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Case Report Open Access

Aortic coarctation and descending aortic aneurysm involving the subclavian artery: Hybrid approach to treatment

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Aortic aneurysms are complex and difficult to treat conditions and are associated with high mortality rates. Alternative methods of treatment continues to show development day by day. One of them is the main subject of this article: the hybrid operation. Herein, we present the case of hybrid repair in a 37-year-old female with 56 mm descending aortic aneurysm and aortic coarctation Aortic debranching, carotid-to-subclavian bypass, and thoracic endovascular aortic repair (TEVAR) operations were performed sequentially in this case. The follow-up computed tomography angiography demonstrated thrombus formation in the aneurysm lumen, no endoleak, and the aortic arch and bypass graft were all patent.

Keywords: Aortic coarctation; descending aorta aneurysm; hybrid procedure; thoracic endovascular aortic repair.

Treatment of aortic aneurysms is performed by less invasive methods with the growing experience and knowledge of hybrid procedures and the developments in recent years.[1-3] Conventional surgical methods still have total circulatory arrest caused by neurological complications and high mortality and morbidity rates are reported.[4,5] Hybrid approach continues to evolve with each passing day. Arch hybrid procedures include three basic approaches: *(i)* debranching of aortic arch and anastomosis; *(ii)* preparation of the proximal and distal landing zones; *(iii)* thoracic endovascular aortic repair (TEVAR). Stenting procedure can also be performed together or sequentially in different sessions. In this case report, we present a hybrid two-stage surgical procedure in a patient with descending aorta aneurysm involving subclavian artery and postductal coarctation of the aorta.

CASE REPORT

A 37-year-old female patient was admitted with complaints of back pain. On physical examination, her blood pressure (BP) measurements were 123/97 mmHg and 114/92 mmHg at her right and left arm, while 84/67 mmHg and 82/65 mmHg at her right and left ankle. Chest X-ray showed a calcified mass and then transthoracic echocardiography was performed. On echocardiography, aortic coarctation with 38 mmHg peak gradient and aneurysm of the descending aorta was detected. Thoraco-abdominal computed tomography angiography, coronary angiography, and aortography was performed (Figure 3, 4). According to the Ishimaru classification, aortic coarctation and descending aortic aneurysm localized zone 2 and zone 3 (Figure 1) was identified (Figure 2). Bilateral carotid and vertebral artery Doppler ultrasonography showed no pathology.

Surgery was performed under general anesthesia with cerebral oximetry monitoring by near-infrared reflectance spectroscopy (NIRS). Heparin administrated to maintain activated clotting time (ACT) over 300 s. Median sternotomy was performed and innominate vein agenesis was observed. An additional anatomical variations or venous anomaly was not detected. Truncus brachiocephalicus and left common carotid artery were explored. The left subclavian artery was located in the aneurysm site. Aorta-to-left common carotid and aorta-to-truncus brachiocephalicus bypass operations

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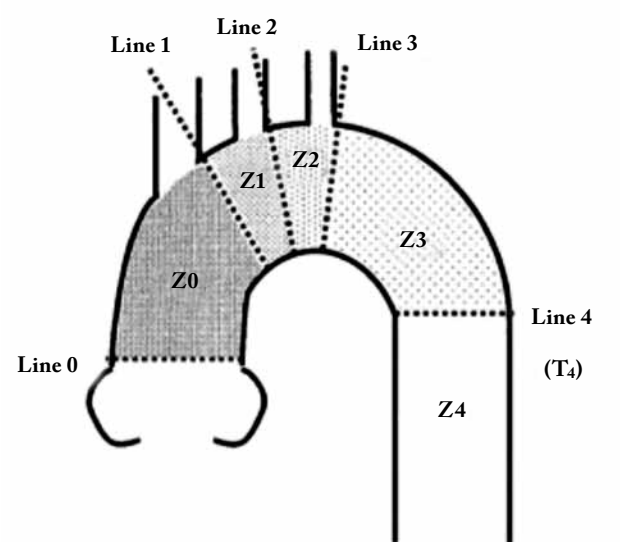

Figure 1. Ishimaru classification.

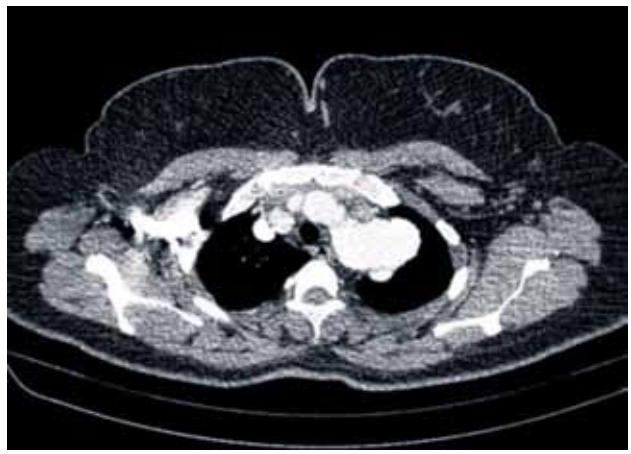

Figure 2. Preoperative thoraco-abdominal computed tomography angiography.

were performed with side clamping by using 7/14 mm Y-shaped Dacron graft without cardiopulmonary bypass (Figure 5). Zone of the stent will be placed on the ascending aorta were marked with wire of pacemaker.

