Successful treatment of a right internal mammary artery aneurysm with thoracoscopic surgery

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ABSTRACT
Internal mammary artery aneurysms are rarely detected, with only a few cases caused by physical trauma, connective tissue diseases, and vasculitis having been reported. We describe the case of a 52-year-old woman diagnosed with a right internal mammary artery aneurysm several months after experiencing a DeBakey III acute aortic dissection. The artery had an indication of dissection that seemed to have caused the aneurysm. Thoracoscopic resection was performed, and the patient recovered with no major complications. (J Vasc Surg Cases and Innovative Techniques 2019;5:269-72.)

Keywords: Internal mammary artery aneurysm; Thoracoscopic surgery

Rupture of an internal mammary artery (IMA) aneurysm is a life-threatening condition that causes massive hemothorax or hemorrhagic shock, can lead to death, and requires immediate treatment. An IMA aneurysm is often discovered accidentally on chest radiographic examinations performed for other diseases and is currently detected most often on chest computed tomography (CT) angiography. Aneurysms are usually asymptomatic until moments before rupture and are therefore difficult to identify at an early stage. Moreover, the developmental mechanism of an IMA aneurysm is still unclear and screening for these aneurysms is difficult because there is no unique hereditary factor that predisposes an individual to its occurrence.

We report on a patient who had a right IMA (RIMA) aneurysm that was found during follow-up for acute aortic dissection; the patient was safely treated with thoracoscopic surgery and had no recurrence. We found a dissection in the tunica media of the RIMA by pathologic examination. The patient provided consent for publication of this case report.

CASE REPORT
In September 2013, a 52-year-old woman who complained of sudden chest and back pain was brought into our emergency room. She was diagnosed with acute aortic dissection type A and immediately admitted for urgent treatment. The entry of the dissection was at the distal arch of the aorta. The dissection was found to have progressed in an antegrade and retrograde manner, which is a condition called DeBakey IIIb, and involved the ascending aorta, brachiocephalic artery, and left common carotid artery. The false lumen of these arteries was completely thrombosed (Fig 1), whereas the right carotid artery and bilateral subclavian arteries had no indication of dissection. The false lumen that connected with the area from the descending aorta through the right common iliac artery was kept patent. The patient was placed on complete rest and strict blood pressure control. After 1 month, she was discharged without any complications. Her physical condition was stable, and her blood pressure was well controlled.

A follow-up CT, which was performed 3 months after the onset of disease, revealed dilatation of the RIMA. Accordingly, she was rehospitalized for treatment of the RIMA aneurysm 5 months after the onset of acute aortic dissection. Before the patient’s initial hospitalization for acute aortic dissection, she had no physical problems other than hypertension, no physical trauma, no hereditary diseases, and no smoking history. On admission, her vital signs, blood test results, chest radiograph, electrocardiograph, and echocardiograph were normal. The size of the RIMA at its maximum point was 9.4 mm in diameter, and it was dilated by 5 mm within 2.5 months after the aortic dissection. The RIMA had a dissection at the point at which the aneurysm occurred (Figs 2 and 3). The false lumen of the artery from the ascending aorta through the brachiocephalic artery and the left common carotid artery was completely thrombosed. Moreover, there was no indication of progressing dissection in any area of her body except the RIMA. As a result, she was diagnosed with a RIMA aneurysm. The RIMA aneurysm was growing solitarily with its false lumen kept patent.

On the day after her admission, the aneurysm was surgically treated. With the patient lying on her left side and under the thoracoscopic view, the aneurysm was resected using three ports inserted in the second, third, and sixth intercostal spaces under differential lung ventilation. The aneurysm in the second intercostal space was easily found under thoracoscopic view. After the tissue around the RIMA was peeled off, a vessel loop was taped around the RIMA. The proximal and distal sides of

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The aneurysm were then double-clipped, and the aneurysm was safely resected. This case was caused by dissection of the tunica media of the RIMA, which was confirmed by pathologic examination, and thrombosis was found in some parts of the false lumen of the RIMA aneurysm (Fig 4). These findings established the diagnosis of dissected RIMA aneurysm. The patient’s physical condition was favorable after surgery, and she was discharged on postoperative day 5. Eighteen months later, the patient had no signs of recurrence.

DISCUSSION

The IMA is one of the arteries that branches from the subclavian artery, runs behind the sternum, and has a normal diameter of approximately 2 mm. An IMA aneurysm is rarely seen outside of conditions such as physical trauma, hereditary diseases, or iatrogenic problems.1-4,12-14 Only 10 cases of an IMA aneurysm outside of the conditions described above have been reported since 1978 (Table) with a mean patient age of 51.9 years at occurrence, irrespective of sex or laterality. From a pathologic viewpoint, an IMA aneurysm is most commonly caused by atherosclerosis,11,15,16 and either degeneration of the tunica media or arterial fibromuscular dysplasia is associated with its occurrence.1,10

Our patient had a dissected RIMA aneurysm found 3 months after the occurrence of an acute aortic dissection, which was a comparatively early stage. Two other previously reported cases of an IMA aneurysm occurred after the onset of acute aortic dissection13,17; however, combined cases in patients without a genetic cause have not been reported. After a retrospective review of our patient’s previous CT scan, no dissection was found on the right subclavian artery that branched from the dissected brachiophealcal artery with its completely thrombosed false lumen. However, the RIMA was dissected, and aneurysmal changes were found only at the second intercostal space. We had difficulty establishing the cause of the aneurysm that occurred only in the RIMA, because the patient had no chest trauma, previous medical procedure, or advancement of the previous aortic dissection. Considering the risks of arterial dissection in other parts, a careful regular medical check-up by surveillance imaging with CT is required.

