Editorial Comment

Make Balloon Dilatation an Approved Procedure for Recurrent Coarctation in Children

J. Deane Waldman, MD

The most obvious and yet fundamental difference between children and adults is that children experience growth. This mandates follow-up studies in pediatric patients to determine when or if an intervention originally judged successful becomes inadequate because of patient growth. Only in follow-up can one judge whether procedures such as balloon dilatation (BD) are palliative or corrective. To evaluate this, one looks with interest at the report by Hijaki et al1 from Yale in this issue.

See p 1150

Though controversy persists over whether BD is appropriate initial therapy for unoperated coarctation of the aorta, an extensive literature2-11 exists on BD in this setting. Less information is available on BD of previously operated coarctation, despite its obvious attractiveness.12-15

Why is BD so attractive for 'recoarctation'? The answer (before Hijaki’s report) related partly to the unattractiveness of repeat operation for coarctation. Landmarks are obliterated by previous thoracotomy; the phrenic and other nerves are buried in scar tissue; the chance of success is significantly reduced, and the threat of paraplegia looms in the background. Balancing the surgical risks were the potential problems with balloon dilatation: 1) ileo-femoral complications, reported to be as high as 43%16; 2) the possibility of aneurysm formation at the site of BD8,9; and 3) the unknown rate of success, especially long term.

The report by Hijaki et al attempts to quantify these risks; it strongly supports the advantages of BD over surgery for coarctation after prior surgical repair. In 26 patients, 29 BD’s were performed with: a) no mortality, b) no clinically symptomatic complications, c) 4% (one patient) aneurysm formation, d) 4% (one patient) femoral artery occlusion, and e) average resting transcoarctation pressure gradient reduced to 8.5 mm Hg from 40.3 before BD.

Reduction in the resting transcoarctation gradient is not the sole criterion for success in coarctation therapy. One can have significant obstruction with a small gradient at rest, which becomes large as cardiac output increases, for example, during exercise.17 Therefore, although the Yale experience is encouraging, one still cannot rule out persistent significant obstruction in the absence of exercise data. This is as true of surgical follow-up studies (which also generally lack exercise data) as it is of the present BD report.

Controversy over the significance of the resting gradient relates not only to outcome evaluation but also to patient selection. Hijaki chose 20 mm Hg resting gradient as the entrance criterion. Others have used higher or lower gradients as indicators of significant coarctation. Might it not be reasonable to try BD for a patient whose exercise gradient is 43 mm Hg but who at rest has no gradient (namely patient 21, Reference 17)?

Among the 26 patients reported by Hijaki, various prior surgical techniques had been utilized: 11 resections with end-to-end anastomosis, 11 subclavian flap aortoplasties, and four patch aortoplasties. The fact that BD seemed applicable following all three surgical procedures is encouraging and extends its potential usefulness.

At present, there is no consensus as to the appropriate balloon size for BD of coarctation. Balloon dilatation is always a balance between the extent of the transmural tear and the need to maintain vascular integrity. Criteria for balloon size are generally linked to the aorta proximal to the obstruction,6-9,14,15 the aorta at the level of the diaphragm,5,11 or 2.5-3.0 times the narrowest area.4,13 Hijaki chose balloons equal in size to the largest aortic diameter distal to the obstruction, which generally is the poststenotically dilated segment. Most interventional cardiologists have used smaller balloons for two reasons: 1) the disparity between the stenotic segment and the poststenotic area may be so great as to cause aortic rupture and 2) it seems illogical to dilate the stenosis to a supernormal width. It is clear that Hijaki et al chose a larger balloon...
‘reference’ measurement in an attempt to have an improved therapeutic effect. The lack of complications in their 29 procedures supports the safety of this approach, but one must still urge caution because use of such large balloons in younger children (Hijaki’s mean age was 4.75 years) may be more dangerous both to the aorta and the femoral artery.

Hijaki et al describe the obstruction in their patients as “recurrent”. The authors are to be commended in avoiding the term ‘recoarctation’. Recoarctation is a term best discarded. It fails to distinguish residual coarctation (that which was still present immediately after surgery) from recurrent coarctation (that develops subsequent to an operation which initially resulted in good relief of obstruction). These two conditions are very different and may have different natural histories. When coarctation is recurrent, there is usually a relatively discrete area of obstruction at the surgical site, due either to scar formation or to lack of growth. This condition is more likely to respond to BD than hypoplasia of the transverse aortic arch, the usual reason for residual coarctation. Recurrent coarctation is a very different condition from unoperated aortic obstruction with different risk/benefit ratios; good results in the former circumstance should not be extrapolated to the latter.

One additional advantage of BD in recurrent coarc- tation bears special emphasis: avoiding the risk of paraplegia. While paraplegia can develop during surgery for unoperated coarctation, it is more likely to occur in the older child with moderate recurrent obstruction and no collateral vasculature. Aortic cross-clamp time may be lengthened by suboptimal surgical exposure in the chest scarified by previous thoracotomy, and collaterals may be sacrificed to reduce bleeding, both of which increase the ischemic insult to the distal spinal cord. As damage to the spinal cord is likely to be a summation effect (severity times duration), a surgically-induced insult of 30 or more minutes is orders of magnitude greater than the 10 or more seconds of ischemic time during balloon inflation, which is also unlikely to affect collateral flow. Reduced risk of paraplegia is sufficient reason in and of itself to consider BD for recurrent coarctation.

In their final sentence, Hijaki et al conclude that BD “should be considered the treatment of choice for relief of recurrent aortic coarctation.” Although their data support this approach, it is still premature to discard surgery completely, especially as the mean follow-up after BD is still less than 4 years. It would be quite satisfactory if BD were considered an acceptable treatment option for recurrent coarctation in children, because at the present time, the only condition for which balloon dilation is approved is pulmonary valve stenosis. Until an authoritative body such as the American College of Cardiology or the American Heart Association states in print which disorders are currently acceptable for catheter treatment, insurance companies and governmental agencies can claim that such procedures are experimental, refuse to reimburse for the procedure, and thereby deny appropriate care to many children who would be benefited by BD.

References

Key Words • balloon dilatation • pediatrics • Editorial Comments
Make balloon dilatation an approved procedure for recurrent coarctation in children.

J D Waldman

Circulation. 1991;84:1440-1441
doi: 10.1161/01.CIR.84.3.1440

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1991 American Heart Association, Inc. All rights reserved.
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/84/3/1440.citation

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org/subscriptions/