学 位 論 文 の 要 旨

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学 位 論 文 名

The Prognostic Impact of Echocardiographic Indices in Patients With Severe Aortic Stenosis Who Underwent Transcatheter Aortic Valve Implantation

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論 文 内 容 の 要 旨

INTRODUCTION

Symptomatic severe aortic stenosis (AS) has a dismal prognosis. Thus, early intervention is strongly recommended in all patients. Surgical aortic valve replacement (SAVR) for severe AS has been the gold standard treatment and the first choice for younger patients with lower surgical risk, conferring a positive long-term prognosis. However, with the clinical application of transcatheter aortic valve implantation (TAVI) since 2002, it has become necessary to decide whether SAVR or TAVI should be selected. The selection of SAVR or TAVI should be done after considering the patient's age, anatomical characteristics, comorbidities, and frailty, as well as the durability of the valve replacement. The present guidelines released in 2020 offer an index of prioritization that suggests using TAVI in patients aged ≥80 years and SAVR in those aged <75 years. Recently, a new staging system for severe AS has been proposed to quantify the extent of cardiac anatomical and functional damage, as evaluated by echocardiography in patients with AS. The aim of this study was to evaluate the prognostic impact of echocardiographic indices in our real-world patients with symptomatic severe AS patients who underwent TAVI.

MATERIALS AND METHODS

In this study, we retrospectively reviewed the data of 54 patients with severe AS who underwent TAVI between September 2018 and May 2020. Severe AS was defined as a peak aortic jet velocity ≥4.0 m/s and/or a mean aortic valve (AV) gradient ≥40 mmHg and/or an aortic valve area <1.0 cm^2. The study protocol was approved by the Research Ethics Committee of

Shimane University. A standard echocardiographic examination that included comprehensive two-dimensional and Doppler echocardiography using a multi-window approach was performed by experienced sonographers prior to the TAVI procedure in all patients. Stages of cardiac damage were defined as followings: Stage 0, no signs of cardiac damage; Stage 1, left ventricular (LV) damage; Stage 2, mitral valve or left atrial (LA) damage; Stage 3, tricuspid valve or pulmonary artery vasculature damage; and Stage 4, right ventricular (RV) damage. Calculation of relative wall thickness (RWT) with the formula (2 × posterior wall thickness)/(LV internal diameter at end-diastole) permits categorization of an increase in LV mass as either concentric (RWT >0.42) or eccentric (RWT ≤0.42) hypertrophy. All patients were followed up after TAVI. Follow-up data were obtained from a detailed review of all medical records. Adverse valve-related events (VRE) were defined as cardiac death or hospitalization for congestive heart failure (HF). Cardiac death was defined as sudden death, death from HF, or myocardial infarction.

RESULTS AND DISCUSSION

The mean age of the cohort was 87 ± 4 years with 19 (35%) men included. The mean follow-up duration was 431 days. With regard to cardiac damage, 3 patients (5.5%) were classified under Stage 1 (LV damage), 41 (75.9%) under Stage 2 (mitral valve or LA damage), 9 (16.6%) under Stage 3 (tricuspid or pulmonary artery vasculature damage), and 1 (1.9%) under Stage 4 (RV damage). The cumulative 1-year all cause and cardiovascular mortalities were 5.5% (n=3) and 0%, respectively. Three patients experienced VRE (hospitalization for congestive HF) within the follow-up period, of whom 1 patient each was categorized under stages 2, 3, and 4. No significant relationship between VRE and the stage of cardiac damage was found. The RWT of patients with VRE was significantly greater than those without VRE (0.71 ± 0.05 vs. 0.60 ± 0.08, P< 0.016). A RWT cut-off value of 0.66 (sensitivity, 100%; specificity of 72%) was used to detect the presence of VRE. The area under the curve was 0.66 (P=0.022). In patients with RWT ≥0.66, VRE free-survival rate during follow-up was 75±13%. In contrast, VRE free-survival rate during follow-up was 100% in patients with RWT <0.66.

A previous study has demonstrated that the staging system of cardiac damage provided accurate prognostic value in patients undergoing TAVI. In our cohort that was composed of older patients, there were no significant relationships between VRE and the stage of cardiac damage. The patients who were hospitalized for congestive HF within the follow-up period had a significantly smaller LV size and greater RWT (i.e., concentric hypertrophy). Maintenance of cardiac output in patients with severe AS imposes a chronic increase in LV pressure. In response, the LV typically undergoes hypertrophic remodeling characterized by myocyte hypertrophy and increased wall thickness. However, in patients with severe AS, several studies have demonstrated

that increased LV hypertrophic remodeling is associated with more severe LV dysfunction and HF symptoms, as well as higher mortality. Cardiac hypertrophy in response to pressure overload involves both adaptive and maladaptive processes. While LV hypertrophic remodeling may reduce wall stress, it may have long-term deleterious effects that translate into impaired LV performance and worse clinical outcomes. A small LV radius with increased relative wall thickness allows for stress normalization. To maintain stroke volume and ejection performance, however, the presence of increased filling pressure and oxygen consumption is linked. The recognition of advanced stages of cardiac damage may improve risk assessment of patients undergoing TAVI and modulate subsequent follow-up and management strategies.

CONCLUSION

Patients with smaller LV size and concentric hypertrophy are at high risk for HF hospitalization after TAVI.