

Surgical Treatment for Innominate Artery Aneurysm with a Coronary Pulmonary Artery Fistula: A Case Report

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A 50-year-old woman complained of hoarseness and chest X-ray demonstrated a widening of the superior mediastinum. Computed tomography scanning and aortography demonstrated aneurysmal dilatation at the innominate artery. Coronary arteriography showed a coronary pulmonary artery fistula originating from the left anterior descending artery. The surgical procedure was prosthetic bifurcated bypass grafting from the ascending aorta to the right common carotid artery and right subclavian artery. During the period of innominate artery occlusion, the patient was cooled to 25°C with selective cerebroperfusion and circulatory arrest. Pathologic diagnosis of the specimen was that of a true aneurysm with atherosclerotic plaque and calcification. The coronary pulmonary artery fistula was closed inside the pulmonary artery. There were no signs of neurologic deficit noted. Innominate artery aneurysm is uncommon and the surgical approach varies in each case. A coronary artery fistula is also an uncommon congenital malformation but has been recognized more often with the improvement in diagnostic techniques such as selective coronary arteriography. We performed successful surgical treatment for a rare case of innominate artery aneurysm with a coronary pulmonary artery fistula. (*Ann Thorac Cardiovasc Surg* 2005; 11: 55–8)

Key words: innominate artery aneurysm, coronary pulmonary artery fistula

Introduction

Innominate artery aneurysm is an uncommon entity but may arise from trauma, infection, or atherosclerotic degeneration. Atherosclerosis in the brachiocephalic vessels generally results in occlusive disease; however, approximately 4% of all surgeries on the innominate artery are for aneurysmal disease.¹⁾ An innominate artery aneurysm is usually detected as an asymptomatic mass on chest X-ray but may present with neurologic symptoms from emboli or mediastinal compression due to aneurysmal enlargement.²⁾ Surgery is indicated due to the propensity

for these aneurysms to enlarge, rupture, thrombose, or embolize. A coronary artery fistula is also an uncommon congenital malformation^{3,4)} but has been recognized more often with the improvement in diagnostic techniques such as selective coronary arteriography. Krause first described a coronary artery fistula in 1865 as characterized by the involved coronary artery having a normal origin from the aorta with a fistulous communication with the atria or ventricles, or with the pulmonary artery.⁵⁾ An unusual case undergoing surgical treatment for an innominate artery aneurysm with a coronary pulmonary artery fistula is presented.

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Case Report

A 50-year-old woman was referred our hospital for evaluation of hoarseness. She had a history of traffic accident resulting in right rib fracture seven years earlier. Chest X-ray demonstrated widening of the superior mediasti-

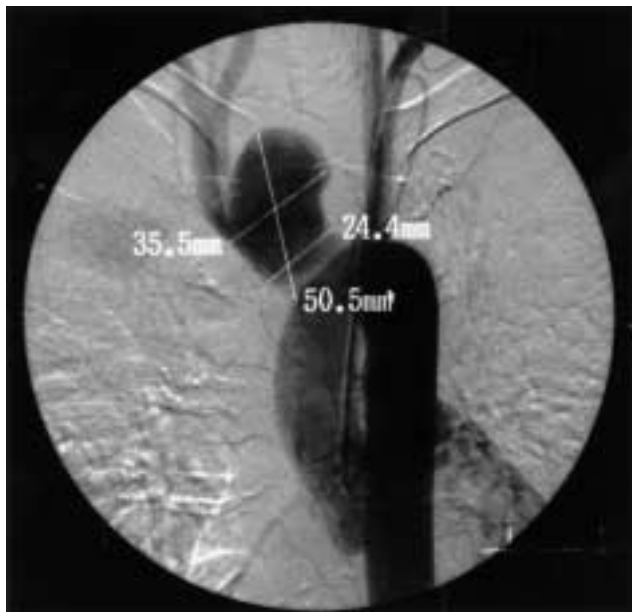


Fig. 1. Aortography demonstrated an isolated saccular aneurysm of an innominate artery.

