A 54-year-old man was referred for an abnormality detected on a routine preoperative chest radiograph (for ophthalmological surgery). He had a history notable for a myocardial infarction that occurred 18 years ago, followed 1 year later by a four-vessel coronary artery bypass graft (CABG). The patient was symptom-free until 1 year ago, when mild angina symptoms recurred. He was a smoker known to have arterial hypertension, hyperlipidemia, and peptic ulcer disease, which were well controlled with appropriate medication. There was no history of trauma. The physical examination was not contributory.

Since his CABG surgery, two chest radiographs had been obtained in the course of investigation of minor medical problems. Eight years ago, a chest radiograph had been interpreted as normal. Five years later, a mediastinal mass was noted, which measured $4.2 \times 5$ cm in diameter. No further investigation was done, and the patient remained without symptoms. The preoperative radiograph that brought the patient to our attention is showed in Figure 1. The radiological investigation was then pursued with a CT and an MRI examination of the thorax (Figs 2, 3).

What is the diagnosis?
Figure 2. CT scan showing a slightly heterogeneous mass, lateral to the pulmonary artery trunk. Discrete mural calcifications in its innermost segment (arrow) suggest the vascular nature of the lesion.

Figure 3. Axial gadolinium-enhanced spoiled gradient echo MRI. Only the central portion (arrow) of the voluminous mass demonstrates a hyperintense signal, due to the presence of vascular flow. The remainder of the mass is constituted of parietal thrombus.
Diagnosis: Pseudoaneurysm of an aortocoronary bypass graft.

The chest radiograph (Fig 1) displays a left-sided homogeneous anterior mediastinal mass, measuring $7 \times 6.5$ cm, sitting above the left ventricle. The cardiac silhouette is otherwise normal. There is no associated adenopathy or pleuraparenchymal abnormality. Sutures from the previous median sternotomy are seen.

The unenhanced CT scan (Fig 2) shows a soft-tissue mass, lateral to the main pulmonary artery. The mass is slightly heterogeneous, with discrete mural calcifications medially; it measures $8 \times 6 \times 6$ cm in maximal diameter. Because of the wall calcifications and the location close to the site of the previous bypass graft, the possibility of a vascular lesion was raised, and an MRI study was prescribed, which later confirmed the vascular nature of the mass (Fig 3).

Coronarography (Fig 4) was then performed to determine with greater precision the origin of the vascular mass. The aortocoronary graft bridging the left anterior descending artery as well as distal marginal branches presents two successive aneurysmal dilatations. These dilatations are enveloped in a voluminous pulsating mass, representing a large, partially thrombosed false aneurysm.

Surgery confirmed the diagnosis. The patient underwent surgical resection of the aneurysms with success, followed by graft replacement. The postoperative course was uneventful.

**DISCUSSION**

Aneurysmal disease of the native coronary circulation is recognized in 1.4 to 4.9% of angiographic studies, but aneurysms of saphenous vein grafts are rare. The first case was reported in 1972, in a patient having undergone carotid artery bypass grafting. In 1975, Riahi and coworkers reported the first false aneurysm of an aortocoronary saphenous vein graft. Despite the large number of patients undergoing coronary artery bypass grafting with autogenous saphenous veins, formation of false or true aneurysms of venous grafts remains uncommon.

Saphenous vein aneurysms can be located anywhere along the graft. When located at the anastomotic sites (suture line aneurysms), they almost always represent false (or pseudo) aneurysms and consist of a focal disruption with hematoma formation. These aneurysms have no endothelial lining. Proximal suture line aneurysms are more common than distal ones and represent a dilatation secondary to a disruption of one or more layers of the wall. Pseudoaneurysms are usually found in the weeks or months following the procedure and can be associated with wound infection or intrinsic or iatrogenic weakness of the wall. Iatrogenic trauma to the saphenous vein during harvesting is a known cause. Inherent weak sites in the venous graft have been described as well, found at valve sites or at branch points, where the normal circumferential arrangement of the smooth muscle layers in the media takes on a longitudinal orientation, thereby creating a weak point of resistance to the stress generated by arterial pressure. One report describes formation of a large pseudoaneurysm after placement of a stent across a severely stenotic venous graft segment.

