# Correspondence

## Response to Letter Regarding Article, "Histopathology of Embolic Debris Captured During Transcatheter Aortic Valve Replacement"

Transcatheter aortic valve replacement (TAVR) involves the introduction of a large-bore catheter system into a major artery or the left ventricle and the passage of guidewires, temporary pacemakers, balloons, and the valve-containing delivery system through the vascular bed to enable the delivery and eventual deployment of a previously crimped bioprosthesis in the aortic root. Appropriate anticoagulation is mandatory to minimize thrombus formation throughout the course of this relatively complex procedure. Fanning and colleagues, just as we were, are surprised by the relatively high thrombotic load captured in the embolic protection filters during TAVR. We reported suboptimal activated clotting times not reaching the intended target of 250 to 300 seconds that might have contributed to these findings.[1] In our understanding, no consensus guidelines have so far formally recommended target activated clotting time levels >300 seconds. Indeed, the referenced American College of Cardiology Foundation/American Association for Thoracic Surgery/Society for Cardiac Angiography and Interventions/Society of Thoracic Surgeons expert consensus document on TAVR reads as follows: "…anticoagulation therapy is usually initiated after insertion of the regular sheaths and prior to placement of the large sheath into the vasculature, and repeated to maintain an activated clotting time of >300 seconds."[2] The optimal activated clotting time for a TAVR procedure remains unclear. Instead of simply proposing higher activated clotting time targets, we could strive for more trustworthy anticoagulation regimens with heparin or explore other anticoagulants like bivalirudin to reach adequate and predefined anticoagulation levels more reliably because more aggressive targets could come at the expense of increased bleeding and vascular complication rates.

We agree that the procedure times in our study exceed what others have reported. However, the definition of procedure time varies across the literature. In our series, the timer started when the patient was installed in the catheterization laboratory before the anesthesiologist initiated the required patient workup (central venous line, arterial line, induction and intubation, etc). Undoubtedly, many reports consider only the time between the first femoral puncture and the final arteriotomy closure. Of note, the introduction and deployment of the embolic protection device used in this study (Montage Dual Filter System, Claret Medical, Inc) generally take only a couple of minutes and do not add significantly to the overall procedure time. We do concur that the use of embolic protection devices per se may contribute to the overall thrombotic burden.

We respectfully yet strongly disagree with the suggestion that on the basis of our study the findings of embolized valve/vascular tissue debris could be unique to transcatheter aortic valve implantation procedures with the Medtronic CoreValve. Our study included a limited overall number of cases, and the predominance of Medtronic CoreValve precludes any comparison with other devices. In fact, the protection filters contained macroscopic debris in all 4 cases in which the Edwards SAPIEN device was used in this study. Controversy remains concerning the applicability, interpretation, and reproducibility of transcranial Doppler studies.[3] In our experience, as in recently presented prospective series but contradicting the findings by Kahlert et al,[3] crossing the degenerated aortic valve with a wire may generate a similar or even higher number of high-intensity transient signals compared with valve positioning and implantation. Furthermore, the relatively high incidence of new (subclinical) brain lesions by magnetic resonance imaging after TAVR is a consistent finding regardless of device platform or access strategy used.[4] We therefore believe that cerebral embolization is truly a universal finding with TAVR regardless of the access strategy or device-type selection.

In conclusion, both histopathology and transcranial Doppler studies provide robust evidence of TAVR-related cerebral embolization and corroborate brain magnetic resonance imaging findings. The next step is to address the long-term clinical impact on neurocognitive function of these so-called subclinical brain lesions and to explore whether the use of embolic protection devices may limit the frequency or volume of these TAVR-related brain (micro) infarcts.

## Disclosures

None.

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