

Predictive Impact of Paravalvular Leak Assessments on Clinical Outcomes Following Transcatheter Aortic Valve Replacement



Paravalvular leakage (PVL) following transcatheter aortic valve replacement (TAVR) is associated with greater mortality. In clinical practice, determining PVL severity after TAVR remains challenging and often requires multiparametric assessments. This study sought to evaluate the respective value

of various modalities of PVL assessments, including transthoracic echocardiography (TTE), cine-angiography, aortic regurgitation index (ARI), and closure time with adenosine diphosphate (CT-ADP), in the prediction of adverse clinical outcomes. Consecutive TAVR patients at our institution (Nouvel Hôpital Civil, Université de Strasbourg, Strasbourg, France) between February 2010 and May 2019 were enrolled. The PVL grading by TTE was according to Valve Academic Research Consortium-2 criteria¹ and angiography was evaluated using the Sellers crite-

Established cut-off values of ARI (<25) and CT-ADP (>180sec) were used to assess the presence of PVL after TAVR. Major adverse cardiac and cerebrovascular events (MACCE) were defined as a composite of all-cause death, myocardial infarction, stroke, and heart failure hospitalization within 1 year. Of 1,075 consecutive TAVR patients, we enrolled 1,044 patients who received both TTE and angiography immediately after the valve implantation. ARI and CT-ADP values were available in 825 patients and 861 patients, respectively. Moderate to