The feared complication of anastomotic aneurysms is dehiscence of the anastomosis with life-threatening hemorrhage. Indeed, in many case reports, such aneurysms presented as a massive hemorrhage in the postoperative period, as early as in the first 10 days after the intervention. Sepsis or severe atherosclerosis of the ascending aorta are aggravating factors.

True aneurysms, on the other hand, represent expansion of all layers of the wall, and are more commonly found within the body of the graft. With
few exceptions, most authors agree that they are less common than pseudoaneurysms. They usually present 5 years or more after the initial intervention, with a reported range of 2 months to 21 years. The pathogenesis of these true aneurysms is not fully understood. These aneurysms probably develop because of progressive atherosclerosis; exposure of saphenous vein grafts to systemic BP results in atherosclerotic changes in the graft, especially in patients with other risk factors for atherosclerosis. Indeed, only 40 to 45% of grafts have normal angiographic appearance 10 years after the grafting procedure, and Teja and coworkers have shown an increased incidence of aneurysms in patients who continue to show hyperlipidemia after CABG. Mycotic infection and sepsis may also, albeit rarely, result in aneurysm formation.

False and true venous graft aneurysms are often asymptomatic and discovered as an incidental finding, as in our patient. When the aneurysm is symptomatic, it is usually due to myocardial ischemia. It is estimated that the aneurysm is partially thrombosed in about one half of patients, thereby leading to occlusion and episodic distal embolization. In one case, the patient presented with a pulsatile retrosternal mass detected on physical examination. Complications of venous graft aneurysms include myocardial infarction, fistula formation to the right atrium or right ventricle, rupture, and secondary hemorrhage.

Treatment includes exclusion of the aneurysm, thrombectomy, or resection of the aneurysm with myocardial revascularization, taking special care to prevent distal propagation of intraluminal thrombus and atherosclerotic debris.

Vein graft aneurysms are easily detected on CT studies. They can occasionally be detected on routine chest radiographs, where they present as para-vascular, hilar, or mediastinal masses. Differential diagnosis includes aneurysmal dilatation of other vascular structures, lymphadenopathy, lesions of thymic or thyroid origin, teratoma, and bronchogenic or pericardial cysts. On CT, including ultrafast electron beam CT or MRI, these lesions appear as enhancing tubular masses of mixed density, along the heart border. The largest reported false aneurysm measured 13 cm in diameter on CT. Dynamic CT or MR studies can show the lesion enhancing simultaneously with the descending aorta, later than the pulmonary artery. Transesophageal and traditional echocardiograms show hypoechoic masses.

To date, the method of choice for evaluating graft status in CABG patients is coronary angiography. However, Lopez-Velarde and coworkers reported the case of a patient presenting with a nonenhancing anterior mediastinal mass on CT. Coronary angiography missed the diagnosis because there was no visualization of the graft, which was thrombosed; final diagnosis was made at surgery. Even when visible on coronarography, the presence of mural thrombus can underestimate the aneurysm’s true dimensions. A recent report demonstrates the promising features of contrast-enhanced breath-hold MR angiography in the characterization of venous grafts; more work is needed before this diagnostic test can be routinely put to use in clinical practice.

A preoperative diagnosis of saphenous vein aneurysm was not made in the majority of reported cases, sometimes leading to increased morbidity and mortality. In a patient having undergone a CABG procedure, the appearance of a mediastinal mass on a chest radiograph should raise the suspicion of a dilatation of the venous graft. Early recognition will help to prevent complications associated with delayed diagnosis, unnecessary biopsy, or inadequately planned thoracotomy.

References
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