Treatment methods should be selected after carefully considering the aneurysm size, speed of development, and presence of symptoms. Immediate surgery should be performed if the patient has a high risk of rupture, which is present in most large aneurysms, pseudoaneurysms, and aneurysms caused by connective tissue.12,13 At present, the two surgical treatment methods performed are open surgery and endovascular treatment. Endovascular treatment can be applied during coil embolization and stent implantation, and its use is increasing because of improvements in medical technology.13,14 As a result, the number of IMA aneurysm cases successfully treated with this method is increasing.2,4,8,12,13,16,18

Endovascular treatment is a minimally invasive procedure that is especially effective for older and severely ill patients, as well as patient with Marfan and Loeys-Dietz syndromes, who often require surgery. We considered
the RIMA aneurysm in our patient to be at a high risk of rupture, even though the symptoms were not severe, because of its rapid progression. In addition, we determined that procedures requiring access to the patient’s vessels were too dangerous owing to the potential for vascular complications and the patient’s history of aortic dissection. Therefore, we decided to treat the dissected RIMA aneurysm with thoracoscopic surgery, even though the use of this surgical method for the treatment of an IMA aneurysm had not been reported. In retrospect, we think that the right radial or brachial approach would have avoided the dissected portions of the arteries and allowed minimally invasive embolization. The operation was performed with the cooperation of thoracic surgeons who were skilled in handling thoracoscopy, and the RIMA aneurysm was successfully resected.

The general prognosis of IMA aneurysms is satisfactory. However, determining the appropriate treatment method for patients with vascular fragility is difficult. In cases of IMA aneurysm where the choice of open surgery is unclear, thoracoscopic surgery with endovascular treatment may be an effective treatment option. This
treatment method is minimally invasive and may be adopted even for complicated and high-risk cases, such as those with vascular diseases.

CONCLUSIONS

This report presents a new case of a solitary RIMA aneurysm, which developed after the occurrence of an acute aortic dissection type A, that was successfully resected with thoracoscopic surgery.

REFERENCES

1. Okura Y, Kawasaki T, Hiura T, Seki H, Saito H. Aneurysm of the internal mammary artery with cystic medial degeneration. Intern Med 2012;51:2335-9.
2. Lindblom R, Zemgulis V, Liliejqvist A, Nyman R. Even small aneurysm can bleed: a ruptured small idiopathic aneurysm of the internal thoracic artery. Interact Cardiovasc Thorac Surg 2013;17:583-5.
3. Heyn J, Zimmermann H, Klose A, Luchting B, Hinske C, Azandaryani MS. Idiopathic internal mammary artery aneurysm. J Surg Case Rep 2014;12:1-3.
4. Almerey T, Paz-Fumagalli R, Farres H, Oldenburg WA, Hakaim AG. Idiopathic internal mammary artery aneurysm in the setting of aberrant right subclavian artery. J Vasc Surg Cases Innov Tech 2017;3:251-3.
5. Phan TG, Sakulsaengprapha A, Wilson M, Wing R. Ruptured internal mammary artery aneurysm presenting as massive spontaneous haemothorax in a patient with Ehlers-Danlos syndrome. Aust N Z J Med 1998;28:210-1.
6. Chan LW, Fermanis GG. Spontaneous hemothorax caused by an internal mammary artery aneurysm. Aust N Z J Surg 1996;66:332-3.
7. Soda H, Mashimoto H, Funatsu S, Komori K, Ikebe A, Nakano M, et al. Spontaneous rupture of an internal thoracic artery in a patient with neurofibromatosis. Jpn J Chest Dis 1984;43:77-82.
8. Fujiyoshi T, Nishibe T, Koizumi N, Ogino H. Coil embolization of bilateral internal mammary artery aneurysm is durable in a patient with Marfan syndrome. J Vasc Surg Cases Innov Tech 2018;4:216-9.
9. Otter GD, Stam J. Aneurysm of internal mammary artery. Thorax 1978;33:525-7.
10. Connery CP, Cramer SF, Cheeren D. Multiple aneurysm of the internal thoracic artery. Ann Thorac Surg 1995;59:1561-3.
11. Tabata T, Handa M, Ashino Y, Ono S, Tanita T, Fujimura S. A true aneurysm of the right internal mammary artery, accompanied by diminished grasping power of the right hand. Jpn J Thoracic Diseases 1995;33:1330-3.
12. Rose JF, Lucas LC, Bui TD, Mills JI Jr. Endovascular treatment of ruptured axillary and large internal mammary artery aneurysm in a patient with Marfan syndrome. J Vasc Surg 2011;53:478-82.
13. Ohman JW, Charlton-Ouw KM, Azizzadeh A. Endovascular repair of an internal mammary artery aneurysm in a patient with Loeys-Dietz syndrome. J Vasc Surg 2012;55:837-40.
14. Ma RY, Yang ZY, Jian Z, Chen L, Xiao YB. Traumatic aneurysm of the right internal thoracic artery. Ann Thorac Surg 2012;93: e107.
15. Wildhirt S, Eckel L, Beyersdorf F, Satter P. Atherosclerotic aneurysm of the right internal mammary artery presenting as a mediastinal mass. J Thorac Cardiovasc Surg 1994;107:1555-6.
16. Kugai T, Chibana M. Non-trauma-induced aneurysm of the left internal thoracic artery with ischemic heart disease-A case report and review of the literature. Jpn J Cardiovasc Surg 1999;28:260-3.
17. Burke C, Shalhub S, Starnes BW. Endovascular repair of an internal mammary artery aneurysm in a patient with SMAD-3 mutation. J Vasc Surg 2015;62:486-8.
18. Common AA, Pressacco J, Wilson JK. Internal mammary artery aneurysm in Marfan syndrome. Can Assoc Radiol J 1999;50:47-50.

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