an acceptable landing zone for an endovascular stent graft. We report a case where the bypass graft used in the thoracic endovascular aortic repair procedure compressed the left internal jugular vein, causing acute thrombotic occlusion.

Key words: 1. Thrombosis
2. Aorta
3. Bypass

CASE REPORT

A 64-year-old man visited the emergency room for abrupt-onset chest pain. He had undergone a closed thoracostomy for left hemothorax in another local clinic. Whole body computed tomography imaging indicated a possible ruptured thoracic aortic aneurysm; the maximal diameter of the thoracic aorta was 65 mm (Fig. 1). The patient underwent an urgent thoracic endovascular aortic repair procedure the next day. Since the proximal landing zone of the stent graft was estimated to be between the innominate artery and the left common carotid artery (zone I), he concomitantly underwent the debranching of the arch vessels. All procedures were performed in the operating room. The extrathoracic exposure of the arch vessels was performed via two small supraclavicular incisions. The debranching of the arch vessels was done by bypassing the left common carotid artery and the left subclavian artery to the right common carotid artery using a single 8 mm vascular graft (InterGard Woven; InterVascular, La Ciotat, France). The course of the graft crossed above the trachea and above the left internal jugular vein. The thoracic endovascular aortic repair procedure was carried out using a SEAL thoracic aortic stent (SEAL Thoracic 38/34×180 mm; S&G Biotech Inc., Seongnam, Korea) via both femoral arteries. All procedures were uneventful. The patient underwent perioperative cerebrospinal fluid drainage to prevent paraplegia.

Postoperatively, the patient twice failed to be weaned off the ventilator because of intractable stridor and desaturation immediately after extubation. He underwent reoperation on postoperative day four due to suspected airway edema caused by the obstruction of venous return. When neck ultrasonography was performed in the operating room, a large amount of thrombi was found in the left internal jugular vein and no

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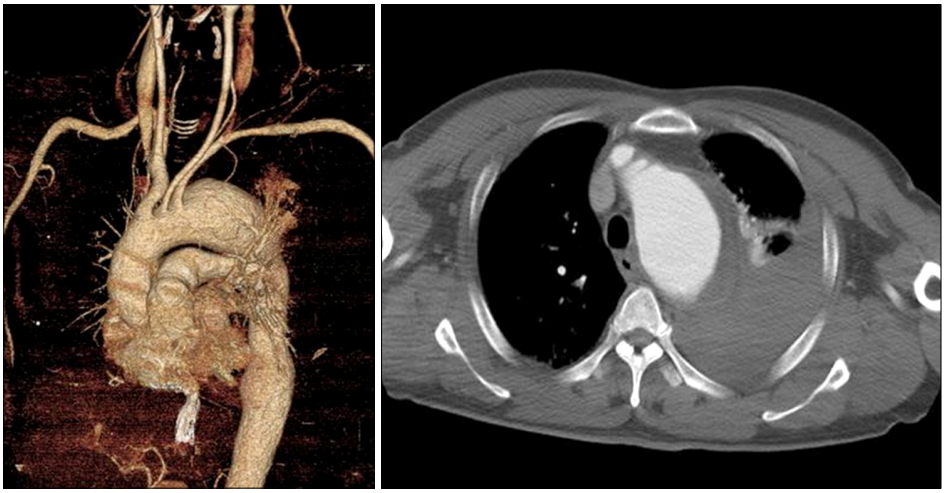

Fig. 1. On a preoperative whole body computed tomography scan, a ruptured thoracic aortic aneurysm was suspected, and the maximal diameter of the thoracic aorta was 65 mm.

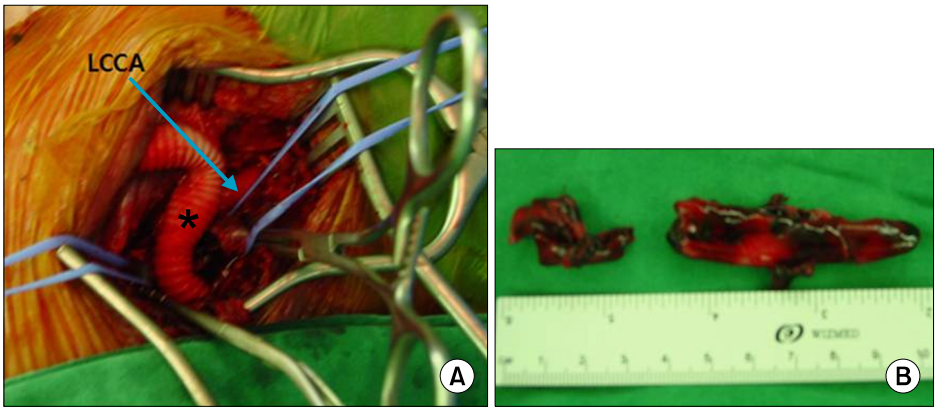

Fig. 2. (A) Reoperation indicated that the left internal jugular vein was totally obstructed by large thrombi. *means bypass graft. The vessel snared by the blue loop is the left internal jugular vein. LCCA, left common carotid artery. (B) Removed thrombi are shown.

