

Letters

RESEARCH CORRESPONDENCE

Sex-Specific Grip Strength After Transcatheter Aortic Valve Replacement in Elderly Patients



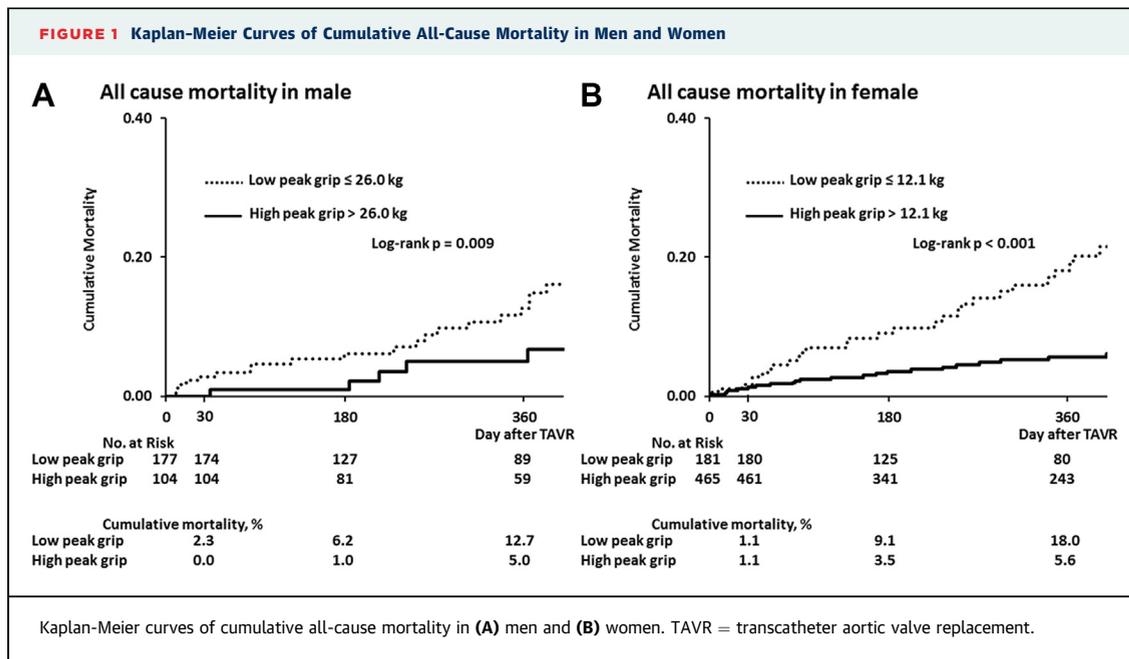
Hand-dominant grip strength is a simple marker that reflects frailty associated with incremental risks for late mortality. However, the prognostic value and optimal threshold of grip strength are not fully validated in elderly patients who undergo transcatheter aortic valve replacement (TAVR). The current study aimed to elucidate the effect of a sex-specific threshold of grip strength on prognosis following TAVR.

A total of 927 patients ($n = 281$ men, $n = 646$ women; mean Society of Thoracic Surgeons Predictive Risk of Mortality score 6.7% [4.6% to 9.4%]) were included in this study population in the Japanese multicenter OCEAN (Optimized Catheter vAlvular iNtervention) registry between October 2013 and April 2016. Grip strength was measured with a conventional dynamometer before TAVR procedure, with the patient in a standing position with his or her arm extended straight down the side of the body. The survival classification and regression tree analysis statistically identified that the optimal threshold of peak grip strength in men was 26.0 kg and in women was 12.1 kg. We divided patients into 2 risk groups (low-grip and high-grip groups) according to the previous cutoff value. Clinical data as well as in-hospital and all-cause mortality rates were compared between the 2 groups for each sex.

