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EDITORIAL COMMENTARY

Bioprosthetic valve thrombosis: Are we not seeing the wood for the trees?

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A major decision facing many patients undergoing valve replacement is selection of valve prosthesis, traditionally assessing the risks of lifelong anticoagulation after mechanical valve replacement versus the risks of bioprosthetic valve degeneration and possible reoperation. Despite promising improvements in the longevity of newer-generation bioprosthetic valves, reduced risks associated with redo surgery, and now the possibility of redo “valve-in-valve” transcatheter aortic valve replacement (TAVR), improving outcomes after bioprosthetic valve replacement remains important.

In this edition of the *Journal*, there is a provocative Expert Opinion by Egbe and the group¹ from the Mayo Clinic, on an underrecognized problem: bioprosthetic valve thrombosis (BPVT). On the basis of their own study,² the authors clearly explain how it may be the presence of thrombus on bioprosthetic valves, and not valve degeneration, that causes reduced leaflet motion, a resultant increase in transvalvar gradients, and possible hemodynamic compromise.

Egbe and colleagues’ study² of 397 valve explants found pathologic evidence of BPVT in 46 cases (11%), with 65% of these occurring more than 1 year after valve insertion and 15% after 5 years, suggesting this is not a

perioperative phenomenon. By using echocardiographic criteria, particularly increased cusp thickness, decreased cusp mobility, and increasing transvalvar gradients, they estimated the incidence of BPVT to be at least 1%, based on 3161 patients who underwent follow-up echocardiograms at their institution. They demonstrate the efficacy of warfarin therapy in treating BPVT in 14 of 15 cases of established BPVT (93%), thereby avoiding reoperation.³ They also consider that antiplatelet therapy, or guideline-directed^{4,5} (3 months only) anticoagulation, is ineffective in preventing BPVT. Finally, they reference the recent *New England Journal of Medicine*

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Central Message

BPVT is not uncommon and is amenable to prevention, early diagnosis, and safe treatment.

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article about the possible occurrence of BPVT in patients undergoing TAVR, diagnosed with computed tomography scanning, and the possible effectiveness of warfarin in treating this.⁶

Egbe and colleagues acknowledge possible weaknesses in their study,² particularly that it is a retrospective, single-center experience that may have an unrepresentative referral bias, that their echocardiographic data were incomplete with approximately half of the potential patients not having studies available for review, and that they used “time to valve explantation” as a surrogate for “time to thrombosis.” However, using this time surrogate would overestimate the time that BPVT occurs, and so we can assume that BPVT, although not being a perioperative event, usually occurs within the first 5 years after implantation.

This Expert Opinion¹ is of particular interest because it relates to something commonly performed: conventional valve replacement. Moreover, BPVT is an underrecognized problem for which Egbe and colleagues concisely direct how future research should ascertain which diagnostic, preventive, and treatment strategies would improve long-term outcomes and avoid redo surgery.

Egbe and colleagues¹ recommend that diagnosis is feasible with echocardiography using their 3 criteria (increased cusp thickness, decreased cusp mobility, and increasing transvalvar gradients). Because BPVT is not a perioperative phenomenon, but because most cases occur within 5 years of implantation, they suggest current guidelines against routine echocardiography in the first 5 years⁷ should be revisited. They imply an early postimplant baseline echocardiogram would be necessary with annual studies thereafter.

The choice of a bioprosthetic valve is frequently made to “avoid” anticoagulation while accepting an increased risk of reoperation as a result of valve degeneration. This intriguing article¹ complicates this consideration because it indirectly recommends a fairly long period of preventive anticoagulation after bioprosthetic valve implantation, certainly longer than the first postoperative 3 months only as recommended by some guidelines.^{4,5} Antiplatelet agents alone are not effective in preventing BPVT. Treatment of established BPVT with a course of anticoagulation was successful in 93% cases with evidence of increased leaflet pliability, decreasing gradients, and subsequent avoidance of redo surgery.³ The rationale for planned trials, including the role of alternatives to warfarin and the relevance of BPVT in the population undergoing TAVR, in whom treatment of BPVT with warfarin also has been successful,⁶ is well made.¹ Whatever the outcomes of future studies, preventive anticoagulation after bioprosthetic valve replacement will be evidence driven and tailored to individual patients. It will never be mandatory, unlike after mechanical valve replacement.

The role of porcine versus pericardial valve prosthesis type in the development of BPVT is unclear. Egbe and colleagues² found that, although pericardial valves only accounted for 8 of 46 BPVT cases, porcine valves are still not a predictor of BPVT. However, another study from the Mayo clinic found 8 cases, all of which were in porcine valves.⁸

Egbe and colleagues¹ make a sound case for BPVT and bioprosthetic valve degeneration being separate entities. However, there will clearly be cases of thrombus adhering to a degenerating valve or alternatively organizing thrombus leading to fibrosis and valve degeneration. Egbe and colleagues’ major recommendations, that BPVT is amenable to prevention, diagnosis, and treatment, remain valid even if BPVT and degeneration are stages or variations of the same disease process.

Understandably, most current literature on valve replacement reflects the exploding interest in TAVR and other developing technologies. The expression that someone “cannot see the wood (ie, forest) for the trees” implies that one fails to see what is important because of giving too much attention to other details. This article is relevant to much that is important—not only to improving outcomes with conventional valve replacement but also to these developing technologies. It is not uncommon for an article to have a single message and provoke only 1 idea. This Expert Opinion¹ has messages on current practice, diagnosis, prevention, treatment, emerging technologies, and future research. BPVT is a fairly simple message and is potentially very important.

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