Suprarenal abdominal aortic dissection with retrograde formation of a massive descending thoracic aneurysm

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Abdominal aortic dissections are rare events, particularly those that originate in a suprarenal location. We herein report such a patient whose chronic dissection resulted in the formation of a giant descending thoracic aneurysm. (J Vasc Surg 1998;27:180-2.)

Spontaneous aortic dissections that originate from tears in the abdominal aorta constitute no more than 1% to 2% of all aortic dissections.[1] Rarer still are cases of abdominal aortic dissections arising in suprarenal locations, as most appear from infrarenal intimal defects.[2] Nonetheless, successful surgical repair in these cases has been reported.[3,4] We present a most unusual case of an abdominal aortic dissection originating in the suprarenal aorta with retrograde formation of a giant descending thoracic aneurysm.

CASE REPORT

A 31-year-old man who had a chronic history of hypertension came to the Harbor-UCLA emergency room with severe abdominal pain and shortness of breath. The patient had no history of trauma to suggest an aortic injury, nor did the patient ever have severe back pain, either in the past or at presentation. His visceral complaints were exaggerated in relation to the actual findings of his abdominal examination. All pulses were palpable and intact. A plain chest film revealed gross thoracic aortic dilation. A computed tomographic scan revealed a giant descending thoracic aneurysm; it measured 13 cm at its widest diameter, decreased to 9 cm at the diaphragmatic hiatus, and continued down to just above the level of the renal arteries. This appeared to be a chronic dissection, and there appeared to be contrast in the false lumen in the distal descending thoracic aorta (Fig. 1). However, there was only clot in the proximal descending thoracic aorta false lumen. It was therefore postulated that the tear was intraabdominal, with retrograde flow up the descending thoracic aorta. An angiogram was obtained that showed a chronic dissection that appeared to have become aneurysmal, and the intimal tear appeared to be at the level of the celiac axis with retrograde flow up into the descending thoracic aorta false lumen (Figs. 2 and 3). With the patient's visceral symptoms, expeditious surgical intervention was undertaken.

A double lumen endotracheal tube was placed and a thoracoabdominal approach used via the eighth interspace. The diaphragm was taken down from the retroperitoneal route. Retroperitoneal exposure and mobilization of the abdominal aorta was done. Exposure of the proximal thoracic aorta was achieved through the fourth interspace. The proximal descending thoracic aorta had a nice neck for about 5 cm distal to the left subclavian artery before becoming aneurysmal. One milligram/kilogram heparin was given, and the left femoral artery was cannulated in anticipation of partial left heart bypass. As left atrial appendage cannulation was performed, the patient unexpectedly became bradycardic and fibrillated, requiring open heart compression, internal defibrillation, and fluid resuscitation for about 1 minute. With the patient resuscitated, left atrial–femoral bypass grafting was initiated at a flow of 2 L/min. Cross-clamps were placed on the aorta proximally and distally on the neck of the aneurysm in the proximal descending thoracic aorta, and the aorta transected between the clamps in the manner of Borst et al.[5] A 26 mm Hemashield graft was anastomosed end-to-end to the nondissected proximal aorta and found to be hemostatic. We chose this somewhat large graft to be able to fashion a larger leveled distal graft. Left atrial–femoral partial bypass grafting was then discontinued, the distal crossclamp removed, the infrarenal aorta clamped, and the thoracic aorta opened. A tremendous amount of organized clot was removed from the false lumen, and the septum between true and false lumens was incised down to the abdominal aorta. This septum actually straddled the right and left arteries of each intercostal pair such that one artery came off the true lumen and the other from the false. Several of the higher intercostal pairs were ligated. A large transverse intimal tear connecting true and false lumens

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was identified at the level of the celiac axis posteriorly. There was no other intimal tear present in any portion of the aorta from the left subclavian to the perirenal aorta. The flap of the intimal tear was near the orifice of the celiac axis, and although there was wide patency of the celiac and superior mesenteric at surgery, an intermittent valve-type of compromise was possible. The bowel had no evidence of compromise. The suprarenal aorta and distal Hemashield graft were beveled, and the distal anastomosis was performed to include a low intercostal artery as well as the celiac axis and superior mesenteric artery. Several more cephalad intercostal arteries were ligated. The remnant aortic wall was wrapped about the graft, and the left atrial and femoral cannulae were removed. The partial bypass time and ischemic time were 20 minutes and 38 minutes, respectively.

