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EDITORIAL COMMENT

Post-Dilating Transcatheter Heart Valves*

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In this issue of *JACC: Cardiovascular Interventions*, Nombella-Franco and the Quebec Heart and Lung Institute (1) report their experience with balloon post-dilation in patients with residual paravalvular aortic regurgitation after transcatheter heart valve (THV) implantation. Paravalvular regurgitation grade ≥2 was documented by transesophageal echocardiography in approximately one-third of their 211 patients. Post-dilation reduced regurgitation by ≥1 grade in the majority (71%), consistent with the early experience of our group in which paravalvular regurgitation was reduced in 75% of patients undergoing THV post-dilation (2).

See page 499

How might post-dilation reduce paravalvular regurgitation? The Quebec city group used transesophageal echocardiography to document an increase in stent minimum diameter by a mean of 1.9 mm (1). Our group used quantitative fluoroscopy to document an increase in stent diameter by a mean of 0.9 mm (2). This, in addition to an increase in THV circularity, likely results in improved apposition of the sealing cuff and annular tissue (3).

Nevertheless post-dilation rates vary widely (4,5). There are concerns that over-expansion might result in: 1) atrioventricular block, periaortic hematoma, or annular rupture; 2) poor leaflet apposition with central regurgitation; or 3) leaflet injury. Although these concerns are real, experience has shown that post-dilation with appropriately sized, noncompliant balloons is unlikely to result in valve injury.

Does paravalvular regurgitation matter? Severe paravalvular regurgitation is obviously important and must be dealt with, although post-dilation is generally insufficient. In contrast, mild and moderate regurgitation are well tolerated acutely and do not increase with time. True, there is an association between moderate, and even mild, paravalvular regurgitation and increased late mortality. However, cause and effect have not been demonstrated and there is no evidence to date that post-dilation in the setting of mild, or even moderate, leaks improves late survival (6–10).

Does calcification influence the severity of regurgitation? Bulky, heavily calcified valves do predispose to paravalvular regurgitation (11). The Quebec city group found that the volume of calcification as determined by multidetector computed tomography was the most important predictor of regurgitation and the need for post-dilation. Interestingly, calcification also predicted the likelihood of reducing regurgitation with post-dilation. Perhaps regurgitation in the absence of severe calcification is more likely to be the consequence of a THV that is just too small or implanted too high or too low in relation to the aortic annulus?

Can post-dilation result in stroke? We know from transcranial Doppler studies that cerebral microemboli are most common at the time of THV interaction (positioning and deployment) with the native valve (6,12,13). We have little information about balloon dilation performed after THV implantation. It is certainly possible that transient expansion and recoil of a stent frame within a partially disrupted native valve might be a particularly efficient way to generate embolic particles.

The Quebec city group found a nonsignificant increase in procedural major strokes (i.e., stroke with permanent disability) with post-dilation (5.1% vs. 1.3%, $p = 0.14$). However, cerebrovascular events (transient ischemic events, minor strokes without disability, and major strokes) were markedly increased (11.9% vs. 2.0%, $p = 0.006$). The most important predictors were calcification and post-dilation. To what degree was post-dilation just a marker of a more calcified valve intrinsically more likely to release embolic material at the time of valve positioning or expansion? We do not know.

What are the alternatives to post-dilation? More effective pre-dilation and, in the case of balloon expandable valves, more effective deployment with high pressure, appropriately large, noncompliant balloons might result in more complete and symmetrical valve expansion and a reduction in paravalvular leaks. The competing strategy favors more conservative balloon expansion to minimize the risk of embolic stroke, atrioventricular block, and annular rupture, only followed by more complete post-dilation later if a paravalvular leak actually occurs.

Are there differences for balloon and self-expandable valves? The rate of post-dilation with self-expanding valves has been quite variable, with large series reporting rates of 10% to 30%, with a reduction in regurgitation reported in most patients (4,14–16). Post-dilation of self-expandable valves might be associated with greater transient expansion and subsequent recoil than rigid balloon-expandable valves. We do know that re-intervention (repositioning or post-

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dilation) in the setting of a CoreValve implant (Medtronic, Minneapolis, Minnesota) for paravalvular regurgitation is associated with an increased stroke rate (7,8,17). Grube et al. (17) postulated that avoiding pre-dilation before CoreValve implantation might result in fewer strokes. However, in a report from this group, the post-dilation was more often required (17%) when pre-dilation was avoided. The stroke rate of 5% rate was comparable with other current experience (18).

To what degree valve design might alter the risk of cerebral embolization is unknown. A more occlusive sealing cuff might actually trap particulate debris; a less-distensible sealing cuff might result in less native valve trauma and embolization at the time of post-dilation than a more-distensible cuff. Newer, more effective sealing cuffs and better sizing might reduce paravalvular leaks and the need for post-dilation.

For now the role of post-dilation after THV implantation remains controversial. Will other studies bear out the association between post-dilation and embolic events? We are sure to hear more about this over the next few years.

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Key Words: aortic stenosis ■ aortic valve ■ transcatheter.