Large post-stenting innominate artery pseudoaneurysm

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Abstract

Pseudoaneurysms of the sovra-aortic trunks are uncommon lesions that usually have a post-traumatic etiology. The singular case of a patient who developed an innominate artery pseudoaneurysm (IAP) where a stent had been inserted 12 years earlier to manage severe innominate trunk stenosis is described. A chronic and large (8 cm in diameter) IAP was successfully treated in extracorporeal circulation and deep hypothermic circulatory arrest. The distal tract of the ascending aorta and the proximal aortic arch were substituted; total replacement of the innominate trunk with a singular 8-mm Dacron graft was necessary. We reviewed the literature about the reports of IAPs and the management of this singular lesion.

Keywords: Pseudoaneurysm; Innominate artery; Stenting

1. Case report

Among the mediastinal vascular lesions, innominate artery pseudoaneurysm (IAP) is not a common clinical report. Symptoms of chronic thoracic aorta false aneurysm or chronic false aneurysm of the innominate artery may be minimal and, consequently, a high degree of suspicion plus serial imaging is mandatory. Some reports exist about innominate artery rupture and acute or chronic pseudoaneurysms due to chest trauma [1–4]. More recently, mediastinal vascular pseudoaneurysms are increasing as late complications following thoracic aortic surgery, associated with a substantial morbidity and mortality [5, 6].

We present a singular case of a large chronic IAP which developed in a patient who, twelve years earlier, had been submitted to the endovascular positioning of a stent for the treatment of a severe stenosis producing symptoms of vertebrobasilar insufficiency. This lesion was surgically treated with good results, as described below.

A 71-year-old man with type 2 diabetes, multi-drug treated hypertension and a previous history of heavy smoking, was referred to our institution because of persistent but moderate thoracic pain, increasing dyspnoea and cough without hemoptysis. A recent chest radiogram showed a right-sided mediastinal enlargement. There was no history of thoracic trauma or cardiovascular surgery. The patient did not complain of episodes of syncope or acute thoracic pain. Twelve years earlier, he had undergone an endovascular procedure with angioplasty and stenting of the first tract of the innominate trunk for a severe stenosis and symptomatic vertebrobasilar insufficiency. The patient could not report any specific medical document about this procedure, but he did not refer to any correlated complication.

With the suspicion of a sub-acute or chronic aortic dissection, a computed tomography (CT) scan of the chest with bi-dimensional reconstruction was performed. It demonstrated a large pseudoaneurysm of the thoracic aorta and the origin of the innominate artery, in the region of the stent (measuring approximately 8 cm in diameter) clearly posing an indication for surgery. CT-scan did not disclose calcifications within the pseudoaneurysmatic sac or around it (Fig. 1).

Peripheral cardiopulmonary bypass between the right femoral artery and vein was started before median sternotomy. We isolated a voluminous pseudoaneurysm involving the distal tract of the ascending aorta, the proximal tract of the arch and the origin of the innominate trunk. The pulmonary arteries and the left main bronchus appeared distorted. The patient was cooled to 18 °C (nasopharyngeal temperature) and bypass circulation was stopped. During circulatory arrest antegrade selective cerebral perfusion was maintained by selective direct cannulation of the innominate artery and the left common carotid artery. Opening the pseudoaneurysmatic sac, an evident tear was detected, from the postero-lateral portion of the innominate trunk to the arch wall, in the region of the insertion of the vessel. The previously placed stent was dislocated and it protruded distally into the aortic lumen (Fig. 2). After removing the stent, the pseudoaneurysmatic cavity was inspected through the tear but we did not find any signs of infection or thrombosis. We proceeded with a debridement of the pseudoaneurysmatic sac. Then the terminal portion of the ascending aorta and the proximal...
Fig. 1. CT angiogram aortic reconstruction showing morphology of the aorta and large pseudoaneurysm of the thoracic aorta and the origin of the innominate artery, in the region of the stent.

Fig. 2. The previously placed stent dislocated into the aortic arch lumen.

