teaches educational courses for Medtronic; and is a consultant to Medtronic, Edwards, and Sorin. All other authors have nothing to disclose with regard to commercial support.

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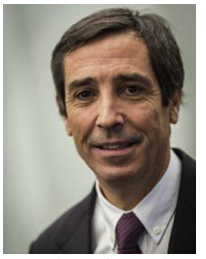
Key Words: surgical aortic valve replacement, aortic tissue valves, antiplatelet/anticoagulant-related bleeding

Discussion



Dr Miguel Sousa Uva *(Lisbon, Portugal)*. Thank you, Dr Sabik, for this very clear and well-organized presentation, and thanks for sending me the manuscript in advance.

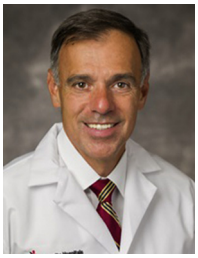
Two years ago at this meeting in Boston, you presented the 1-year results of the Avalus bioprosthetic valve (Medtronic, Minneapolis, Minn). You hypothesized at that moment that the reason for higher bleeding was related to patient medication due to associated conditions, and this is the subject of today's presentation. The reported linearized late event rate for major bleeding in the Pericardial Surgical Aortic Valve Replacement Pivotal Trial was above, as you said, the objective performance criteria, in line with other modern bioprosthetic pericardial valves. You have shown us that, at discharge, 43% of patients were taking anticoagulants or anticoagulants plus antiplatelet therapies, whereas at 3 years this was the case only in 16% of patients. So most of these patients were on anticoagulation and antiplatelet therapies for other conditions than the prophylaxis after surgical aortic valve replacement. You performed multivariable Cox proportional hazard regression showing that frail patients, older patients, peripheral vascular disease, renal insufficiency, and diabetes were independent predictors for bleeding.

We now have 572 patients available for follow-up at 3 years, and there was, fortunately, only a very low rate of valve explants, 1.9%, and so we are reassured that this valve is safe in terms of major adverse events, and durability, of course, at 3 years is still too short.

You have not mentioned, but the hemodynamic performance of the valve was evaluated by echocardiography at

6 months and as late as follow-up, and we have observed that mean gradients were stable. But the results presented and published in the *Journal of Thoracic and Cardiovascular Surgery* showed one third of patients had a significant prosthesis–patient mismatch (PPM).

So my first question. Did you look into reasons for this low indexed effective orifice area reaching almost one third of patients with this bioprosthetic valve?



Dr Joseph F. Sabik *(Cleveland, Ohio).* Thank you. I think that's a very good question. And I suppose the way I think about it is the same way I think about this objective performance criteria for bleeding. Our patients have changed over time. We are seeing bleeding in patients with biological valves, something we wouldn't expect, and it is because of all of their comorbid conditions that is leading to anticoagulant therapy and their bleeding. I think when I think about PPM, I joke around with my residents, I said, you know, when I first came on I was a staff surgeon. It was very rare for me to operate on somebody weighing >80 kg. Today it is very rare for me to operate on somebody weighing <100 kg, it seems. And so I think our patient population is changing, and sometimes we have large patients in small bodies.

And so I think we probably need to think a little bit different about PPM and that maybe we are seeing these artificially low or higher rates of PPM really because of the size of our patients. I think you bring up a very good point. We are following these patients very closely, and we are not seeing the deterioration you talked about because of these findings.

So I think as probably a subject of another paper is, do we really need to look at PPM as well just because our patient population is changing over time.

Dr Sousa Uva. Thank you. My second question concerns the protocol. Did the trial protocol recommend a specific antithrombotic protocol at discharge and did it specify any type of self-monitoring or self-management international normalized ratio?

Dr Sabik. You know, I apologize, I don't remember. It has been a while since I have looked at that, but my guess would be is that that was left up to the individual sites. But I would have to recheck the protocol.

Dr Sousa Uva. Thank you. Finally, as you know, subclinical valve thrombosis has been detected by 4-dimensional computerized tomography and occurs with a rate of around 7% for surgical bioprostheses and around 14% after transcatheter aortic valve replacement. Although this is subclinical, this phenomenon may be a mechanism involved in late valve degeneration, although this is a hypothesis. The rate of hemodynamic structural valve deterioration occurred only in 3% of all patients, which is reassuring.

So my last question: Could this low rate of even moderate valve degeneration be related to the fact that patients were under anticoagulation and do you plan to perform any 4-dimensional computed tomography scans in a subset of these patients?

Dr Sabik. That's an excellent question. Obviously we are always trying to balance the risk versus the benefit, and to me it's very interesting to just look at the correlation between the period of time when patients were bleeding and the amount of anticoagulants they were on and then clearly the anticoagulants were pulled back by their doctors and the bleeding went away, but are we going to switch 1 problem for another? I think that's an excellent question.

To my knowledge, we are following these patients and a group of these patients are going to be followed to well beyond 10 years, but with echocardiography and not with 4-dimensional computed tomography.

Dr Sousa Uva. Thank you.