Acute Retrograde Ascending Aortic Dissection During Thoracic Endovascular Aortic Repair in a Rare Triple-Barreled Aortic Dissection
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A 56-year-old woman with a history of hypertension was admitted to the emergency department due to syncope after repeated episodes of severe back pain lasting 30 min. One day earlier, she had a sudden onset of severe back pain without further treatment. Contrast-enhanced computed tomography (CT) on admission showed a triple aortic dissection starting immediately after the origin of the left subclavian artery and extending down to the left iliac artery.

Figure. (A) Three-dimensional reconstructed CT (November 29, 2013) showing 3 channels: an inner narrowed true channel, a middle false channel, and an outer false channel. (B) Coronal multiplanar reformatted CT (December 11, 2013) showed a larger massive left pleural effusion and left pulmonary atelectasis. Note the blood injection sign (black arrow). (C) Digital subtraction angiography confirmed the blood injection sign of the primary entry tear (black arrow). (D) Angiogram after deployment of the stent graft showing a retrograde dissection along the ascending aorta. (E) Histology of the aortic wall showing the presence of medial degeneration and cystic medial necrosis. CT, computed tomography.
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On the arterial phase, CT showed the blood injection sign: high contrast outflow at the entry tear of the outer false lumen. In addition, mediastinal hematoma around the descending aorta and small left pleural effusion were noted. The patient was transferred to the critical care unit, where beta-blockers and nitrates were given and intra-arterial blood pressure was monitored.

Contrast-enhanced CT demonstrated an enlarged massive left pleural effusion indicating rupture of the outer dissecting aortic aneurysm on hospital day 12 (Figure B). Therefore, angiography was done, which confirmed the previous diagnosis (Figure C) and the patient underwent insertion of endovascular stent graft to exclude the intimal tear and obliterate the false lumen. Under general anesthesia, a Talent LPS endoprosthesis (Medtronic, Minneapolis, MN, USA) was introduced through open right femoral artery access. The stent graft itself consisted of self-expanding nitinol stent springs, covered by a woven Dacron graft with an uncovered proximal (FreeFloTM) and distal (Bare SpringTM; Medtronic) anchoring design. The diameter of the stent graft was 32 mm, and the total length of the device was 160 mm. It was decided to overstent the left subclavian artery origin with the proximal uncovered part of the stent graft to create a more adequate proximal anchoring zone affording a tight endosseal. Simultaneously, another 10×60-mm bare stent graft (Medtronic) was deployed in the left carotid artery. Completion angiography indicated an intimal flap starting from the most proximal stent-graft and dissecting retrograde throughout the arch and ascending aorta (Figure D), and immediate surgical repair was undertaken.

The patient underwent successful replacement of the ascending aorta and proximal hemi-arch under deep hypothermic circulatory arrest and antegrade cerebral perfusion via the right subclavian artery. Upon operation, the origin of the initial dissection was still sufficiently occluded by the endovascular stent graft, but there was another entry between the innominate artery and the left carotid artery near 1 proximal end of the stent’s strut. Histology of the aortic wall indicated medial degeneration and cystic medial necrosis (Figure E). The post-operative course was uneventful and the patient was discharged 25 days after the surgery.

To our knowledge, this is first case report on intraoperative retrograde ascending aortic dissection (RAAD) in a rare triple-barreled aortic dissection. RAAD is a potentially lethal complication of thoracic endovascular aortic repair (TEVAR). There are several potential mechanisms of RAAD in patients undergoing TEVAR. The majority were related to the trauma caused by the semi-rigid stent graft either during implantation or subsequently after implantation caused by repeated subtle back-and-forth motion of the stent graft with the cardiac cycle. Others were related to the underlying aortic disease process that eventually led to aortic dilation or initial tearing requiring the initial TEVAR procedure. In the present case, CT and angiography indicated the third dissection originating from the lateral wall of the second channel and a communication between the 2 false channels. The prognosis in the case of such a communication is definitely grave. Histology of the aortic wall showed the presence of medial degeneration and cystic medial necrosis, which might be another reason for RAAD. Taken together, the present case suggests that patients undergoing TEVAR for triple-barreled aortic dissection appear to be more prone to RAAD than those with the double-barrel type. In the meantime, multi-slice CT can not only delineate triple-barreled aortic dissection, but also demonstrate dynamic changes in blood flow between the true and false lumens. In other words, RAAD can present as an early complication after descending stent grafting because of aortic instability or disease progression, which is a life-threatening complication that can be managed safely with early recognition and rapid delivery of open repair.

References