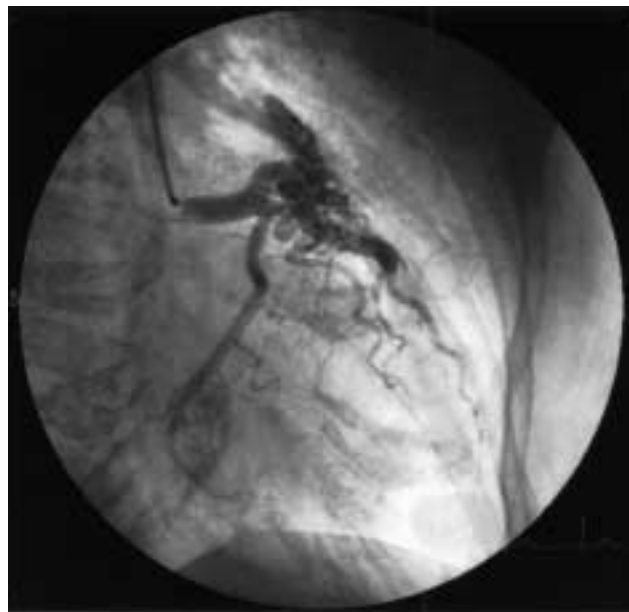


Fig. 2. Coronary arteriography showed a coronary pulmonary artery fistula originating from the left anterior descending artery.

num. Electrocardiogram showed normal findings. Chest computed tomography demonstrated an aneurysm, 45 mm in maximal diameter, at the innominate artery. Aortography demonstrated an isolated saccular aneurysm of an innominate artery (Fig. 1). Coronary arteriography showed a coronary pulmonary artery fistula originating from the left anterior descending artery (Fig. 2).

We planned prosthetic bypass grafting from the ascending aorta to the right common carotid artery and right subclavian artery. The right common carotid and right subclavian arteries were isolated through a right supraclavicular incision connected to a median sternotomy. A 33×47 mm saccular aneurysm was identified at the innominate artery. Cardiopulmonary bypass was established from both vena cava to the right common femoral artery. The left ventricle was vented through the right superior pulmonary vein. Because the aneurysm involved the proximal aortic arch, we induced circulatory arrest under moderate hypothermia at 25°C core temperature. After aortic cross clamping, cardiopulmonary bypass was stopped and the heart was arrested with continuous antegrade cold cardioplegia. The innominate artery aneurysm was opened and selective cerebral cannulas were inserted into both common carotid arteries. The saccular portion of the aneurysm showed thrombus. A 14×7-mm Hemashield (Meadox Medicals, Oakland, NJ) bifurcated graft was anastomosed to the ascending aorta in an end-

to-side fashion apart from the innominate origin. The aneurysm was resected and the innominate origin was trimmed and closed with horizontal mattress over and over suture. Selective cerebral cannula of the left common carotid artery was removed. Systemic perfusion was restarted and the patient was rewarmed. The right common carotid artery was anastomosed in an end-to-end fashion and selective cerebral cannula of the right common carotid artery was removed. Finally the right subclavian artery was anastomosed in an end-to-end fashion (Fig. 3). Under complete cardiopulmonary bypass, the pulmonary artery was opened to expose the termination of the coronary artery fistula. The fistula was closed inside the pulmonary artery using 5-0 Prolene. Cardiopulmonary bypass time was 190 minutes, the aortic cross clamp time was 66 minutes, the duration of circulatory arrest was 9 minutes and that of selective cerebral perfusion was 57 minutes. The patient's postoperative course was uncomplicated. On the twenty-first day, the patient was discharged home, free of any signs or symptoms. Pathological diagnosis of specimen was true aneurysm with atherosclerotic plaque and calcification.

Discussion

An innominate artery aneurysm is an uncommon entity but may arise from trauma, infection, or atherosclerotic

