

Case Report

Operation for huge subclavian artery aneurysm: a case report

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ABSTRACT

Subclavian artery aneurysm is extremely rare, and further aneurysm compressing trachea and leading to breathing difficulty is more exceptional. The most common causes of subclavian artery aneurysm are atherosclerosis, trauma and post-stenotic dilated aneurysm secondary to thoracic outlet syndrome, besides, the rare causes include infective, syphilitic media necrosis and so on. We present a case report in which the patient presented with severe dyspnea due to compression of trachea by a 7 cm large subclavian artery aneurysm. After operation, the patient improved symptomatically. The blood pressure remained stable, blood circulation of right upper extremity was fine, and pulse was improved comparing with that before operation. Chest film confirmed tumor shrank and depressed trachea improved significantly. The patient was discharged 14 days later and continued anticoagulant therapy after discharge. Follow up one month later after the operation revealed breathing difficulty disappeared, and patient was with normal right upper extremity movement and good blood circulation.

Key Words:

huge subclavian artery aneurysm; surgical management

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Introduction

Subclavian artery aneurysm is extremely rare, and further aneurysm compressing trachea and leading to breathing difficulty is more exceptional. Here, We present a case report in which the patient presented with severe dyspnea due to compression of trachea by a 7 cm large subclavian artery aneurysm.

Case report

A 42-year-old female with post medical history of uncontrolled hypertension presented with the complaint of intermittent cough, chest discomfort and dyspnea for more than one year. Anti-inflammatory therapy was given for cough and dyspnea but the symptoms aggravated gradually. A chest X-ray (CXR) revealed right upper mediastinal haziness and Computed Tomography (CT) showed a possibility of right subclavian artery aneurysm (Fig 1). On physical exam, no difference in blood pressure was noted between the two arms. Trachea was slightly shifted to the

left. Chest auscultation revealed decreased air enter in the right upper lobe with no rhonchi and crepitations. Right radial artery pulse was weaker as compared to the left radial artery.

CTA of the chest revealed an aneurysm in the first portion of the right subclavian artery with smooth and complete boundaries. Trachea was pushed to the right with decrease in the lumen of the trachea (Fig 2). Magnetic resonance angiography (MRA) revealed an aneurysm with afferent loop and efferent loop measuring 7.0 cm, and that the brachiocephalic trunk and right common carotid artery were tortuous due to compression (Fig 3).

Operation method

After successful general anesthesia, a median incision over sternum was made to divide sternum longitudinally so as to expose and protect right phrenic nerve, left and right innominate veins and superior vena cava. A huge lump was detected over right neck and right superior mediastinum, upper boundary of which extended to lower pole of thyroid gland, lower boundary was over aortic arch and ascending aorta. The lump was not pulsatile. Proximal end of tumor body was 2 cm away from the origination of subclavian artery, while edge of distal part was not clear. Superior vena cava and left innominate vein were compressed to the right by the tumor, right innominate artery and common carotid artery pressed toward the left, and trachea deformed toward left. Tumor body was closely adhered to the above

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Fig 1. CT revealed a circular high density shadow over right superior mediastinum (1), and trachea was compressed obviously (2).



Fig 3. MRA revealed Brachiocephalic trunk and right common carotid artery were tortuous due to compression.



Fig 2. CTA revealed A circular high density shadow (3) over the origination of right subclavian artery (1), boundary of which was smooth and complete, with a diameter of about 7cm. Trachea (2) was compressed to the right, with lumen obviously narrowed.

mentioned arteries and retrosternal tissues. We cautiously dissociated and blocked originations of right innominate artery, right common carotid artery and right subclavian artery. A transverse infraclavicular incision was made over right midclavicular line to expose axillary artery, and then covered a blocking belt over there. After blocking originations of right axillary artery and subclavian artery, body of aneurysm was incised. It was observed that right vertebral artery was breached on posterior wall of the tumor body with massive bleeding, so suture was

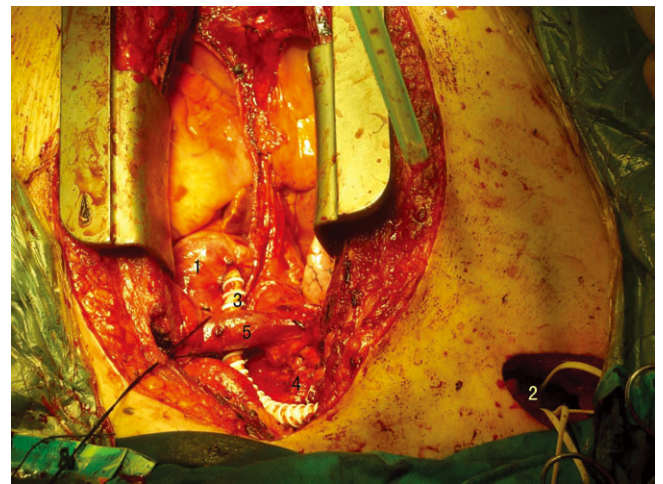


Fig 4. Operation method: 1. ascending aorta; 2. subclavicular incision, with distal end of subclavian artery; 3. artificial blood vessel; 4. site of aneurysm suture; 5. left brachiocephalic veins.

performed. According to exploration, the aneurysm cavity was about 7×7×6cm in size. The cavity was kept exclusion after aneurysmal sac suture. Origination of right subclavian artery and proximal end of right axillary artery were ligated, and an artificial ePTFE blood vessel with stent, 6mm in diameter, was grafted over distal end of ascending aorta and right axillary artery. Anastomosis was performed after venting (Fig 4). Blood flew fluently, and there was no hemorrhage over stoma.

