Comparison of Outcomes of Urgent/ Emergent Endovascular Transcatheter Aortic Valve Implantation in Patients With Tricuspid Versus Bicuspid Stenotic Aortic Valve

Bicuspid aortic valve (AV) stenosis often presents in young low-risk patients compared with tricuspid AV stenosis. Patients with bicuspid AV were excluded from pivotal trials of transcatheter aortic valve implantation (TAVI) devices. However, recent studies have shown reasonable safety and efficacy of TAVI in carefully selected patients with bicuspid AV.[1–3] With the expansion of TAVI to low-risk patients, a significant number of patients with bicuspid AV stenosis may be eligible for TAVI. The majority of TAVIs in the United States are performed as elective in hemodynamically stable patients.[4] A recent study showed that urgent/emergent TAVI is feasible with acceptable in-hospital and mid-term outcomes.[4] This study involved patients predominantly with tricuspid AV stenosis (~90%). Therefore, we conducted this analysis to assess the safety and efficacy of urgent/emergent TAVI in patients with bicuspid compared with tricuspid AV stenosis.

The Nationwide Readmission Database (NRD) was used to identify patient hospitalizations with severe aortic stenosis undergoing endovascular TAVI from 2012 to 2017.[5] Patients with bicuspid AV were then identified using International Classification of Diseases-9th (746.4) and -10th (Q23.1) codes. The procedure was categorized as urgent/emergent if the admission was not designated "elective" status in the NRD. A propensity score-matched model was used with 3:1 ratio to compare outcomes between the groups. The model was adjusted for patient characteristics, baseline comorbidities, and hospital characteristics (bed size and teaching status). The primary outcome was in-hospital mortality. Secondary outcomes were in-hospital complications, length of stay, and 30-day heart failure (HF)-related readmissions. All statistical analyses were performed using SPSS software version 25.0 (IBM Corp., Armonk, New York). This study was exempted from local IRB/ethical approval as NRD contains deidentified data.

A total of 32,834 patients with urgent/emergent TAVI were included in this analysis (weighted national estimate), of whom 394 (1.2%) had TAVI performed in bicuspid AV. In our unmatched population, TAVI patients with bicuspid AV were younger (mean age 66 vs 80 years), more likely to be males, and had lower prevalence of hypertension, hyperlipidemia, diabetes mellitus, coronary artery disease, HF, atrial fibrillation, history of myocardial infarction, history of coronary artery bypass grafting, history of pacemaker, and chronic kidney disease compared with patients with tricuspid AV ($p < 0.001$ for all). Bicuspid AV patients were more likely to have chronic liver disease, tobacco abuse, and malignancy ($p < 0.001$ for all). In the propensity score-matched cohort, TAVI in bicuspid AV was associated with similar in-hospital mortality, stroke, pericardial effusion/tamponade, aortic dissection, acute myocardial infarction, blood transfusion, vascular complications, and 30-day HF-related readmissions compared with tricuspid AV. However, higher rates of new permanent pacemaker (PPM), acute kidney injury (AKI), conversion to open heart surgery, and increased length of stay (median 11 vs 9 days; $p = 0.002$) were noted in TAVI patients with bicuspid compared with tricuspid AV (Figure 1).

In this observational study of patients undergoing treatment for severe aortic stenosis, we examined the comparative safety of urgent/emergent TAVI in bicuspid compared with tricuspid AV. Our findings suggest statistically similar but numerically higher in-hospital mortality and stroke in TAVI patients with bicuspid compared with tricuspid AV. In addition, we found higher rates of PPM, AKI, conversion to open heart surgery, and increased length of stay in patients with bicuspid AV.