flow was found through the left internal jugular vein. In the operative theater, the left internal jugular vein was found to be totally obstructed by thrombosis (Fig. 2), which might have been caused by compression from the bypass graft. The reoperation was done by thrombectomy and left internal jugular vein intervenous bypass using an 8-mm ringed graft (EXXCELL SOFT ePTFE vascular graft; MAQUET cardiovascular LLC, San Jose, CA, USA) (Fig. 3). After reoperation, the patient's upper airway symptoms improved, but he still displayed delirium and poor spatial orientation. He was weaned off the ventilator five days after the second operation and transferred to a general ward on postoperative day eight. He was readmitted to the intensive care unit because of stridor and delirium on postoperative day nine. On an upper airway exam, bilateral vocal cord palsy was noted. Thereafter, he was given steroid medications and was weaned off the ventilator four days later. On postoperative cardiac computed tomography, a patent debranching graft was noted and the thoracic stent graft was well positioned with no evidence of endoleak (Fig. 4). On a follow-up vocal cord exam, his bilateral vocal cord palsy had improved. He was discharged from hospital on postoperative day 30, but was prescribed oral aspirin for anticoagulation to maintain the patency of the intervenous graft.

DISCUSSION

Thoracic endovascular aortic repair has become a widespread alternative treatment option for thoracic aortic aneurysms. Compared with open surgical repair, thoracic endovascular aortic repair is less invasive and does not require cardiopulmonary bypass or deep hypothermic circulatory arrest. The rate of postoperative neurologic complications such as paraplegia or stroke is comparable or even superior to open surgical repair

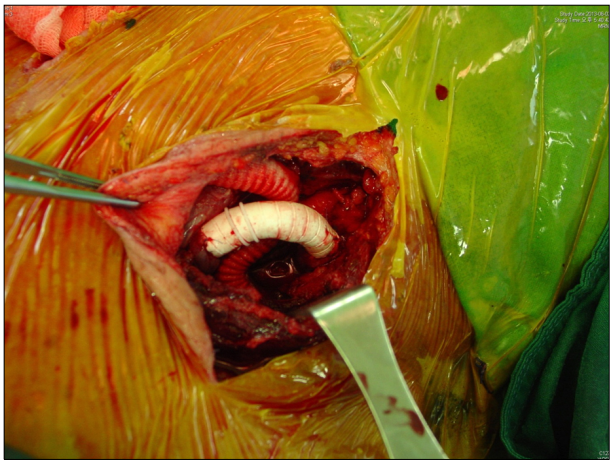

Fig. 3. After a thrombectomy was performed, the left internal jugular vein was transected and repositioned above the bypass graft. An intervenous bypass (end-to-end anastomosis with an 8-mm ringed vascular graft) was carried out.

Fig. 4. Postoperative computed tomography imaging showed a patent debranching graft and a well-positioned thoracic endovascular stent graft.

[1]. In the case of an aortic arch or proximal descending aortic aneurysm, the debranching of arch vessels may be required to ensure a sufficient landing zone for the endovascular stent graft. When the landing zone is between the innominate artery and left common carotid artery (zone 1), it requires more extensive arch vessel debranching.

There are several arch vessel debranching techniques for the zone 1 landing zone: using a branching graft under partial or full sternotomy [2], native arch vessel sequential anastomosis [3], or extrathoracic arch vessel bypass without sternotomy [4]. Among these options, the extrathoracic arch vessel bypass has several advantages such as involving a relatively simple procedure and avoiding a sternotomy. The technique also has the drawback of requiring the blood supply of the arch vessels to be maintained by the right common carotid artery flow. Nonetheless, in a series of carotid-carotid bypasses, the long-term patency has been shown to be excellent [5].

In this case, an unsuitable course of the bypass graft caused the compression of the left internal jugular vein. The course of the bypass graft was over the left internal jugular vein. Since the left internal jugular vein is more superficial than the left common carotid artery, it might be preferable for the course of the bypass graft to be under the left internal jugular vein. An alternate solution might be to transect the left common carotid artery and anastomose it above the bypass graft in an end-to-side fashion [4].

Vocal cord palsy is a serious complication of the extrathoracic arch vessel bypass procedure. The vagus nerve is located in the carotid sheath posterior to the common carotid artery and both recurrent laryngeal nerves are in the ipsilateral tracheoesophageal groove. Careful arterial dissection and clamp application is essential to avoid injuring the vagus nerve and the recurrent laryngeal nerve.

In conclusion, determining an adequate course for the bypass graft and careful arterial manipulation are critical to successfully perform the thoracic endovascular aortic repair procedure.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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