At the same session, left common carotid-to-left subclavian artery bypass surgery was also performed. The left femoral artery was explored before the end of the operation for TEVAR. Artery calibration viewed approximately 10 mm. The patient after surgical procedures was taken to angiography unit. A 20 mm self-expandable nitinol stent (E-XL Endoluminal Aortic Stent Prosthesis 20x30 mm, JOTEC GmbH, Hechingen, Germany) was deployed across the coarctation and aneurysm site without previous balloon dilatation procedure. The proximal end of the stent to the ascending aorta and distal end of the stent was placed to distal zone of coarctation site (Figures 6, 7).

Figure 3. Preoperative three dimensional computed tomography angiography.

Figure 4. Preoperative aortography.

Figure 5. Aorta-to-left common carotid and aorta-to-truncus brakiosefalikus bypass.

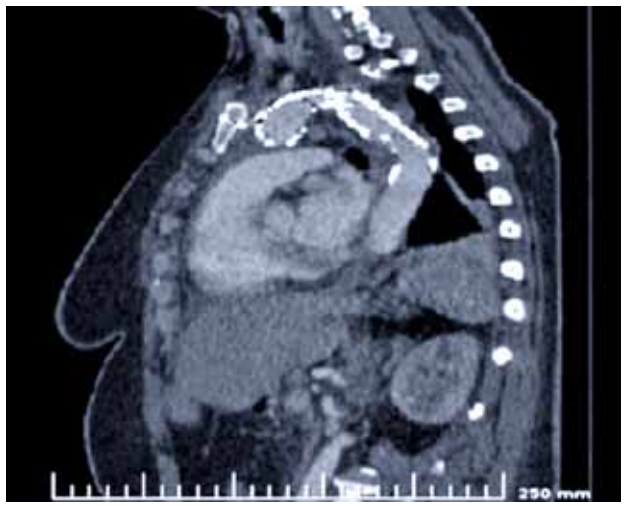

Figure 7. Postoperive computed tomography.

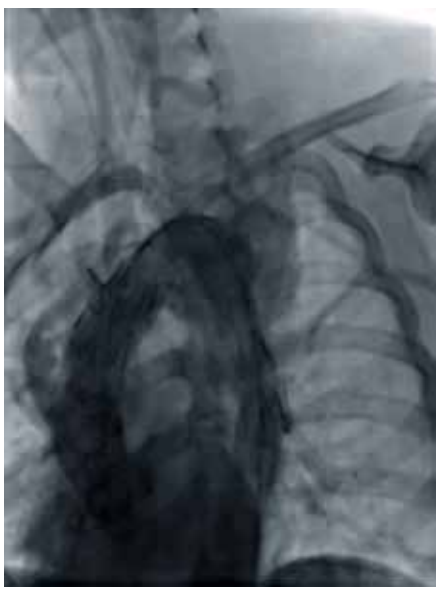

Figure 6. Postoperative aortography.

No further balloon dilatation was done immediately after the stent deployment to avoid unnecessary tissue injury. There was no endoleak at the end of the procedure and the patient was taken to the intensive care unit. The patient was discharged at the sixth postoperative day. At two months and every six months, follow-up was scheduled and no endoleak was observed. The BP measurement of four limbs evaluated (Table 1).

DISCUSSION

With the introduction of developments in the treatment of aortic aneurysms in the last 10 years, less invasive methods can be used. These processes performing without cardiopulmonary bypass and hypothermic cardiac arrest attracts the complication rates, morbidity and mortality rates linked to aneurysm surgery down.[6,7] The hybrid method combining cardiovascular surgery and catheterization procedures has been rapidly spreading all over the world. There are publications showing that hybrid method is effective in cases of dissections, ruptures requiring an emergency intervention, and elective cases.[8] Proximal landing zone is the distal site of left subclavian artery, therefore it is zone 2 (Z 2) or zone 3 (Z 3). It may be possible, if the aneurysm is localized in the distal site of the left subclavian artery or thoracic aortic aneurysm or in some cases of type B dissections. If the pathology located proximally, left common carotid-to-left subclavian artery

Table 1
Blood pressures (systolic/mean/diastolic, mmHg) of four limbs

	Right arm	Left arm	Right ankle	Left ankle
Before the stent insertion	123/106/97	114/100/92	84/73/67	82/71/65
Five days after the stent insertion	130/113/103	128/107/96	119/98/88	123/104/95
Six months after the stent insertion	116/97/87	119/102/93	109/89/79	109/90/81

bypass surgery should be performed. In the literature, TEVAR procedures to fix the complications developing secondary to the coarctation surgery performed.[9,10] Hybrid treatment of a newly diagnosed coarctation together with an aneurysm of descending aortic is less invasive and safer than convantional surgery.

Declaration of conflicting interests

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