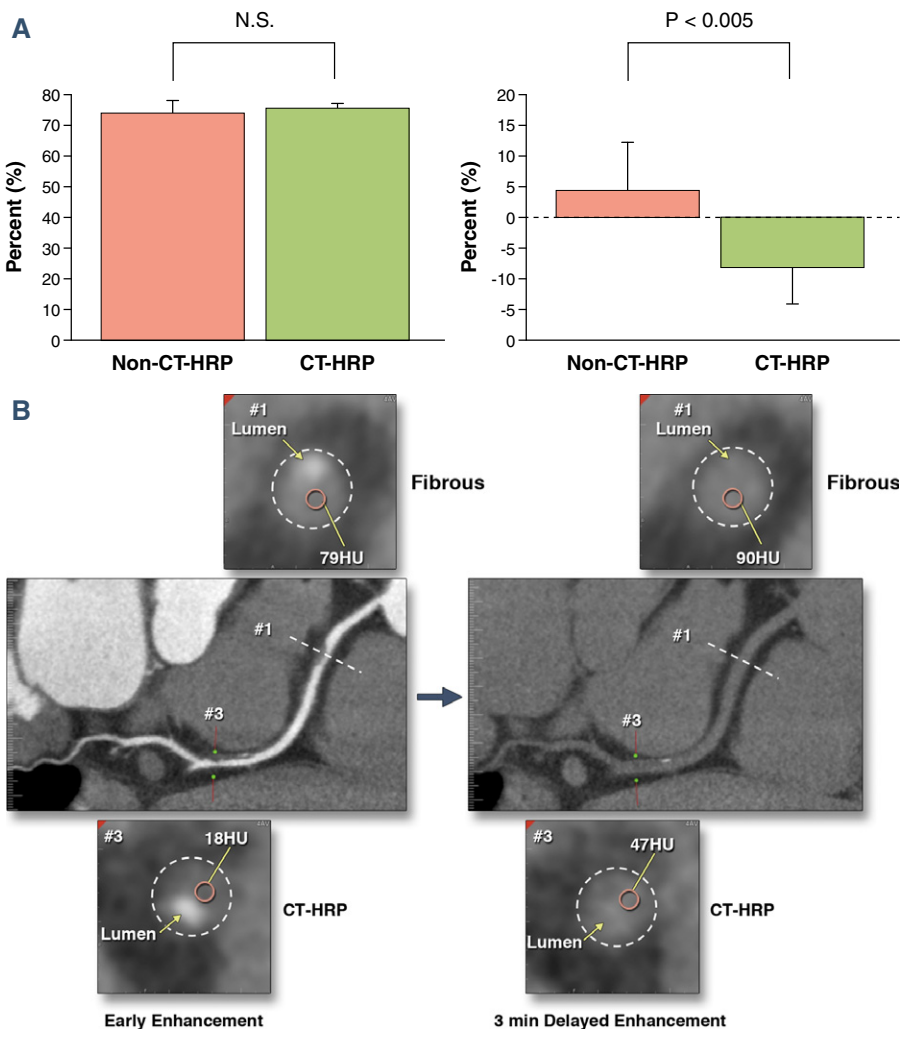

Figure 1. Comparison of Contrast Washout Between Early and Delayed CT and a Representative Case of Coronary Plaque Delayed Enhancement

(A) Comparison of contrast washout between early and delayed computed tomography (CT) acquisitions in the aortic lumen **(left)** and within coronary atherosclerotic plaque **(right)** in lesions with high-risk morphology and lesions without such features. **(B)** Delayed enhancement of a high-risk coronary plaque. A 61-year-old male, with coronary risk factors (family history, hypertension, dyslipidemia, and smoking) underwent coronary CT angiography that revealed a stenosis with 75% luminal diameter reduction and associated plaque without high-risk features in the proximal right coronary artery. In addition, a second lesion with positive remodeling and low initial CT attenuation (high-risk morphology) was found in the distal right coronary artery. Percent contrast washout was −2.4% in the proximal lesion and −6.3% in the distal lesion. CT-HRP = computed tomography verified high-risk plaque (positive remodeling >1.3 and low attenuation plaque <30 HU).

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Pre-Dismissal Surveillance Echocardiography Second Day After TAVR

Transcatheter aortic valve implantation (TAVI) has been recognized as an alternative treatment for high-risk surgical patients

with symptomatic severe aortic stenosis (AS). Valve migration is a potentially life-threatening complication of TAVI that usually occurs during implantation. Late (>24 h) (1) migration may result in catastrophic complications like cardiogenic shock (1) or heart failure (2). We recently encountered a case of a valve migration into the left ventricular outflow tract (LVOT) identified on a routine 24-h follow-up echocardiogram in an asymptomatic patient.