After operation, patient improved symptomatically. The blood pressure remained stable, blood circulation of right upper extremity was fine, and pulse was improved comparing with that before operation. Chest film

confirmed tumor shrank and depressed trachea improved significantly. The patient was discharged 14 days later and continued anticoagulant therapy after discharge. Follow up one month later after the operation revealed breathing difficulty disappeared, and patient was with normal right upper extremity movement and good blood circulation.

Discussion

Subclavian artery aneurysm is an extremely rare entity while true atherosclerotic aneurysm is even more rare. Dent et al have reported that only 2 out of 1488 cases of atherosclerotic aneurysm had subclavian artery aneurysm, with an incidence of about 0.13% (1). The most common causes of subclavian artery aneurysm are atherosclerosis, trauma and post-stenotic dilated aneurysm secondary to thoracic outlet syndrome, besides, the rare causes include infective, syphilitic media necrosis and so on (2). Symptoms of subclavian artery aneurysm are determined by the aneurysm site and size. Extrathoracic aneurysm usually presents with pulsatile lump over supraclavicular fossa with pulsation and vascular murmurs; whereas intrathoracic aneurysm or post-stenotic dilated aneurysm compress brachial plexus or upper extremity vessels leading to the ischemia of the limb; while tumor body eroding apex of lung might cause hemoptysis; compress recurrent laryngeal nerve resulting in hoarse voice; besides, there are reports about dysphagia and Horner's syndrome as well (3), however, dyspnea caused by trachea compression is seldom reported.

Chest CTA reveals tumor site, size and artery strikes. Not only is CTA a valuable diagnostic investigation, but also it helpful for operational approach. (4). Color ultrasonography has definite value for giving preoperative diagnosis and evaluating postoperative therapeutic effect during follow up since it is a non-invasive technique and can be repeated when needed.

As spontaneous rupture and thrombosis are common risks associated with subclavian artery aneurysm, so it is highly recommended to correct the aneurysm especially in patients with compressive symptoms (5, 6).

Surgery technique selection is important because subclavian artery aneurysm is close to brachial plexus, vessels over lateral branches are rich, and clavicle and sternum cover the front, which makes it difficult for full exploration. Pathway selection principle is to choose inflow and outflow tracts, which would benefit for exposing bilateral ends of aneurysm. The most common incisions are as follows: 1. poster lateral incision; 2. incision over the third anterior intercostal space to enter thorax; 3. median incision over sternum for dividing sternum + transverse incision over second or third intercostals space; 4. Supra-

infraclavicular incision (2,7). In this case, tumor was huge and tightly adhered to many arteries and retrosternal tissues, so scheme of median incision over sternum for dividing sternum plus subclavian incision was adopted, which was useful in exposing bilateral inflow and outflow tracts though incisions were invasive.

According to many reports, common operation methods include: 1). Arterial ligation. It is recommended for badly contaminated traumatic aneurysm and aneurysm over distal end of subclavian artery branch; 2). Ateriorrhaphy. It is suitable in cases of post contaminated aneurysm wound repair and without risk of leading to lumen stenosis or obliteration; 3). Blood vessel grafting. It is suitable for comparatively huge aneurysm over origination or trunk of subclavian artery, and the defected artery would be over 3cm after excision (7,8). There are two common blood vessel substitutes: 1). Blood vessel. Great saphenous vein is adopted commonly, however, the transplantation can be followed by complications such as degeneration, calcification and aneurysm; 2). Polymer vessel. It is currently the most commonly applied substitute, but there are reports indicating artificial vessels in small caliber are with low long-term patency rates. Recently, in order to avoid major thoracic surgery, a combined endovascular and open repair (through a supraclavicular incision) was considered the best, minimally invasive treatment option. yet its long-term effect remains to be established on further follow up (4,9).

During the operation, it is generally recommended to expose proximal and distal ends of subclavian artery first, and then handle the tumor body. When necessary, innominate artery and carotid artery are supposed to be blocked, or the operation should be performed in profound hypothermic circulatory arrest under extracorporeal circulation. It is highly recommended not to open the aneurysm sac if the the aneurysm sac adhered to the surrounding tissues with rich collateral circulation as ligation of bilateral ends is effective as well (9).

Exposure of tumor body, tumor inflow & outflow tract control and intracapsular bleeding control after tumor dissection are crucial for the success of the operation. Our experience is to dissociate origination of right innominate artery, right common carotid artery and right subclavian artery first, respectively block them to control blood flow, and then make a transverse subclavian incision, dissociate and control distal end of subclavian artery over aneurysm. Incise anterior wall of aneurysm until the inflow and outflow tracts are under sufficient regulation, and then suture and ligate the vertebral artery breach over intratumoral posterior wall, transect proximal and distal arteries of tumor finally so that to perform artificial vessel graft in comparative calibers. Measures,

such as endotracheal combined anesthesia, keeping stable intraoperative and postoperative blood pressure, stable hemodynamics maintenance, postoperative intensive care therapy, are all vital for enhancing efficacy and reducing complications.

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