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JOURNAL OF CARDIOVASCULAR MAGNETIC RESONANCE®
Vol. 5, No. 3, pp. 501–504, 2003

CASE REPORT

False Aortic Aneurysm at Site of Previous Coarctation Repair: The Role of Cardiovascular Magnetic Resonance

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ABSTRACT

We describe a 37-year-old who presented with hemoptysis. Twenty-one years previously he had undergone Dacron patch aortoplasty for coarctation. Initial investigations failed to reveal the cause of the hemoptysis. Cardiovascular magnetic resonance (CMR) demonstrated an aneurysm at the site of the repair. He underwent successful repair of the aneurysm with a Gelseal interpositional graft.

Key Words: Dacron patch aortoplasty; Aortic aneurysm; Cardiovascular magnetic resonance.

INTRODUCTION

The Dacron patch aortoplasty first described by Vosschulte (1957) came into wide use in the 1960s and '70s for repair of coarctation of the aorta. However, due to the high incidence of late aneurysm formation, this operation is now less commonly performed (Ala-Kulji and Heikkinen, 1989; Knyshov et al., 1996). Resection of the stenosed segment of the aorta with end-to-end anastomosis (Backer et al., 1998), use of a subclavian flap, or endovascular stent grafting (Mullen, 2003) are now common types of repair. We describe a case of a leaking false aortic aneurysm in a patient who had previously undergone Dacron patch repair for coarctation, in which cardiovascular magnetic resonance (CMR) helps make the diagnosis.

CASE REPORT

A 37-year-old sound engineer, who had never smoked, presented with a 1 month history of episodes of hemoptysis, of up to half a cup, occurring approximately every 3 days. 21 years previously he had undergone Dacron patch aortoplasty for aortic coarctation and was otherwise fit and well. Prior to presentation at the Royal Brompton Hospital he had been investigated for

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DOI: 10.1081/JCMR-120022266
1097-6647 (Print); 1532-429X (Online)

