Balloon Therapy of Critical Aortic Stenosis in the Neonate
The Therapeutic Conundrum Resolved?

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In this issue of Circulation, Zeevi and his colleagues from the Children’s Hospital in Boston examine critically the results of surgical or balloon dilation therapy applied to a few neonates with life-threatening aortic stenosis.1 Of 16 consecutive neonates from 1978 through 1984 undergoing surgery, there were six early and two late deaths. From 1985 through 1988, balloon dilatation was applied to another 16 consecutive neonates with severe aortic stenosis, with three early and three late deaths. Examination of the hemodynamics in the survivors of both treatment groups and length of hospital stay (similar in both groups) has persuaded the Children’s Hospital group that “percutaneous balloon valvotomy is as effective as surgical valvotomy in newborns with critical valvar aortic stenosis” despite their own caveats that this study retrospectively addresses nonrandomized groups from different time periods.

As correctly pointed out by the authors, severe aortic stenosis in the neonate is a complex disorder, frequently associated with varying degrees of left ventricular hypoplasia, functional and structural abnormalities of the mitral valve expressed as either stenosis or regurgitation and, not uncommonly, endomyocardial abnormalities as well.2-5 Severe endocardial fibroelastosis and the sequelae of myocardial ischemia have been well documented at postmortem examination in these patients.2 Indeed, some of the earliest reports of neonatal myocardial ischemia and infarction were from babies dying with critically severe aortic stenosis.6-9 Because the myocardium of babies with critical aortic stenosis may be so disordered, it may be advisable to attempt salvation without anesthesia, inflow occlusion, or cardiopulmonary bypass. But the anatomic matrix for aortic stenosis in the neonate is usually considerably more complex than commissural fusion producing a restrictive orifice. Anular hypoplasia, dysplasia, or both of the aortic valve are common, and either may prevent successful surgical or balloon therapy. Indeed, in some babies with severe aortic stenosis, dysplasia of the aortic valve may be as prominent or conspicuous as commissural fusion.5

If the results of balloon therapy are as effective as surgical intervention in this particularly thorny set of patients as Zeevi and his colleagues are persuaded, then clearly in a tertiary referral center such as the Children’s Hospital, this may be the approach to take. But we must be cognizant of the problems with balloon valvotomy.1,10-12 Significant postballoon aortic regurgitation has been attributed by this group to cusp perforation by the guidewire and subsequent avulsion by the balloon catheter, a complication experienced in Toronto as well.13 I think it most unlikely that echocardiographic imaging of the position of the stenotic aortic valve orifice will prevent this complication, especially when using the umbilical artery. There are too many anatomic fulcrums with this approach to permit controlled manipulation. The use of a soft guidewire and a “gentle touch” will, I hope, reduce cusp perforation, but this complication by its very nature will not be eliminated. It is too simplistic to tell us that “loss of pulse occurred in nine neonates but returned to normal in seven after anticoagulation, thrombolytic therapy, or both.” With current technology, including Doppler and digital subtraction angiography, we should be clearly informed about the integrity of the iliofemoral arterial system. For patients who may well require repeated arterial retrograde catheterizations, an arterial injury and loss of arterial access should not be lightly dismissed. Indeed, five of the nine survivors of balloon therapy were recatheterized 2 weeks to 13.5 months after the initial procedure, and it would not have compromised the patient to image the iliofemoral system at that time. We might ask as well how much radiation from prolonged fluoroscopy were these babies exposed to during the balloon valvotomy.

For those currently engaged in pediatric cardiology, the integration of balloons, blades, and umbrellas into the cardiac catheterization laboratory has dramatically altered the practice and, indeed, impact
of our specialty. The novelty of balloon valvotomy has now worn off, and there is no doubt that for some forms of congenital heart malformation the therapeutic balloon is the instrument of choice.13 While Zeevi and his colleagues are persuaded that balloon valvuoplasty is as efficacious as surgery for critical aortic stenosis in their institution, I am less convinced. Indeed, this report leaves me a little uneasy and I am thus reluctant at this time to unequivocally endorse this approach to the pediatric cardiology community at large for this particular group of patients. I would hope that with increased clarity and precision in imaging the aortic valve, we could define those babies who would better be treated by surgeons and those in whom a judicious attempt at balloon valvotomy should be the initial therapeutic choice. The availability of low-profile balloons should further reduce the risk of arterial injury. Finally, for the neonate with life-threatening aortic stenosis, the therapeutic decision tree is not easy to define. Thus, I am not critical of the position taken by the Boston group. Rather, I suggest caution in this approach.

References
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Circulation. 1989;80:1087-1088
doi: 10.1161/01.CIR.80.4.1087

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/80/4/1087.citation

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