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Management of a large pseudoaneurysm secondary to balloon angioplasty for aortic coarctation

Aort koarktasyonu için balon anjiyoplasti sonrası gelişen büyük psödoanevrizmanın cerrahi tedavisi

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Balloon dilation of native aortic coarctation has been employed safely and effectively in selected patients, with good results during follow-up. However, pseudoaneurysm formation at the site of dilatation occurs in about 2% to 8% of the cases. Although the majority of these pseudoaneurysms remain stable, they may occasionally increase in size during follow-up, having potential risks for rupture, massive bleeding, and even death. We report a nine-year-old child who developed an aneurysm after balloon dilation of native coarctation of the aorta and was successfully treated with interposition of tube graft. The patient was discharged on the sixth postoperative day without a complication.

Key words: Aneurysm, false; angioplasty, balloon/complications; aortic coarctation/surgery; heart catheterization.

Aort koarktasyonunun anjiyoplasti balon dilatasyon ile tedavisi iyi sonuç veren ve yaygın olarak uygulanan bir yöntemdir. Bu yöntem sonrasında dilatasyon yerinde %2-8 oranında psödoanevrizma gelişebilir. Bu psödoanevrizmaların çoğu stabil olarak kalsa da, bir kısmının genişleyerek yırtılmaya bağlı aşırı kanama sonucu ölüme yol açabileceği unutulmamalıdır. Bu yazıda, aort koarktasyonunun balon dilatasyon yöntemiyle tedavisi sonrasında psödoanevrizma gelişen dokuz yaşındaki bir çocukta uygulanan tüp greft interpozisyonu ile tamir sunuldu. Hasta ameliyat sonrası altıncı günde sorunsuz taburcu edildi.

Anahtar sözcükler: Psödoanevrizma; anjiyoplasti, balon/komplikasyon; aort koarktasyonu/cerrahi; kalp kateterizasyonu.

Surgery has long been considered the treatment of choice for aortic coarctation in children and adults.[1] Within the last decade good results have been reported with the interventional angioplasty techniques, for the native aortic coarctation and the re-coarctation as well, in children and in adults. However, there is considerable controversy over the use of balloon dilation for the treatment of native coarctation of the aorta because of the previously reported high incidence of aneurysm formation and other complications.[2]

CASE REPORT

A 9-year-old boy, weighing 30 kg, with clinical asymptomatic and diagnosis of pseudoaneurysm of the aorta was referred to our institution for possible surgical treatment. He underwent successful balloon angioplasty for aortic coarctation four years ago. Systolic gradient of 40 mmHg disappeared immediately after the procedure. In follow-up period an aneurysmatic dilatation at the angioplasty side and a gradient of 35 mmHg were detected on echocardiography. Pseudoaneurysm distal to the left subclavian artery was revealed on cardiac catheterization (Fig. 1a). Diameter of the aneurysm was two times of the aorta at the level of diaphragm. Systolic pressure was considered 100 mmHg at ascending aorta and 88 mmHg at descending aorta. On physical examination blood pressures were 150/70 mmHg on the right arm and 120/70 mmHg on the left arm.

Operative management. A posterolateral left thoracotomy was done. There was a huge pseudoaneurysm with diameter of 3x4 cm including the isthmus just distal to the left subclavian artery. Arcus aorta, left subclavian artery, descending aorta and ligamentum arteriosum were prepared. Because pseudoaneurysm sac was extended to a long segment of descending

