

## Letters

### Pre-Procedural 6-Min Walk Test as a Mortality Predictor in Patients Undergoing Transcatheter Mitral Valve Repair



The simple, functional 6-min walk test (6MWT) can predict exercise capacity and is widely used to assess treatment outcomes (1). Transcatheter mitral valve repair (TMVR) (MitraClip, Abbott Vascular, Menlo Park, California) has become widely adopted for clinical use in high-risk or prohibitive-risk patients with mitral regurgitation. Although mortality is significantly less than for open mitral valve surgery in this population, it remains a concern and the utility of the 6MWT in predicting mortality has not been validated (2). Thus, we sought to determine whether the pre-procedural 6MWT was able to predict mortality in patients undergoing TMVR.

We retrospectively studied 139 high-risk or prohibitive-risk patients who attempted the 6MWT during the month before the TMVR procedure at the University of Virginia between March 2007 and October 2015. Fifteen patients were excluded from this study due to a lack of data. The primary endpoint was all-cause mortality. The 6MWT was administered in accordance with the American Thoracic Society protocol (3). After the TMVR procedure, patients received follow-up care at the cardiology outpatient clinic. In addition to the clinic data collected, the Social Security Death Index was searched to confirm all deaths and to check for patients lost to follow-up. There were follow-up and accountability of all patients.

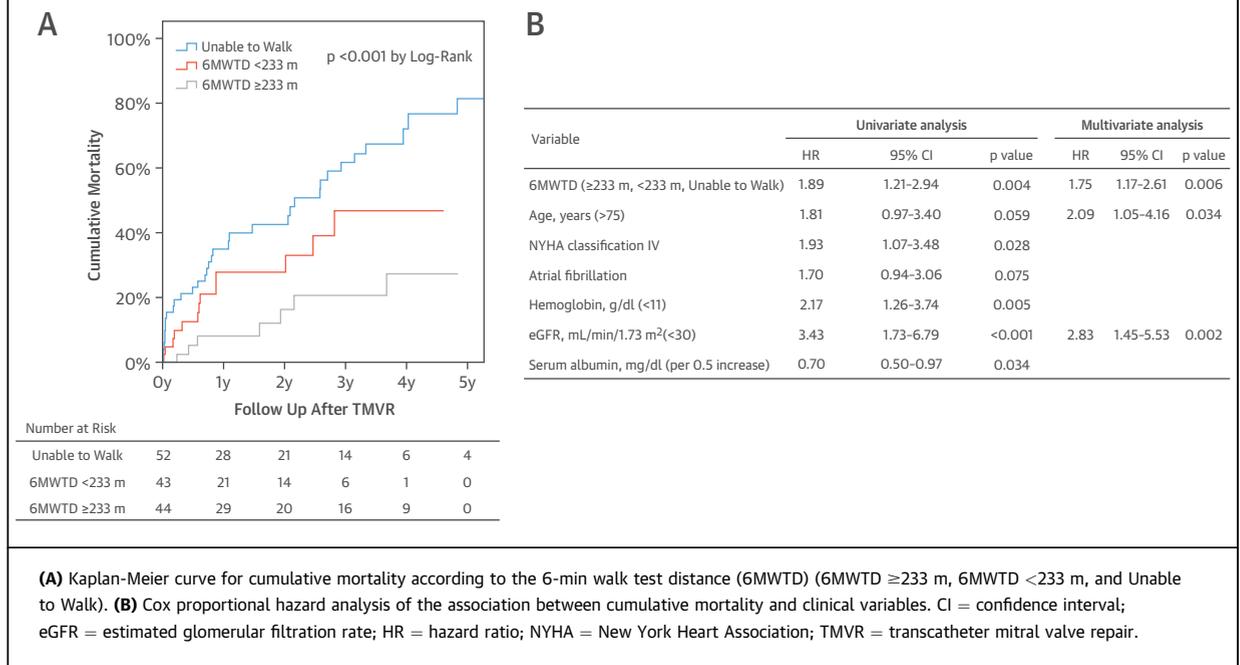
Patients were divided into 3 groups according to the 6MWT distance (6MWTD) using the median (6MWTD  $\geq 233$  m, 6MWTD  $< 233$  m, and Unable to Walk). The prognostic value of the 6MWTD was assessed using univariate and multivariate Cox proportional hazard analyses. The multivariate model included baseline variables that exhibited a  $p$  value  $< 0.15$  on univariate analysis. Cumulative mortality was estimated by Kaplan-Meier curves. Results with  $p$  values  $< 0.05$  were considered significant.

The mean age was  $78 \pm 10$  years, and 52% of patients were female. The mean Society of Thoracic Surgeons score was  $8 \pm 5\%$ . The mean distances walked were  $219 \pm 126$  m; for the 6MWTD  $\geq 233$  m,  $320 \pm 76$  m; the 6MWTD  $< 233$  m,  $115 \pm 71$  m; and for the Unable to Walk  $0 \pm 0$  m. Fifty-two patients (37%) were unable to perform the test due to shortness of breath or desaturation at rest.

Procedural success and mortality at 30 days were 96% and 7.1%, respectively. Mean follow-up was  $2.1 \pm 1.6$ ,  $1.4 \pm 1.2$ , and  $1.8 \pm 1.7$  years for the 6MWTD  $\geq 233$  m, the 6MWTD  $< 233$  m, and the Unable to Walk, respectively. There were no differences in procedural success or complications among 3 groups. In the Kaplan-Meier analysis, those Unable to Walk had the highest mortality rate, whereas the 6MWTD  $\geq 233$  m and the 6MWTD  $< 233$  m patients had lower mortality rates ( $p < 0.001$ ) (Figure 1A). On multivariate analysis, the 6MWTD was an independent predictor of mortality (Figure 1B).

This is the first study to assess the pre-procedural 6MWT as a predictor of mortality in patients undergoing the TMVR procedure. We found poorer baseline functional capacity to be independently associated with mortality. Unlike the present study, European major registries did not report on patients who were unable to walk (2). However, mortality was quite high in this population and should also be evaluated (4).

Walking tests capture additional information about the severity of underlying long-term conditions in clinical and subclinical disease (4). A shorter distance walk test (e.g., 5 m) allows patients to achieve a steady walking speed without eliciting cardiopulmonary symptoms and better appreciates frailty status. The 6MWT appreciates functional status and left ventricular remodeling, particularly in frail patients (1). Notably, mortality in our patients, the Unable to Walk, is comparable to that in patients with optimal medical therapy (5), indicating that they are unlikely to benefit from the TMVR procedure, despite it being a safe procedure. In the future, patients undergoing TMVR, the noninvasive 6MWT in addition to estimated glomerular filtration rate, age, and other independent risk factors in this study will play an important role (2).

**FIGURE 1** Cumulative Mortality After TMVR

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## Added Value of Female-Specific Factors Beyond Traditional Predictors for Future Cardiovascular Disease



In women, sex-specific factors related to hormonal and reproductive status are known to affect cardiovascular disease (CVD) risk (1). It is unknown whether