Acute Pseudoaneurysm Formation Complicating Balloon Dilation of Native Coarctation: Treatment by Delayed Surgical Repair

Ian C. Huggon, Ian A. Murdoch, Andrew C. Cooke, and David R. Anderson
Departments of Pediatric Cardiology and Cardiac Surgery, Guy’s Hospital, London, UK

SUMMARY. An 11-year-old boy developed an acute aortic pseudoaneurysm during balloon dilation of unoperated coarctation of the aorta. The pseudoaneurysm occurred despite the fact that the balloon catheter size did not exceed the diameter of the aorta at the diaphragm. Elective delayed surgical repair was successfully performed after 3 weeks of antihypertensive treatment when serial magnetic resonance imaging had demonstrated a reduction in the local tissue swelling.

KEY WORDS: Aneurysm — Balloon dilation — Coarctation of aorta — Magnetic resonance imaging

Case Report

An 11-year-old boy underwent balloon dilation as treatment for unoperated coarctation of the aorta. Before the balloon dilation, his femoral pulses were weak and delayed compared with his brachial pulse; his right arm blood pressure was 120/65 mmHg, and there was a 25 mmHg deficit between upper and lower limbs. Doppler echocardiography demonstrated a velocity in the descending aorta of 3.2 m/s with extension into diastole.

Left heart catheterization was performed under local anesthesia and sedation with Diazemuls (Kabi). The femoral artery was cannulated percutaneously, and the coarctation was crossed easily with a guidewire. The aortic pressure was 100/75 mmHg distal to the coarctation and 125/80 mmHg proximally. An aortogram in the left anterior oblique projection showed a discrete coarctation with no evidence of an aneurysm. The aorta at the level of the diaphragm measured 16.0 mm in diameter, and the aortic arch just distal to the left subclavian artery was 14.9 mm in diameter. A 16 mm balloon on a 7F shaft passed through an 8F arterial sheath was advanced over a guidewire for an angiography catheter. An aortogram demonstrated an aneurysm at the site of the coarctation.

The blood pressure and heart rate remained stable; and after careful consideration immediate surgical intervention was rejected because of the likelihood of the presence of extensive hematoma. Aggressive conservative management was instituted with analgesia, sedation, and antihypertensive treatment with labetolol infusion.

Magnetic resonance imaging (MRI) performed the next day showed a saccular aneurysm unchanged in size from the aortogram and a large amount of soft tissue swelling, consistent with hematoma, around the aorta at the site of the coarctation and extending both upward around the aortic arch and downward toward the abdomen (Fig. 1). In view of these findings surgical exploration of the aneurysm was postponed until the hematoma had decreased. Sedation and bed rest were continued, and hypotensive therapy with labetolol infusion was maintained to keep the systolic arterial blood pressure in the region of 90 mmHg.

Magnetic resonance scans were repeated at 1 and 3 weeks. They confirmed a reduction in the soft tissue mass surrounding the aorta and showed that the aneurysm was not expanding (Fig. 1).

Twenty-four days after balloon dilation, elective surgical repair was undertaken. The operative findings were of a large pseudoaneurysm immediately distal to the coarctation site related to a posterior split in the aorta with edema and thickening of the surrounding mediastinal pleura. The aneurysm and adjacent coarctation site were excised completely and end-to-end anastomosis performed. The pathology specimen (Fig. 2), had a 1.5 cm posterior split extending through the intima and adventitia with only the adventitia remaining intact. After surgery recovery was uneventful; there were no neurologic sequelae, and Doppler echocardiography indicated a good hemodynamic result with a peak velocity of 2 m/s.

Discussion

Early or late development of an aneurysm is a well recognized complication of balloon dilation of co-
Fig. 1. Serial magnetic resonance images showing the pseudoaneurysm at 1, 8, and 21 days after attempted balloon dilation. (Top) Double-oblique sagittal plane. (Bottom) Transverse plane. Note the extensive soft tissue swelling and hematoma (arrows) on the early images that are reduced on the later images.

Acute rupture of the aorta has been described after balloon dilation of aortic recoarctation [1] and native coarctation [2]. It has been implied in previous reports that acute aneurysm or rupture may be preventable by choosing a balloon diameter smaller than the diameter of the aorta at the diaphragm, by avoiding balloon dilation in those with unfavorable anatomy such as hypoplastic aortic arch, and by never recrossing the dilated segment except over a previously positioned guidewire [3, 4]. In our case, despite strict adherence to these guidelines, acute aneurysm was not prevented.

Tearing of the intima and media of the aorta is prerequisite for successful balloon dilation of coarctation and recoarctation. In the absence of any secure method for preventing this necessary tear from extending into the adventitia and beyond, aneurysm formation will remain a risk inherent in the technique. This risk can be minimized, but not abolished, by adherence to the guidelines.

Late surgical repair was considered safer and

Fig. 2. Sagittal section through the surgical specimen showing the posterior tear and the aneurysm cavity bounded only by adventitia.