RELATION BETWEEN HEMODYNAMIC BEHAVIOR AND OCCURRENCE OF EARLY STENOTIC FAILURE OF BIOPROSTHESES

To the Editor:

In the May issue of the *Journal*, Jamieson and Fradet¹ comment on a recent Brief Communication by Lawton and colleagues² in which 4 cases of early failure of the Mosaic (Medtronic Inc, Minneapolis, Minn) porcine bioprosthesis are described, with development of severe valve stenosis necessitating replacement. In their letter, Jamieson and Fradet question the diagnosis of early structural valve degeneration (SVD) in these explants, stating that the valves reported by Lawton and colleagues were either thrombosed or covered by pannus.

We recently performed long-term clinical and echocardiographic follow-up in a series of 564 aortic bioprostheses (among which 152 were Mosaic valves) with the emphasis on studying the occurrence of structural valve deterioration as determined by echocardiography.³ We demonstrated a link between the presence of prosthesis–patient mismatch (PPM) defined as an indexed effective orifice area (EOAi, cm^2/m^2) less than 0.85 and the occurrence of early, stenotic-type SVD³ with elevated transvalvular gradients. We showed that patients with PPM are at risk for stenotic-type SVD, starting to occur from 3 to 4 years after implantation. In Lawton and colleagues² study, 3 of the 4 cases presented had an EOAI less

than 0.85 and therefore had moderate PPM. The remaining patient had an EOAI of 0.89, which is borderline. The observed early dysfunction in these valves cannot be ignored, given the reported transvalvular gradients and effective orifice areas before their explanation.² Lawton and colleagues have made a correct observation of 4 early, stenotic-type valve failures in patients with moderate PPM. It might still be that both pannus and thrombus were present in these valves, and that these elements were (partially) responsible for the pathologic hemodynamic behavior. But what causes such an early extensive pannus formation or early thrombotic changes at the surface of an aortic bioprosthesis? As stated by Carpentier⁴ in his editorial on our article, a relation between disturbed or turbulent transvalvular flow (as is the case when PPM is present) and bioprosthetic tissue failure has been suspected before but was never demonstrated. Banbury and colleagues⁵ noted a tendency for smaller bioprostheses to fail earlier, but they did not observe statistical significance in their analysis.

In our series, none of the implanted Mosaic valves has been explanted yet, but 7 of the 152 Mosaic valves have met our (echocardiography-based) criteria for stenotic-type SVD on follow-up echocardiography. The earliest was already observed after 2.5 years after implantation. Six of these patients had moderate PPM (EOAI range 0.66–0.82), and the remaining patient had an EOA index of 0.88. PPM might not be harmful for the patient, but for the valve....

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Reply to the Editor:

This communication is in response to the Letter to the Editor by Meuris and Flameng¹ in response to our Letter to the Editor² commenting on the brief communication by Lawton and colleagues.³ We identified that Lawton and colleagues misrepresented thrombosis and pannus (nonstructural dysfunction) as durability issues.

Meuris and Flameng¹ are challenging our judgment and stating that Lawton and colleagues³ “have made a correct observation of four early, stenotic-type valve failures in patients with moderate PPM.” We also stated “the radiographs were reported as part of the pathological reports, showing no mineralization of valve tissue in three and remnants of mineralization of host tissue on the sewing ring of the other prosthesis.” We have reviewed all the documentation, including the radiographs, and stand with our original report.

Meuris and Flameng’s concern is related to evidence recently published by Flameng and colleagues.^{1,4} These investigators evaluated the relationship of structural valve degeneration (SVD) and prosthesis–patient mismatch (PPM) (indexed effective orifice area [EOAI] to body surface area with known referenced effective orifice areas by prosthesis size). They found no relationship to survival for the level of EOAI, the same lack of influence as we found,⁵ but PPM less than 0.85 cm^2/m^2 is predictive of SVD (hazard

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