Case reports

Trefoil balloon for aortic valvuloplasty

BERNHARD MEIER, BEAT FRIEDLI, INGRID OBERHÄNSLI

From the Centre of Cardiology and the Department of Paediatrics, University Hospital, Geneva, Switzerland

SUMMARY A new balloon for valvuloplasty (Trefoil balloon) was successfully used in a 12 year old boy with congenital aortic stenosis. The Trefoil balloon consists of three angioplasty balloons mounted in parallel on a single shaft. When they are inflated simultaneously they produce a rosette that allows blood flow to continue through the valve. The aortic pressure only dropped to 75 mm Hg during a 15 s balloon dilatation at 4 bar (400 kPa). The procedure reduced the transvalvar gradient from 45 to 15 mm Hg.

Transluminal aortic valvuloplasty was first described in 1984.1 To avoid a complete circulatory arrest when the balloon is blocking the valve, the creation of a left ventricular-venous shunt by connection of the central lumen of the balloon catheter to a venous catheter was recommended. The efficacy of this measure was not documented.

The balloon design presented here (Trefoil balloon, Schneider Medintag, Zurich, Switzerland) allows blood flow through the valve to continue during the dilatation process. The Trefoil balloon consists of three identical angioplasty balloons (modified polyvinyl chloride) mounted in parallel on a quadruple lumen catheter. The balloons are filled and emptied simultaneously through a single port. When they are inflated their cross section is that of a rosette or trefoil, which leaves space for blood flow. The diameter of the three balloons is selected according to the diameter of the valve annulus. The length of the balloons ranges from 20 to 45 mm and their waists are slightly tapered to secure their position in the valve. In the aorta and aortic valve of four dogs an oversized Trefoil balloon produced pressure gradients from 5 to 40 mm Hg when it was filled at 2–4 bar (200–400 kPa), whereas a conventional single balloon of comparable size produced complete occlusion.

Case report

A 12 year old boy (166 cm and 57 kg) with congenital aortic stenosis complained of episodes of faintness and chest pain during exercise. The electrocardiogram showed pronounced left ventricular hyper-

![Fig1](simultaneous left ventricular and aortic pressure recordings before, during, and after Trefoil balloon aortic valvuloplasty. The transvalvar pressure gradient was reduced from 45 mm Hg (left hand panel) to 15 mm Hg (right hand panel). During a 15 s balloon filling at 4 bar (400 kPa) the systolic aortic pressure remained at 75 mm Hg and the transvalvar pressure gradient was 80 mm Hg (middle panel).)
Percutaneous aortic valvuloplasty with a Trefoil balloon did not lead to the circulatory collapse known to be associated with balloon valvuloplasty. The blood flow through the creases between the three balloons was sufficient in this case of only moderate aortic stenosis to maintain the systemic pressure during a 15 s dilatation manoeuvre at a level that was adequate for the vital organs. It is conceivable that in a very tight valve the flow will be minimal or absent until the balloon has unfolded to a certain extent. Further experience with Trefoil balloon valvuloplasty in aortic, pulmonary, and mitral valve stenosis will show whether the results with this new type of balloon are comparable to those of valvuloplasty with conventional single balloons. The applicability of the Trefoil balloon to complicated or routine coronary angioplasty is currently under investigation.

References