In a registry-based study, Makkar et al. reported similar rates of mortality,

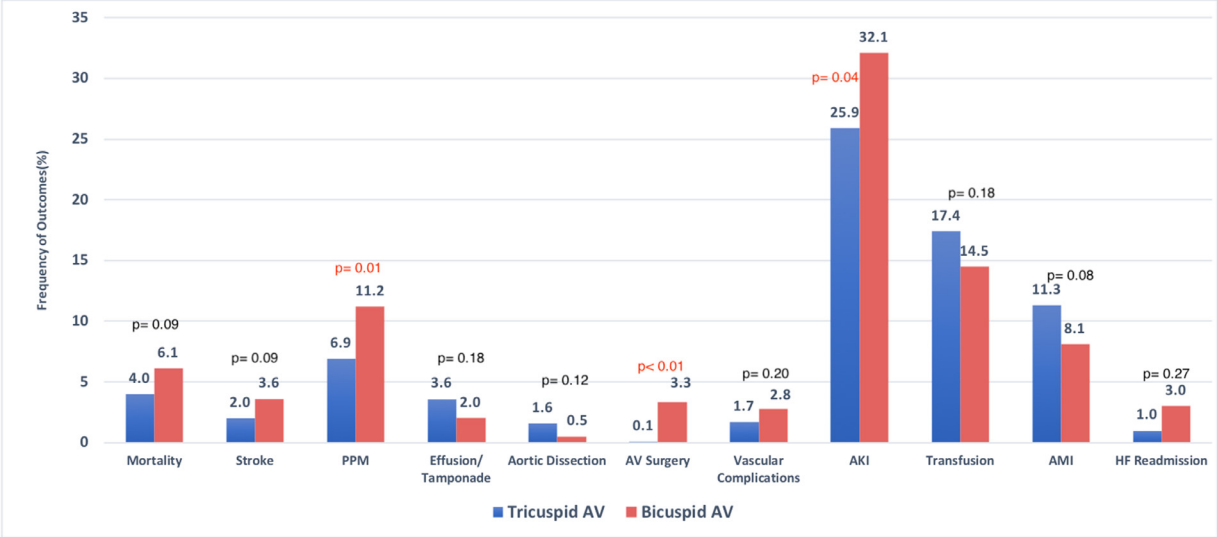

Figure 1. Outcomes of urgent/emergent TAVR in bicuspid aortic valve stenosis. This figure shows comparison of in-hospital outcomes of urgent/emergent transcatheter aortic valve implantation procedure in bicuspid vs tricuspid aortic valve stenosis. PPM = permanent pacemaker; AV = aortic valve; AKI = acute kidney injury; AMI = acute myocardial Infarction; HF = heart failure.

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AKI, and conversion to open heart surgery, but higher rates of stroke and PPM at 30-days in TAVI patients with bicuspid compared with tricuspid AV.[2] Likewise, Halim et al. reported similar in-hospital mortality, stroke, and conversion to open heart surgery, but higher residual moderate or severe aortic insufficiency in TAVI patients with bicuspid compared with tricuspid AV utilizing mostly current generation devices.[3] However, in both aforementioned studies, the majority (>90%) of the procedures were performed in elective hemodynamically stable patients compared with our study, which exclusively evaluated outcomes in urgent/emergent TAVI procedures. The relatively worse outcomes in our study are likely due to decompensated HF, further compounded by anatomical and clinical challenges of TAVI in bicuspid valve such as heavily calcified valve with fused raphe, annular asymmetry, concomitant aortopathy, concern for suboptimal valve expansion in an orifice with 2 commissures, and possibly use of early generation devices compared with current generation devices which are known to have better procedural success and outcomes in bicuspid AV.[1,3]

Our study is limited by database, which lacks information on STS risk scores, valve types (early vs current generation), laboratory/imaging parameters, reasons necessitating urgent/emergent procedures, and long-term follow-up.

In conclusion, in this study of nationally representative cohort of TAVI patients undergoing urgent/emergent procedure, we found relatively worse in-hospital outcomes in patients with bicuspid compared with tricuspid AV.

Disclosures

The authors declare no conflict of interest.

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A Meta-Analysis of Cardiovascular Outcomes in Patients With Hypercholesterolemia Treated With Bempedoic Acid

Treatment with statins has led to significant reductions in cardiovascular events; however, not all patients could attain their target low-density lipoprotein (LDL) level despite treatment with maximally tolerated doses or without experiencing statin-related side effects.[1,2] Bempedoic acid, a small-molecule inhibitor of ATP-citrate lyase, a component of the cholesterol biosynthesis pathway was recently approved by the Food and Drug Administration for the treatment of patients with atherosclerotic cardiovascular disease (ASCVD).[3] However, the efficacy of bempedoic acid in cardiovascular event reduction remains unclear. Therefore, we performed a meta-analysis of randomized controlled trials (RCTs) comparing cardiovascular outcomes in patients treated with bempedoic acid compared with placebo in patients with hypercholesterolemia intolerant to or treated with maximally tolerated statin doses.

We performed a search of electronic databases including PubMed/Medline, Google Scholar, and ClinicalTrials.gov from inception till June 2020. We included RCTs evaluating the effect of bempedoic acid for the treatment of hypercholesterolemia in patients intolerant to or on maximum tolerated statin doses. We included participants from RCTs that were assigned to a daily dose of 180mg of bempedoic acid or placebo throughout the trial period and had reported on individual cardiovascular outcomes. The primary outcome of our meta-analysis was the incidence of five-point major adverse cardiovascular events (MACE) that includes, myocardial infarction, non-fatal stroke, cardiovascular mortality, hospitalization for unstable angina, and coronary revascularization. Secondary outcomes were hospitalization for heart failure and noncoronary revascularizations. Outcomes were analyzed as dichotomous variables, and risk ratios (RR) and their respective 95% confidence intervals (CI) were obtained using the Mantel-Haenszel method and a random-effects model was used. A two-tailed p-value <0.05 was used to indicate significance. Review Manager version 5.3 (RevMan; Cochrane Collaboration) was used to analyze all study data.

A total of 4 RCTs,[4–7] randomizing 3,483 patients (2,332 to bempedoic acid and 1,151 to placebo) were included in this meta-analysis. The mean age of study participants was 65.3 ± 9.3 years, and 58.2% of participants were men. At baseline, mean LDL was 132.6 ±