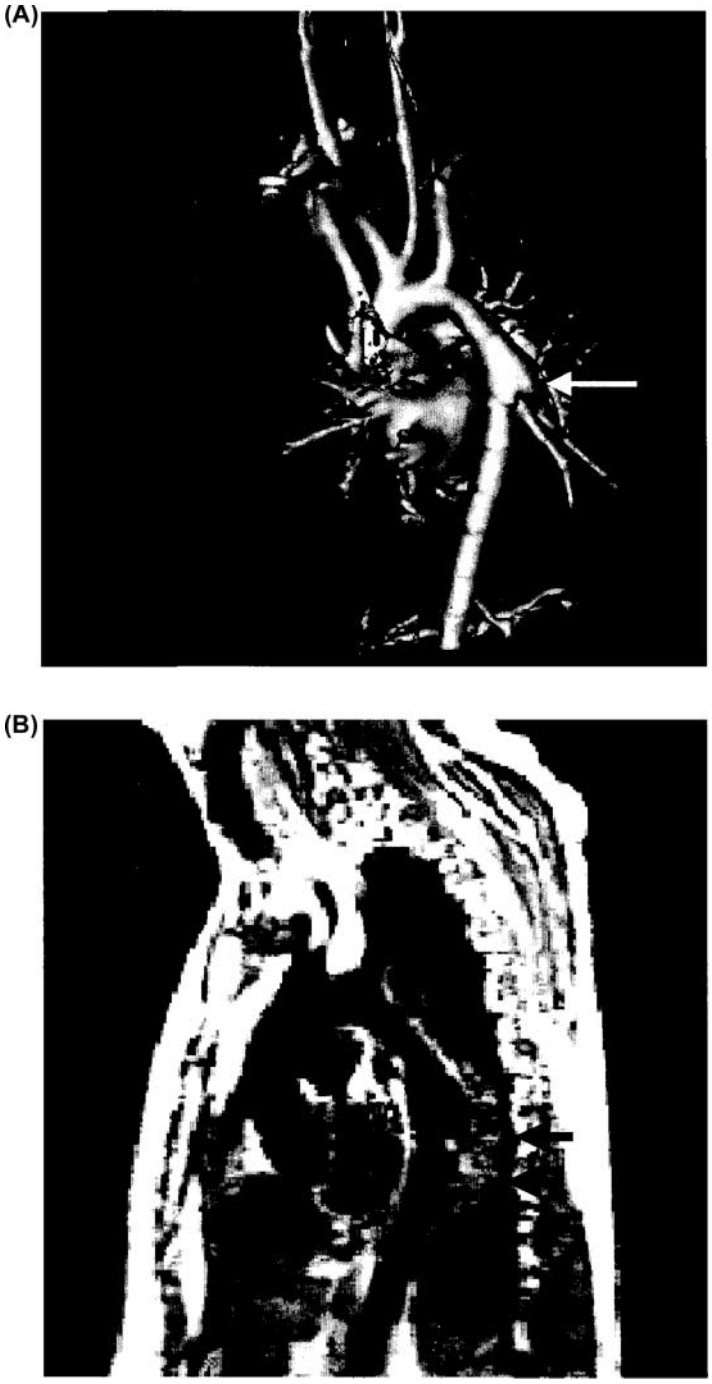

Figure 1. Figures A and C are rendered maximum-intensity-projection magnetic resonance angiograms in the left anterior oblique view. Figure A shows localized aneurysmal dilatation of the posterior aortic wall (arrowed) distal to the aortic isthmus. Figure B is a spin echo image, with the hematoma around the false aneurysm (arrowed). Figure C acquired post-surgery, the graft can be seen (arrowed). Printed with kind permission from Lippincott Williams and Wilkins, from *Adult Congenital Heart Disease*, edited by C. B. Higgins and A. De Roos.

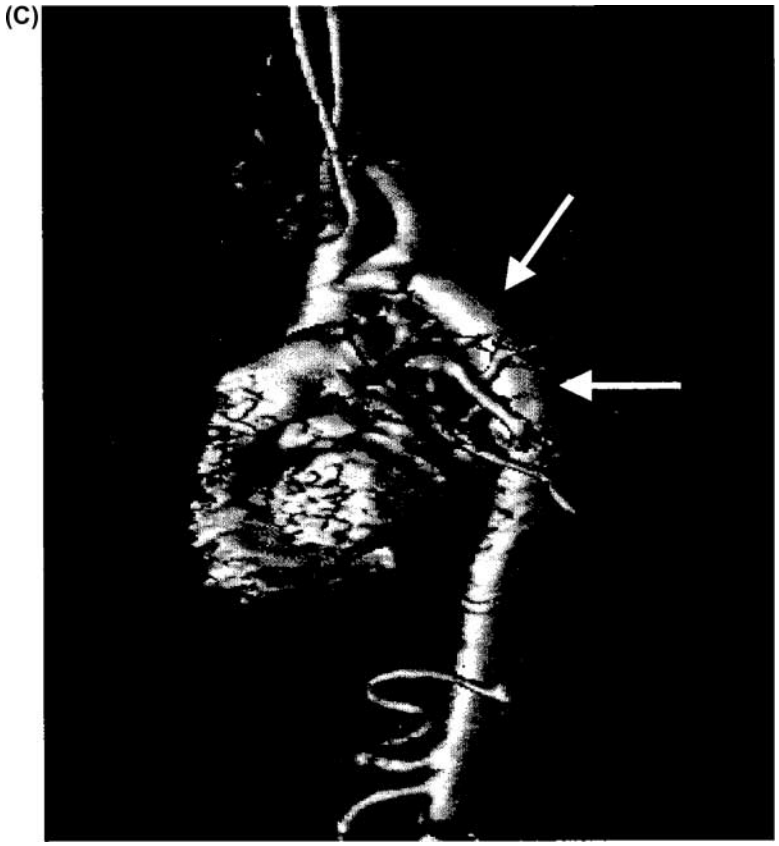

Figure 1. Continued.

the hemoptysis in Singapore. All blood tests had been normal, including an autoimmune screen. Sputum cultures were negative. Chest X-ray had shown nonspecific bilateral interstitial shadowing of the upper lobes. The CT scan of the chest had suggested minor brochiectasis in the left lung, especially in the left lower lobe. The bronchoscopy had shown a hyperaemic left airway, but no other abnormality. A diagnosis of lower respiratory tract infection was made, the patient was started on a course of ciprofloxacin, and discharged.