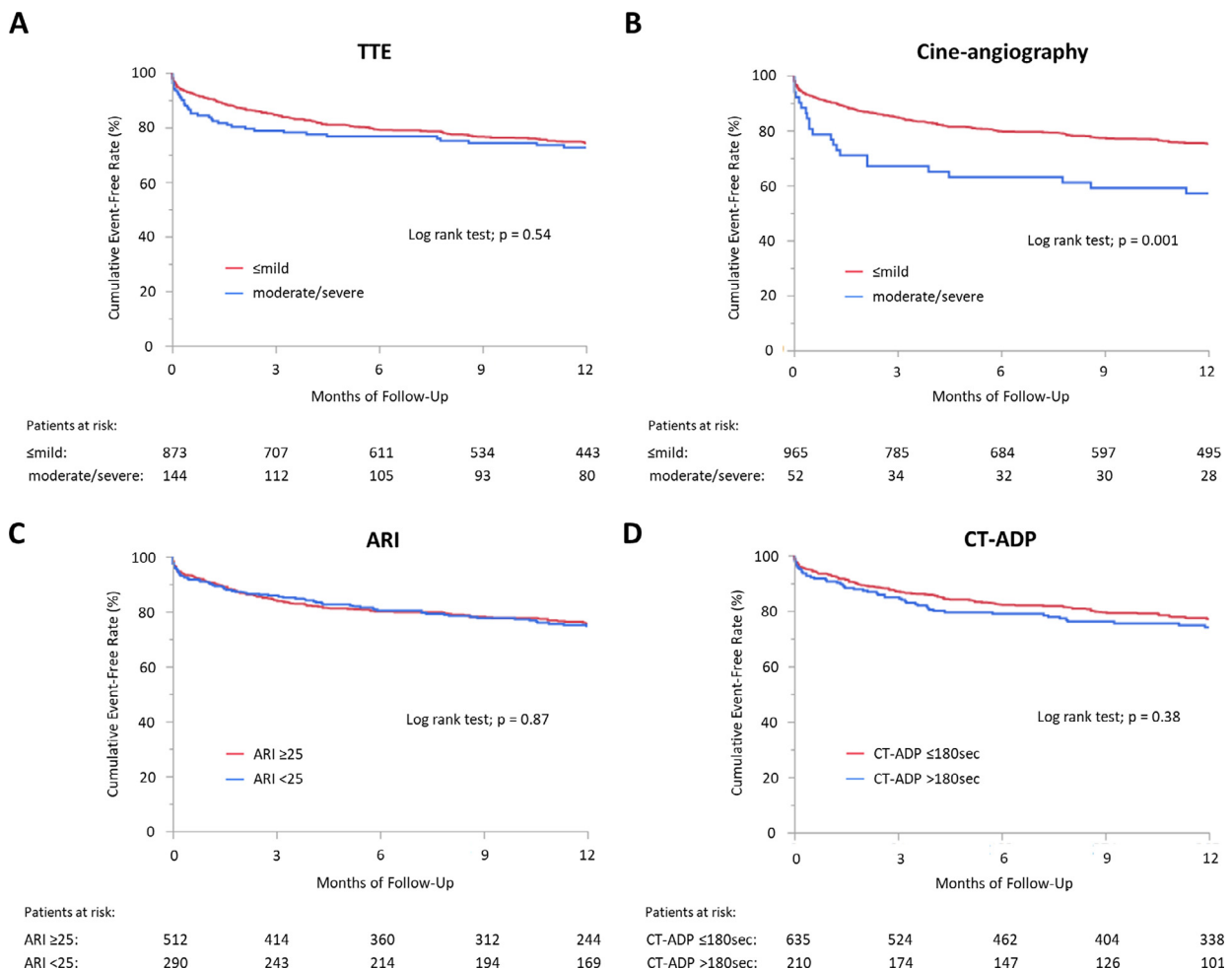


Figure 1. Kaplan-Meier survival curves for major adverse cardiac and cerebrovascular events according to the paravalvular leakage assessments. (A) PVL grading by TTE. (B) PVL grading by cine-angiography. (C) PVL grading by ARI. (D) PVL grading by CT-ADP. ARI = aortic regurgitation index; CT-ADP = closure time with adenosine diphosphate; PVL = paravalvular leakage; TTE = transthoracic echocardiography.

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ria.² The ARI was calculated after TAVR using the following formula: $ARI = [(diastolic\ blood\ pressure - left\ ventricular\ end-diastolic\ pressure) / systolic\ blood\ pressure] \times 100$. Blood samples for CT-ADP analyses were collected 24 hours after TAVR.

severe PVL occurred in 14.2% and 5.2% of patients as measured by TTE and angiography. The rate of patients with ARI <25 and CT-ADP >180sec were 36.5% and 24.9%, respectively. Among the 4 modalities, PVL evaluated by angiography predicted poorer

clinical outcomes (hazard ratio [HR] 2.01; 95% confidence interval [CI] 1.26 to 3.04; $p=0.004$), whereas TTE (HR 1.11; 95% CI 0.78 to 1.55; $p=0.54$), ARI <25 (HR 1.03; 95% CI 0.76 to 1.37; $p=0.87$), and CT-ADP >180 sec (HR 1.16; 95% CI 0.83 to 1.58; $p=0.38$) were not associated with MACCE at 1 year (Figure 1). By multivariate Cox regression analysis, moderate-to-severe PVL by angiography was an independent predictor of 1-year MACCE (HR 1.96; 95% CI 1.22 to 3.00; $p=0.007$).

Current trends of performing TAVR under local anesthesia make transesophageal echocardiography less suitable for PVL assessment. Although cine-angiography has been considered to be highly subjective, dependent on various technical factors and the observer's experience inducing variability in grading, TTE has been the most commonly used method to quantify PVL post-TAVR. However, this technology still has a number of shortcomings, partially due to the multiple, irregular, and eccentric paravalvular jets and the limited window according to patient positioning and interventional procedural factors. Misclassification of PVL grading by TTE was shown in a multicenter study with cardiac magnetic resonance, which demonstrated that PVL severity by cardiac magnetic resonance, but not by TTE, was associated with increased mortality and poorer clinical outcomes.³ Likewise, there is a significant overlap between ARI and aortic regurgitation grades, which can be influenced by diastolic dysfunction, atrial fibrillation, and heart rate. The ARI ratio was suggested to overcome these limits, but its relationship with adverse outcomes was also not evidenced in the present study. Recent clinical study has reported that the CT-ADP >180 sec could be a novel modality to detect PVL and predict 1-year mortality.⁴ However, we previously described that this value could be influenced by the presence of a low hemoglobin level, low platelet count, and appropriate platelet inhibition by P2Y12-inhibitors.⁵ Such factors may decrease the accuracy of CT-ADP in predicting clinical events among real-world TAVR patients. Overall, PVL measured by angiography was

evidenced as the most meaningful modality in the prediction of adverse clinical outcomes in the present study. The grading of PVL remains challenging and future multicenter studies are warranted to ensure our findings in the current TAVR era.

Disclosures

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Association of Internet Use With the Use of Addictive Substances in the United States



Nicotine and tobacco products are strongly associated with cardiovascular diseases. Electronic cigarettes (e-cigarettes) have often been marketed as a safe alternative for smoking cessation,¹ which has led to their popular use over traditional combustible cigarettes. The past decade has also seen a $\sim 20\%$ increase in the use of Marijuana products.² We suspect that online marketing and social media advertisements may have a significant role to play in such trends.

We therefore conducted a cross-sectional study using data from the nationally administered Behavioral Risk Factor Surveillance System survey 2016 to 18 to identify the association between Internet use and pattern of substance use. Internet use was defined as use on 1 or more occasions in the past 30 days. Marijuana use was defined as use on 1 or more days in the past 30 days. Smokeless tobacco use was defined as use of chewing tobacco, snus, or snuff every day or on some days. Cigarette and e-cigarette use was defined as use on some days or every day. We used weighted multivariate logistic regression models to study the association of Internet use with the use of these substances.

Our study population consisted of 81% Internet users ($n=726,329$) and 19% nonusers of Internet ($n=172,642$). Compared to nonusers, Internet users were younger, more likely to be white, single, employed, and more educated. In multivariable analyses, Internet use