A 77-year-old man with symptomatic severe AS and high risk for surgical replacement (European System for Cardiac Operative Risk Evaluation score 20%; Society of Thoracic Surgeons score 17%) underwent TAVI. Baseline echocardiogram revealed a calcified trileaflet aortic valve (AV), AV area 0.87 cm^2, mean pressure gradient 27 mm Hg, and LV ejection fraction 30%. The patient underwent TAVI in standard fashion with transfemoral approach. Intraprocedural transesophageal echocardiogram (TEE) confirmed the aortic annulus diameter of 23 mm. As such, a 26 mm balloon-expandable bioprosthesis (Edwards-SAPIEN, Edwards Lifesciences, Irvine, California) was selected. After the native AV balloon pre-dilation, the TAVI valve was advanced to the annulus using fluoroscopic and TEE guidance and deployed under rapid pacing. Post-deployment, aortogram TEE (Fig. 1A, Online Video 1) and TEE (Fig. 1B, Online Video 2) confirmed optimal valve position. The mean pressure gradient was 9 mm Hg. There was a single jet of moderate eccentric periprosthetic regurgitation (Online Video 3). Considering the patient's hemodynamic stability, no evidence of inadequate valve deployment, and a small risk of device displacement or development of central regurgitation with redilation, no further intervention was undertaken.

Transthoracic echocardiogram (TTE) repeated 24 h after TAVI revealed an increased prosthetic mean pressure gradient (22 mm Hg). Importantly, partially mobile thickened native leaflets were seen overlying the prosthetic stent suggesting TAVI valve migration into LVOT (Fig. 1C, Online Video 4). In addition to mild-to-moderate periprosthetic regurgitation, severe central regurgitation ceasing within LVOT was demonstrated (Fig. 1D, Online Video 5). Urgent TEE confirmed valve migration into LVOT resulting in a simultaneous functioning of the native and bioprosthetic valves (Online Video 6). Full closure of the native

