Bioprosthetic Aortic Valve Replacement in the Young
A Cautionary Tale

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It has sometimes been observed that if there are many solutions to a problem, then it is probable that none is exactly correct. Such is the circumstance for young, adult-sized patients facing surgical aortic valve replacement (AVR). For their much younger and smaller counterparts, in whom somatic growth is incomplete, the pulmonary autograft (Ross procedure) is certainly the correct solution. At the other end of the age spectrum, for patients >70 years of age, a stented bioprosthesis is virtually always the best choice unless high surgical risk would favor transcatheter AVR. For patients <60 years of age, a mechanical prosthesis is appropriate, although current American College of Cardiology/American Heart Association guidelines of the management of patients with valvular heart disease include the following hedge: “A bioprosthesis is recommended in patients of any age for whom anticoagulant therapy is contraindicated, cannot be managed appropriately, or is not desired.” Therein lies the rub: Virtually no young adult desires anticoagulation, and adherence to complex medication regimens in this age group is notoriously poor, rendering the “appropriate” management of vitamin K antagonist (VKA) medication dosage problematic. Furthermore, a substantial number of young, adult-sized patients facing AVR are female and may wish to avoid VKA during childbearing years, despite recent reports describing favorable outcomes in women with carefully supervised VKA-based anticoagulation during pregnancy. Thus, for young, adult-sized patients (and their parents), the contemplation of which valve is the best, or least worst, choice is based on multiple factors, as shown in the Table, with the final selection based on the combination of risk assessment and lifestyle preferences unique to each young patient. (For the sake of completeness, the Table includes the option of stentless bioprostheses, either allograft or xenograft, although they are rarely used except in unusual forms of endocarditis and extremely small aortic root dimension that would cause severe patient-prosthetic mismatch with conventional AVR.) In this issue of Circulation, Saleeb et al report a recent experience in which 31% of young, adult-sized patients who underwent surgical AVR in a large children’s hospital between 2009 and 2013 elected to have stented xenopericardial bioprostheses implanted. Two types of pericardial valve were used during the period, the Mitroflow LXA (Sorin Group) and the Magna/Magna Ease (Edwards Lifesciences), and the results with the former were alarmingly poor. The authors responded to this observation with enhanced and meticulous surveillance of all patients with implanted pericardial valves, reported their findings promptly to the US Food and Drug Administration, and shared their concerns with relevant professional societies. Several important lessons from this episode deserve particular emphasis.

The report exemplifies the complexity of decision making for this patient population. In contrast, the choice of prosthesis for older adults is simple: If the patient is elderly or middle-aged but cannot or will not take VKA, a bioprosthesis is elected and implanted via conventional open-heart surgery or by transcatheter AVR. If the patient is young, able, and willing to take VKA, a mechanical prosthesis is preferred. For the young adult, additional factors beyond age such as childbearing status, lifestyle and occupational priorities, other cardiac issues (such as coexistent right ventricular to pulmonary artery conduits), multiple prior operations, and connective tissue disease may merit consideration. The calculations for a 20-year-old patient facing 4 or 5 additional aortic valve interventions are quite different from those for his or her grandparent who would likely face at most 1 additional procedure. For the latter patient, the prospect of a valve-in-valve transcatheter AVR 15 years hence is a very reasonable intervention after an initial surgical AVR with a bioprosthesis. For the 20-year-old patient whose bioprosthesis, under the best of circumstances, will have a much shorter effective life span, the prospect of a transcatheter AVR at 28 years of age is likely of little solace, given the requirement for several subsequent AVRs. When it comes to choosing an aortic valve prosthesis, youth brings complexity, and the implications of any choice are amplified by the much, much longer period of postoperative hazard.

Among the most important aspects of this report is its genesis: The index case was detected at an autopsy performed after a sudden death during a gastrointestinal illness. The lamentably low rate of autopsies has been discussed extensively, and certainly no practitioner would have difficulty imagining that an autopsy might not have been done at his or her own institution in a similar setting. Although the exact details of communication between pathologist and cardiologist that led to this report are not spelled out in great detail, it is evident that a meticulous postmortem examination was the sine qua non. The recognition of the importance of the pathological findings was also crucial; a cardiologist or several cardiologists contemplated a severely degenerated and obstructed valve in the context of a minimally abnormal echocardiogram a few months earlier. Rather than shrugging off these 2 pieces of
The present report is a cautionary tale for those who care for young adults with aortic valve disease. The version of the Mitroflow valve available in the United States should not be implanted in young adults in the future. For those patients who have already had the valve implanted, enhanced surveillance, as described in the present report, should be initiated immediately if it is not already underway.

Disclosures

None.
References

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