Occlusion of persistent left superior vena cava to unroofed coronary sinus using vena cava filter and coils

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Abstract
A 48 year old female with complex cyanotic heart disease and pulmonary hypertension was partly cyanosed because of a persistent left superior vena cava draining into an unroofed coronary sinus. The left superior vena cava, which measured 22 mm in diameter, was successfully occluded with a Günther Tulip Vena Cava Mreye Filter which acted as a barrier for embolisation coils.

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Forty to 60% of cardiac catheterisations in patients with congenital heart disease are for interventional purposes that replace or complement surgery.1 Transcatheter embolisation has been used to occlude haemodynamically significant vascular connections in patients with congenital heart disease, as well as cardiac and extracardiac arteriovenous fistulae of congenital or acquired aetiology.2 Several occluding agents and devices are available including umbrella devices, an array of coils, detachable balloons, gelfoam, alcohol, and polyvinyl alcohol particles. The choice of the agent or device used depends on the nature and configuration of the lesion. None of the commercially available devices are, however, capable of occluding very large communicating vessels.

We describe a case of a large left superior vena cava draining into an unroofed coronary sinus resulting in cyanosis which was effectively occluded by transcatheter delivery of a vena cava filter packed with Cook detachable coils.

Case report
A 48 year old woman was seen by a gynaecologist for menorrhagia who noticed the cyanosis. The patient had a cardiac murmur detected at the age of 10 years by a school medical officer but was lost to follow up. On clinical examination she had central cyanosis and dextrocardia. On auscultation she had a grade 3/6 ejection systolic murmur accompanied by an early diastolic murmur caused by pulmonary regurgitation.

Electrocardiography showed sinus rhythm with right axis deviation. Echocardiography showed situs solitus, dextrocardia, atrioventricular and ventriculoarterial discordance, and a small atrial septal defect. Echo Doppler showed mild mitral regurgitation but with a velocity of 4.2 m/s indicating high pressure in the subpulmonary ventricle, moderate tricuspid and pulmonary regurgitation. Transoesophageal echocardiography confirmed these findings but also established the presence of a large left superior vena cava draining into the unroofed coronary sinus.

The anatomy was confirmed by catheterisation and an elevated pulmonary artery pressure was documented. Angiography showed two superior vena cavae with a small communicating vein. The left superior vena cava drained into an unroofed coronary sinus resulting in left atrial desaturation.

As there were no devices able to occlude a 22 mm vein, the patient was recatheterised seven months later to occlude the large superior vena cava using a combination of vena cava filter and detachable coils. The left internal jugular vein was entered percutaneously. Under fluoroscopy and transoesophageal echocardiographic control, a Günther Tulip Vena Cava Mreye Filter3 of the jugular design was deployed through a 7 French sheath in the lower part of the left superior vena cava above the coronary sinus. Two 8 mm x 5 loop Cook detachable coils were then delivered proximal to the filter to occlude the left superior vena cava. The coils were unstable moving up and down with each cardiac cycle, therefore, a third coil was used; the delivery catheter was passed beyond the already deployed coils and through the filter where one loop of the third coil was deployed. The delivery catheter was pulled back to deliver the rest of the loops proximal to the previously deployed two coils in order to splint them against the filter. This manoeuvre stabilised the coils and angiography showed the occluding device to be in a satisfactory position (fig 1). The patient was maintained on aspirin. Her saturation rose from 80% to 92% and effort tolerance
Figure 1. Angiogram taken at the time of insertion of the filter and coils. Some flow of contrast in the left superior vena cava persists.

Figure 2. Angiography from left arm performed four months after insertion of filter and coils showing complete occlusion of the left superior vena cava but with a patent communicating vein.

improved. Four months after the embolisation, left arm angiography showed the filter and coil system to be in place and there was total occlusion of the left superior vena cava (fig 2). There was negative contrast from the left jugular vein confirming its patentcy.

Discussion
In recent years, several techniques for transcatheter occlusion of vessels have been developed mostly to occlude small to medium end-hole vessels. None is suitable to occlude large communicating channels such as described in this case. The largest diameter normally considered amenable for occlusion is around 12 mm, the remainder are usually managed surgically.4,5

This case demonstrated that large communicating vessels can be occluded effectively using a vena cava filter packed with coils. The filter acts as a stable barrier to prevent the occluding coils from embolising. There was no migration or thrombosis of the filter and the patient experienced marked improvement in exercise tolerance following improved arterial saturation.

This method, which has not been described previously, is useful and effective for occluding vessels which are deemed too large for conventional occluding devices.