The episodes continued, and on arrival in England the patient was referred to the hospital. On admission he looked well and was apyrexial. Heart rate was 70 and blood pressure was 152/76 with good femoral pulses. Heart sounds were normal and his chest was clear. White blood count was normal and hemoglobin 12.8 g/dl. Echocardiography showed a normal left ventricle, tricuspid aortic valve, and no aneurysm of the descending aorta was seen. He underwent contrast-enhanced magnetic resonance angiography (CE-MRA) which showed aneurysmal dilatation and para-aortic hematoma at the distal suture line of the previous repair (Figures A and B).

At surgery, rupture of the distal suture line was seen. The left lung was dissected away from the aorta via a left thoracotomy. The upper descending aorta and the previous Dacron patch were excised and replaced with a Gelseal interpositional graft (Fig. 1C). The patient made a good postoperative recovery and has returned to his normal life. He has no further episodes of hemoptysis.

DISCUSSION

Hemoptysis in a patient who has previously had coarctation repair may indicate a leaking aneurysm, and should be immediately investigated (Holdright et al., 1991). Conventional angiography and bronchoscopy are contraindicated since they may lead to catastrophic rupture of the aneurysm. The incidence of aneurysm formation after Dacron patch aortoplasty in reported series varied from 4% to 38% (Albert et al., 1993; Clarkson et al., 1985). The majority of late aneurysms occur 9 to 20 years after the initial aortic repair with a Dacron patch (Clarkson et al., 1985). Late aneurysm formation is more likely to occur in female

patients operated on > 2 years of age and especially among women who become pregnant. A common site for aneurysm formation is opposite the patch (McGoldick et al., 1988). A possible mechanism for the late formation of the aneurysm opposite the graft is increased postoperative aortic wall tension being transmitted by the rigid graft to the more elastic abnormal aortic wall opposite the graft (Olsson et al., 1976). Abnormal hemodynamic stresses may also be developed at the aortic-graft suture line, leading eventually to false aneurysms at this site. There is still a large population who have undergone this procedure, and screening is recommended (Ala-Kulji and Heikkinen, 1989). Transthoracic echocardiography potentially allows direct visualization of the coarctation repair site, but views are often obscured in adults. Although transesophageal imaging is better (Simpson et al., 1993) it has difficulty in visualizing the aortic arch vessels, and it is too invasive to be suitable for screening (Silvey et al., 1991). With CMR imaging may be orientated in any plane, allowing direct visualization of the repair site, and accurate measurement of flow in the descending aorta is possible using cine MRI with velocity mapping. Peak velocity in the descending aorta as a measure of gradient correlates well with cardiac catheterization. Furthermore, CMR has the ability to distinguish moving blood from static thrombus or tissue. Spiral CT with three-dimensional reconstruction is inferior to CMR for determining the nature and severity of any recoarctation or aneurysm formation. In addition, it involves significant ionizing radiation exposure, making it unattractive for screening.

There are a variety of CMR techniques available for investigating the aorta. A CMR study of the aorta usually starts with echocardiogram (ECG)-gated, multi-slice, spin-echo images, acquired in transverse and sagittal planes, encompassing the brachiocephalic vessels, aortic arch, and the ascending and descending aorta. Multi-slice sections in the coronal plane are often used for assessment of a tortuous aortic arch and for evaluation of the aortic root and aortic valve. Aortic blood flow can be quantified using cine gradient-echo imaging with velocity mapping. Contrast-enhanced magnetic resonance angiography is particularly useful in the evaluation aortic aneurysms, abnormalities of the aortic arch, and arch vessels.

Due to the strengths described above, CMR has become an important imaging modality for a broad range of aortic diseases, including aortic aneurysm, aortic dissection, aortitis, and coarctation.

Received August 28, 2002
Accepted March 20, 2003

ACKNOWLEDGMENT

We would like to acknowledge the surgical expertise of Dr. Daryl Shore in repairing this patient's aneurysm.

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