Fig. 3. The final surgical result: complete repair of ascending aorta, aortic arch and innominate trunk.

Fig. 4. CT-scan with 3-D reconstruction showing a good surgical result.

arch close to the origin of the innominate trunk were excised. The innominate artery was resected near its distal bifurcation. A 26-mm Dacron graft was sutured between the ascending aorta and the distal tract of the arch. After a careful de-airing, the cardiopulmonary bypass was slowly restarted. An 8-mm Dacron graft was then interposed between the distal tract of the innominate artery and the 26-mm Dacron graft (Fig. 3). After a gradual rewarming, the bypass was easily weaned.

The postoperative course was uneventful and the patient remained neurologically intact. The histological study of the innominate artery and the removed portion of the aortic wall revealed important atherosclerotic changes without evidence of the infection. The patient was discharged from hospital on postoperative day 11 and he was transferred to a rehabilitation facility for 15 days. At the control visit six months later, his cardiovascular and thoracic conditions were good. Eight months after the operation, a CT-scan with 3-D reconstruction showed us a good surgical result (Fig. 4). We have now a follow-up of 20 months.

2. Comment

Excluding the traumatic etiology, IAP is a very rare entity. To our knowledge, this is the first reported case of a pseudoaneurysm involving the innominate artery (IAP) as a result of a previous endovascular stenting of the vessel. Generally, non-traumatic thoracic vascular pseudoaneurysms are often a consequence of chronicized aortic dissections or aortitis (mycotic aortic pseudoaneurysms). The formation of a mediastinal vascular pseudoaneurysm may theoretically start from the innominate artery, but more frequently it develops from an aortic wall lesion, without direct involvement of the head vessels.
Thoracic pseudoaneurysms are reported as negative results of surgical cardiovascular procedures in cases of infected vascular graft or mediastinitis, tissue necrosis due to glue toxicity, suture dehiscence or aorta with weak points at the site of the proximal anastomoses of the grafts, aortotomies, or in the cannulation sites. But late pseudoaneurysms can be also an additional, potential complication of thoracic vascular endostenting, like we observed in our patient. Endovascular approaches are being increasingly utilized to treat a variety of thoracic aortic pathologies and probably in the near future we will have to deal as surgeons with more pseudoaneurysmatic lesions due to thoracic aorta endostents.

Sometimes iatrogenic head vessel pseudoaneurysms are reported as a result of a central venous cannulation, but the innominate artery is rarely involved [7]. Another type of lesion of the innominate artery is an acute condition like the tracheo-innominate artery fistula, that remains an uncommon but highly fatal complication related to a permanent tracheostomy and a peritracheal pathology [8]. A spontaneous rupture of the vessel has been also described [9].

IAPs can be detected by an accurate evaluation with angio-CT scan or with MRI. When the pseudoaneurysm appears limited to the innominate trunk, a surgical repair with the bypass exclusion technique and without cardiopulmonary bypass is a possible treatment, as described in some traumatic series [1–3]. Endovascular stenting can be considered an alternative treatment, especially in emergency or high-risk conditions, when a radical surgery is not feasible, in localized lesions [10]. When IAP is very large and involves the thoracic aorta, a partial substitution of the arch and of the distal tract of the ascending aorta, in conjunction with the reimplantation of the innominate trunk is necessary in deep or moderate hypothermic circulatory arrest, using brain protection techniques. Most patients with a thoracic vascular pseudoaneurysm require extensive thoracic aorta replacement, which can be accomplished with low operative mortality and morbidity. Long-term survival and freedom from reoperation in these patients parallel those expected for complex cardiac and aortic disease [6, 11]. A hybrid approach with aortic arch endostenting and debranching of the head vessels can be performed in selected cases. In this case we preferred to open the aorta, extract the previous implanted stent without risks and control the eventual presence of an infection.

Although technical skill is imperative, decisions regarding diagnosis, operative approach and peri-operative patient care significantly influence outcome. Careful planning and attention to detail can minimize operative risk.

References