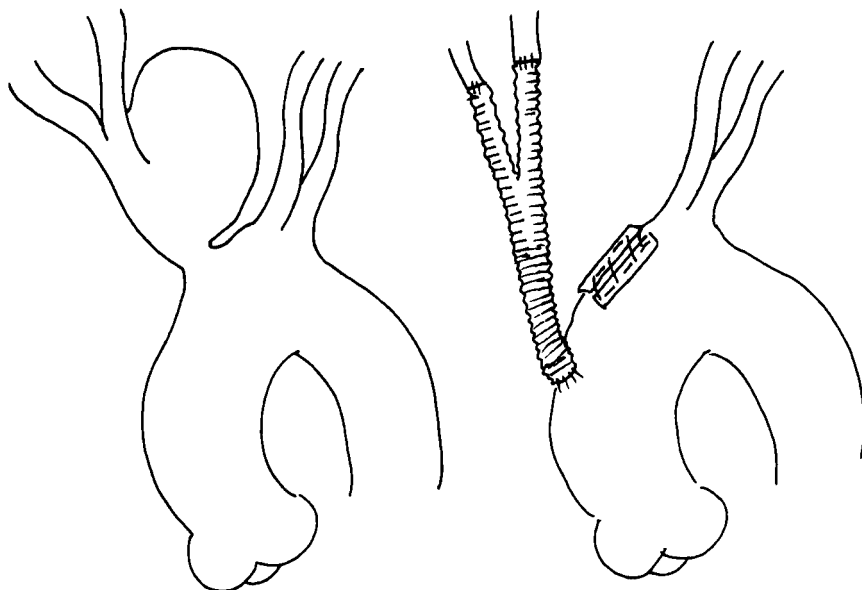


Fig. 3. Illustration of surgical procedure.

degeneration. Atherosclerosis in the brachiocephalic vessels generally results in occlusive disease; however, approximately 4% of all surgeries on the innominate artery are due to aneurysmal disease.¹⁾ Pathologic changes in the brachiocephalic vessels from atherosclerosis generally lead to occlusive lesions or to aneurysmal changes on the aortic arch with extension to the brachiocephalic trunk. An innominate artery aneurysm is usually detected as an asymptomatic mass on chest X-ray but may present with neurologic symptoms from emboli or mediastinal compression due to aneurysmal enlargement.²⁾ When identified, an innominate artery aneurysm requires surgical management to prevent the complications associated with any aneurysm, i.e., enlargement, thrombosis, rupture, or embolization. Kieffer et al. mentioned that patients with isolated asymptomatic aneurysms who are at high surgical risk should undergo surgery when the aneurysms are saccular or when their maximum transverse diameter is more than 3 cm.⁶⁾ Various surgical approaches have been devised for the treatment of the innominate artery aneurysm and include ligation alone,⁷⁾ patch angioplasty,⁸⁾ resection with end-to-end anastomosis,⁹⁾ and bypass with either saphenous vein,²⁾ or prosthetic grafts.¹⁾

Intraoperative cerebral protection is also important to avoid the neurological deficit. Multiple placements of the aortic cross-clamp may increase the risk of intimal damage or embolization in an atherosclerotic aorta. In this case, the aneurysm involved the proximal aortic arch, we induced circulatory arrest under moderate hypothermia

under selective cerebral perfusion.

A coronary artery fistula is an uncommon congenital malformation^{2,3)} and recognized more often with the improvement in diagnostic techniques, such as selective coronary arteriography. The fistula most commonly originates from the right coronary artery (RCA) (55%), but may arise from the left coronary artery (LCA) (35%), both coronary arteries (5%), or an anomalous single coronary artery (3%).¹⁰⁾ The low-pressure chamber is the usual drainage site: the right ventricle in 42.5%; the right atrium in 34%; the pulmonary artery in 15%; the left atrium in 5%; and the left ventricle in 3.5%.¹¹⁾ Pathophysiological condition of a coronary fistula is that of left-to-right shunt, which generally increases in size, leading to congestive heart failure¹²⁻¹⁴⁾ and development of myocardial ischemia by steal phenomenon¹⁵⁾ with or without arrhythmia or myocardial infarction.^{16,17)} Hemodynamic consequences and clinical presentation depend on the size of the fistula and on the communicating structure. Surgical closure of the coronary fistula is widely accepted in symptomatic patients but controversy exists in the absence of symptoms; however, sudden death or congestive heart failure may represent the first symptoms of coronary fistula. For this reason some surgeons advocate surgical treatment even in asymptomatic patients. We performed suture closure of the fistula inside the pulmonary artery because simple ligation of the fistula may have led to late recanalisation.

Conclusion

In this case, an innominate artery aneurysm involved the proximal aortic arch and it was thought that multiple placements of the aortic cross-clamp would increase the risk of neurological complication. Therefore, selective cerebral perfusion, profound hypothermia and circulatory arrest were selected. Preoperative detection of the origin and termination of the coronary artery fistula is important to avoid postoperative recanalisation.

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