After the operation the patient remained hemodynamically stable but was never able to move his lower extremities. He has a persistent dense paraplegia 2 years after operation. He otherwise has no evidence of continuing aortic manifestations, including dilation or redissection.

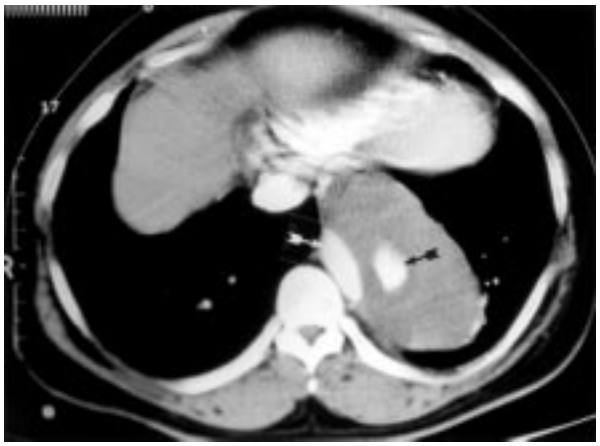

Fig. 1. Computed tomographic scan demonstrates large descending thoracic aneurysm. Contrast is seen in true lumen *(white arrow)* as well as false lumen *(black arrow)*. A massive amount of clot is seen within false lumen.

DISCUSSION

Elliott et al.[3] described the first successful repair of a spontaneous suprarenal abdominal aortic dissection by graft insertion with obliteration of the entry tear. Before this, operative intervention of spontaneous suprarenal abdominal aortic dissection met with generally poor results, with the only survivors being a patient who underwent a fenestration reentry procedure[6] and another who underwent patch closure of the entry tear.[7] At present, three patients have survived graft replacement of suprarenal abdominal aortic dissections, including the reports of Elliott et al.,[3] Urayama et al.,[4] and the present report.

Anatomically, the intimal tear in all three of these cases was in the posterior wall of the aorta at the level of the celiac axis, and all had some degree of retrograde dissection, either to the level of the diaphragm[3,4] or into the thoracic aorta (present study). Also, all three were aneurysmally dilated.

Of the 11 patients reported to have suprarenal aortic dissections who underwent operation (including the present report), at least six had retrograde extension of the dissection (references 3, 4, 8, 9, 10, and the present study). Other than our case, only one of these had retrograde extension into the thoracic aorta.[8] That case involved an abdominal aortic tear near the hiatus that dissected the entire aorta in a retrograde and antegrade manner, resulting in visceral symptoms, chest pain, and aortic insufficiency. This was an acute dissection, and emergency replacement of the ascending aorta was performed but resulted in hemorrhage-related death.