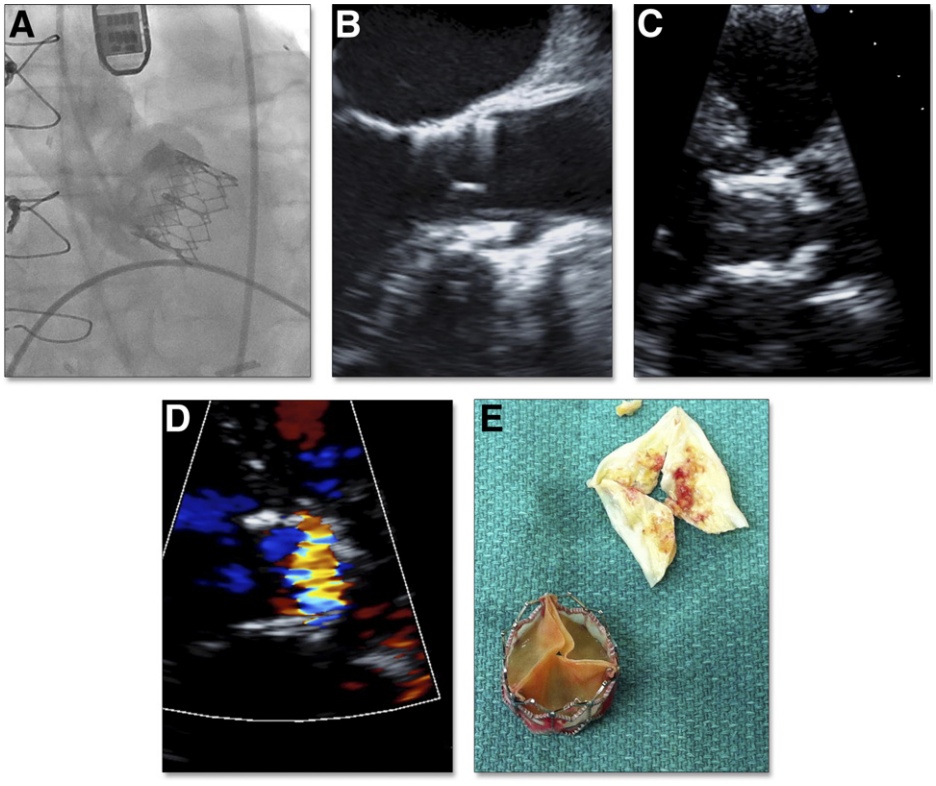

Figure 1. Migration of TAVI Bioprosthesis Into LVOT in an Asymptomatic Patient

Immediately post-transcatheter aortic valve implantation (TAVI), optimal valve position was confirmed with fluoroscopy **(A)** (Online Video 1) and transesophageal echocardiography **(B)** (Online Video 2) with a moderate eccentric periprosthetic regurgitation seen on color Doppler imaging (Online Video 3). Transthoracic echocardiogram performed 24 h post–TAVI demonstrated thickened native leaflets overlying the prosthetic stent suggesting migration of the prosthesis into the left ventricular outflow tract (LVOT) **(C)** (Online Video 4). Severe central regurgitation on color Doppler appeared to cease within LVOT **(D)** (Online Video 5). Prosthetic valve migration with a simultaneous functioning of the native and prosthetic valves was confirmed on a transesophageal echocardiogram (Online Video 6). During an emergent open-heart surgery, the bioprosthesis was found fully expanded and structurally normal. The native aortic valve had 3 relatively flexible cusps with moderate calcification at the tips and trivially calcified annulus **(E)**.

valve leaflets was restricted by the prosthetic stent resulting in severe central regurgitation stopping at the competent bioprosthetic leaflets. An urgent valve-in-valve TAVI was planned but repeat TEE demonstrated further valve migration into LVOT that precluded safe implantation of the second overlapping prosthesis. The patient underwent an emergent open-heart surgery during which the TAVI valve was found sitting in LVOT in an unstable position. The native valve leaflets had 3 relatively flexible cusps with moderate calcification (Fig. 1E). The aortic annulus had only trivial amount of calcium. The AV was replaced with 23-mm Perimount Magna (Edwards Lifesciences) tissue valve. The patient tolerated the surgery well.

Valve dislodgment may occur in patients with less-than-severe AV and root calcification that may be insufficient for anchoring the prosthesis (1,2), which was likely the case in our patient. Other potential causes include stent malposition (3,4) and selection of an undersized valve (5). In the present case, the correct 26-mm valve was selected based on 23-mm annulus, and its optimal position was confirmed with aortogram and TEE. Forces from the periprosthetic and central AV regurgitation, and from the residual overhanging native AV leaflets (2) likely contributed to the progression of valve migration.

This case demonstrates that routine 24-h follow-up echocardiography is essential to confirm correct TAVI valve position and function in order to prevent adverse consequences of delayed mechanical complications. In addition, it demonstrates that TAVI should be used with caution in patients with less-than-severe AV calcification.

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Please note: Dr. Meyer is his site's local investigator for Boehringer Ingelheim's ReAlign trial investigating the use dabigatran in the anticoagulation of mechanical heart valves. He personally receives no money for this trial. His site does receive money to support their research coordinator for this trial. Dr. Shanks serves on the advisory board for Servier Canada and has received honorarium from Astra Zeneca. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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APPENDIX

For supplementary videos and their legends, please see the online version of this article.

Effective Dose of PET/CT in Informed Consent Forms

The recent article by Terranova et al. (1) made important points about informed consent. We agree with their conclusions that "the development of simpler and more informative informed consent models and forms will gently force the doctor to be more aware of what he/she does and the patient more aware of what he/she undergoes, enabling both to make more responsible choices" (1).

However, the authors might have begun with the correct facts to avoid the gross error shown in Figure 3. At the bottom right of that figure, the dose for rest/stress myocardial perfusion positron emission tomography (PET) is shown as approximately 1,000 "equivalent number of chest x-rays." For a visual representation, the authors reproduced Figure 2A from our prior publication, featured on the cover of that issue of the *Journal of Nuclear Medicine* (2). As we described in the middle of the second column on page 1,113 of that paper (2), with further detail in Table 2 of a subsequent paper (3), the dose equivalent from our rest/stress cardiac PET scan using computed tomography (CT) attenuation correction is approximately 7.5 mSv (using a low-dose helical CT at rest and a single post-stress cine CT in addition to the rubidium-82 tracer for PET).

Assuming a standard 0.02-mSv effective dose for a chest x-ray, our PET/CT scan equals roughly 375 chest x-rays, almost one-third of the value suggested in their Figure 3 (1). As such, PET/CT delivers less radiation than other modalities in their Table 3: single-photon emission computed tomography (SPECT) (using either technetium-99m or thallium-201), CT angiogram, or percutaneous coronary intervention. As an additional error, the dose-based order of tests on the x-axis of Figure 3 (invasive angiogram, SPECT, CT angiogram, PET) differs from their order in Table 3 above it (SPECT with technetium-99m, CT angiogram, invasive stenting, SPECT with thallium-201). Therefore, Figure 3 was factually incorrect and failed the authors' words for "simpler and more informative informed consent."

Moreover, quantitative PET perfusion imaging is a powerful guide to avoid the higher-dose procedures like SPECT imaging and CT or invasive angiography by quantitatively defining physiological stenosis severity before these procedures are undertaken and identifying who will optimally benefit from them (4) at the lowest total radiation dose.

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