The average peak grip strength was 17.9 ± 6.9 kg in the overall cohort, 24.5 ± 7.0 kg in men, and 15.0 ± 4.3 kg in women. In men, there were no significant differences about procedural complications between the 2 groups. In women, the rates of bleeding (46.4% vs. 29.7%), transfusion (45.9% vs. 28.4%), and acute kidney injury (12.7% vs. 4.5%) were higher

in the low-grip group than in the high-grip group (all $p < 0.05$). The 30-day mortality rates were not different between the 2 groups for men (2.3% vs. 0%; $p = 0.12$) and women (1.1% vs. 1.1%; $p = 0.97$). The Kaplan-Meier curves showed significant differences in each group regarding all-cause mortality (Figure 1). The cumulative 1-year mortality rates were significantly higher in the low-grip group than in the high-grip group regardless of sex (men: 5.0% vs. 2.7%, $p = 0.009$; women: 18.0% vs. 5.6%, $p < 0.001$). Kaplan-Meier curves indicated no significant increased cardiovascular mortality rates between the groups (men: 3.9% vs. 2.7%, $p = 0.29$; women: 4.6% vs. 2.6%, $p = 0.095$), whereas noncardiovascular mortality rates highlighted significant differences between the 2 groups in both sexes (men: 9.1% vs. 2.7%, $p = 0.006$; women: 14.1% vs. 3.1%, $p < 0.001$). The Cox regression analysis models examining the association between late mortality and clinical findings are tested. The grip strength (<26.0 kg in men and <12.1 kg in women) were associated with a significantly increased risk of late mortality (for men, hazard ratio [HR]: 3.35; 95% confidence interval [CI]: 1.28 to 8.77; $p = 0.043$; for women, HR: 2.98; 95% CI: 1.81 to 4.91; $p < 0.001$). In men, the logistic European System for Cardiac Operative Risk Evaluation score, creatinine, peripheral artery disease, and non-transfemoral approach were related to increasing late mortality (all $p < 0.05$). In women, logistic European System for Cardiac Operative Risk Evaluation score, New York Heart Association functional class III or IV, creatinine, prior stroke, and non-transfemoral approach were related to increasing late mortality (all $p < 0.05$). These results regarding grip strength were not attenuated, even after adjustment for previous multiple confounding factors in the multivariate analysis for both sexes (for men, HR: 4.36; 95% CI: 1.81 to 4.91; $p = 0.007$; for women, HR: 2.26; 95% CI: 1.32 to 3.87; $p < 0.003$).

Grip strength is considered to be a reflection of overall muscle mass and fitness in adults, and it is an indicator of muscle strength in aging people. We recently revealed the assessment of frailty in TAVR cohort was important for risk stratification before procedure and grip strength was highly correlated with semiquantitative Clinical Frailty Scale (1).



The results of the current study demonstrated that peak grip strength was a useful marker for predicting all-cause mortality following TAVR, particularly with noncardiac deaths. The optimal cutoff value reflecting poor clinical outcomes in peak grip strength differed between men and women. When determining the optimal cutoff value of grip strength, sex differences should also be considered. The values that were determined with the use of a survival classification and regression tree analysis demonstrated an independent association with an increased risk of mortality in the Cox regression multivariate analysis. However, the cumulative 1-year mortality was extremely low in patients with high peak grip strength (men 5.0%, women 5.6%). Thus, patients with maintained grip strength could be considered good candidates for TAVR, even if they have advanced age or multiple comorbidities.

A number of limitations should be addressed in this study. First, the total number of men was relatively small. Second, the measurements of peak grip strength were dependent on the individual hospital's protocols. Last, the ethnic differences should be considered when considered the optimal cutoff value of grip strength. The current cutoff value of grip strength should not be overstated; however, we highlighted the importance of grip strength assessment before TAVR.

ACKNOWLEDGMENTS The authors thank all the OCEAN-TAVI Investigators.

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<https://doi.org/10.1016/j.jcin.2017.06.055>

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Please note: Drs. Yamamoto, Koyama, Tada, Naganuma, Araki, Shirai, Watanabe, and Hayashida are clinical proctors for Edwards Lifesciences. Drs. Yamamoto, Naganuma, and Watanabe are clinical proctors for Medtronic. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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1. Shimura T, Yamamoto M, Kano S, et al. Impact of the Clinical Frailty Scale on outcomes after transcatheter aortic valve replacement. *Circulation* 2017;135:2013-24.