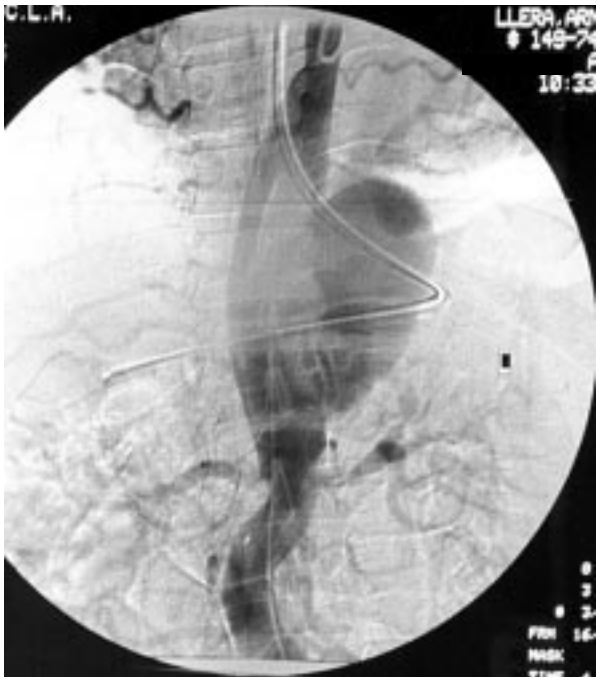

Fig. 2. Angiogram demonstrates thoracoabdominal aneurysm arising from suprarenal abdominal aorta. Contrast seen within false lumen underestimates actual size of aneurysm because of surrounding clot.

Our patient is most unusual in that the suprarenal abdominal aortic dissection extended far proximally into the thoracic aorta and progressed to form a massive chronic aneurysm. Replacement of the descending thoracic and thoracoabdominal aorta was performed with left atrial–femoral bypass grafting with the intention of spinal support. During left atrial can-

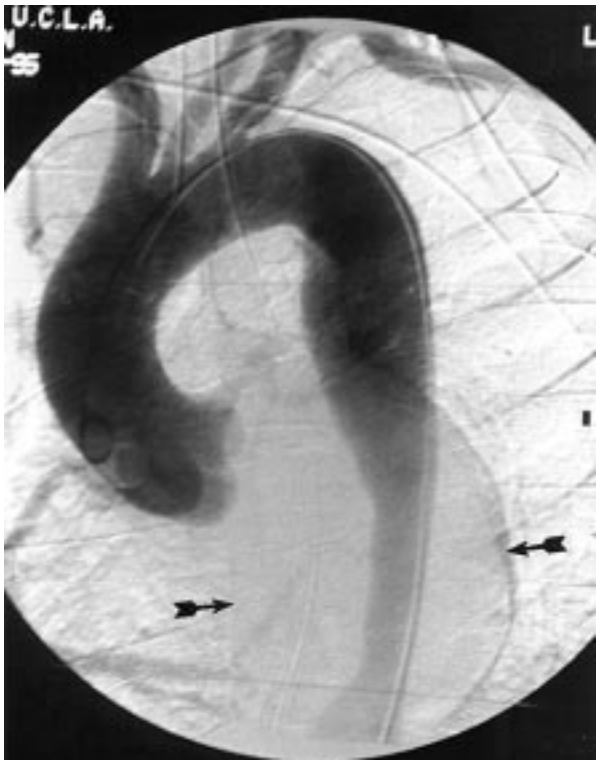

Fig. 3. Arch and descending thoracic aortogram shows a large false lumen filled with clot *(between arrows)* compressing the true lumen.

nulation, which was not technically difficult, the patient arrested and the possibility of coronary air embolism must be entertained. Although the patient survived, a dense paraplegia resulted despite the partial bypass support as a result of the multiple problems that are known to be incremental risk factors for paraplegia (intraoperative arrest, Crawford type I aneurysm, emergency surgery).[11] The previous two reports of successful graft replacement of suprarenal abdominal aortic dissections[3,4] did not use a specific spinal protective technique per se. The dissections/aneurysms in these reports did not extend to the thoracic aorta. Visceral perfusion in one report was afforded by perfusing oxygenated blood into the celiac axis, superior mesenteric artery, and both renal arteries,[4] but this of itself would not have protected the patient from neurologic sequelae. Another option for spinal protection during the repair would have been to perform femorofemoral full cardiopulmonary bypass and achieve profound hypothermia and circulatory arrest, a technique associated with a low incidence of neurologic sequelae in high-risk subsets.[12]

CONCLUSION

We herein have reported an unusual case of a massive descending thoracic aortic aneurysm originating from a suprarenal abdominal aortic dissection. Although retrograde extension appears to be a common finding in suprarenal abdominal aortic dissections, extraabdominal extension is an infrequent and more dangerous situation.

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