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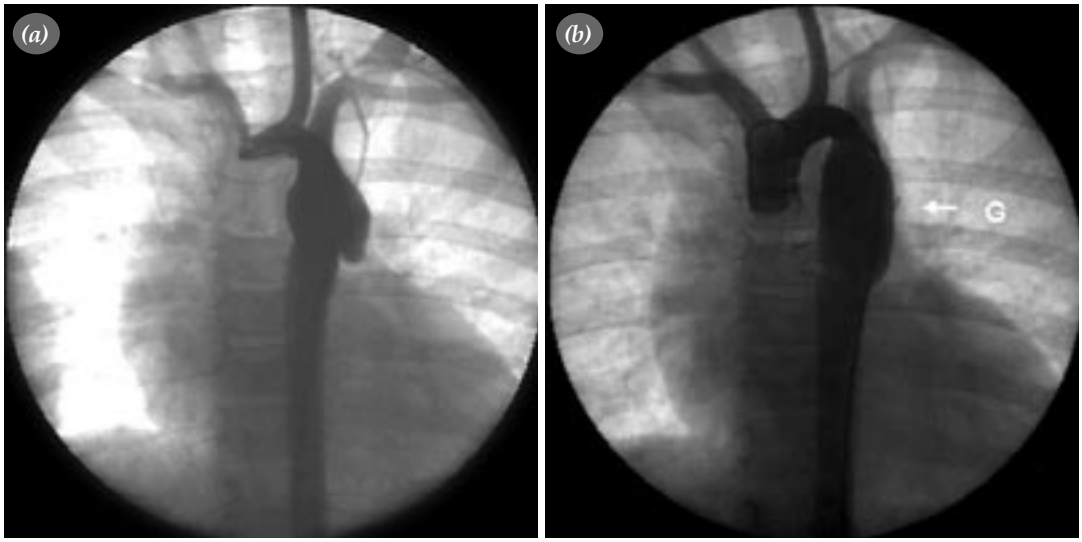

Fig. 1. (a) Cardiac catheterization of the pseudoaneurysm, **(b)** A postoperative angiogram showing the tube graft (G).

aorta, end-to-end direct anastomosis was not suitable after resection. Therefore a 16-mm Dacron tube graft was interposed (Fig. 1b). The patient was discharged on the sixth postoperative day without a complication. Pseudoaneurysm sac including the remnant tissue and the orifice is seen in Figure 2.

DISCUSSION

Balloon angioplasty acts by tearing the vessel wall with disruption of the intima and part of the media. After the healing process takes place in the vessel, its wall is restored and its lumen enlarged.[3] Pseudoaneurysm formation is a well-known complication after balloon dilation of native coarctation of aorta. Although there is no consensus, it is generally defined as a bulge in the aortic wall, whose diameter is 1.5 times the aorta at the level of the diaphragm. It is probably caused by a complete transmedial tear that may occur after dilation, resulting in loss and disarray of supporting smooth muscle cells causing a weakening in the vessel wall.[3] Technical factors, such as the use of oversized balloons with overdistension of the vessel and longer inflation times, may contribute to this event in the acute setting.[3]

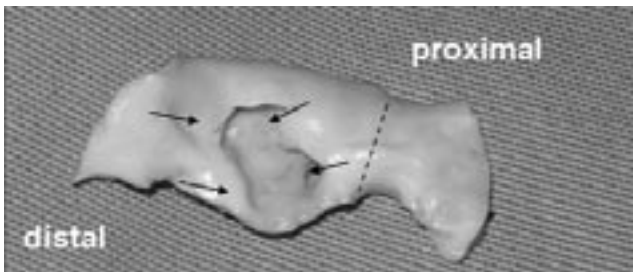

Fig. 2. The appearance of the resected part of the aorta. Dotted lines represent the remnant tissue of aortic coarctation, and black arrows show the orifice of the pseudoaneurysm.

Improvements in surgical technique and modern preoperative, intraoperative, and postoperative management approaches have reduced the early morbidity and mortality associated with the surgical management of complication following percutaneous balloon interventions for aortic coarctation. The absence of mortality and the minimal morbidity continue to challenge those physicians who would recommend transcatheter-based or medical therapy for patients with arch obstructions that persist after surgical repair.

Successful coil occlusion after stent implantation[4] was presented for management of a large pseudoaneurysm secondary to balloon dilation for aortic coarctation. This method may be a noninvasive alternative intervention in patients having suitable pseudoaneurysm for coil occlusion. However, the experience is not sufficient especially in children in most cardiac centers. Furthermore, a large number of series is necessary to determine perioperative complications of coil embolization and complications in long-term follow-up.

In conclusion balloon angioplasty is a successful noninvasive method especially for discrete type aortic coarctation. Pseudoaneurysm formation is a rare long-term complication. Embolization may be an alternative noninvasive approach with increase in experience of coil occlusion in future. Furthermore a large number of coil occlusion series is essential to determine of complications in long-term follow-up. Therefore surgical management is still the safety approach for repair of aortic pseudoaneurysm secondary balloon angioplasty of native aortic coarctation.

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