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New-Onset Atrial Fibrillation After Aortic Valve Replacement

Comparison of Transfemoral, Transapical, Transaortic, and Surgical Approaches

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Objectives This study sought to determine the incidence of new-onset atrial fibrillation (AF) associated with different methods of isolated aortic valve replacement (AVR)—transfemoral (TF), transapical (TA), and transaortic (TAo) catheter-based valve replacement and conventional surgical approaches.

Background The relative incidences of AF associated with the various access routes for AVR have not been well characterized.

Methods In this single-center, retrospective cohort study, we evaluated a total of 231 consecutive patients who underwent AVR for degenerative aortic stenosis (AS) between March 2010 and September 2012. Patients with a history of paroxysmal, persistent, or chronic AF, with bicuspid aortic valves, and patients who died within 48 h after AVR were excluded. A total of 123 patients (53% of total group) qualified for inclusion. Data on documented episodes of new-onset AF, along with all clinical, echocardiographic, procedural, and 30-day follow-up data, were collated.

Results AF occurred in 52 patients (42.3%). AF incidence varied according to the procedural method. AF occurred in 60% of patients who underwent surgical AVR (SAVR), in 53% after TA-TAVR, in 33% after TAo-TAVR cases, and 14% after TF-TAVR. The episodes occurred at a median time interval of 53 (25th to 75th percentile, 41 to 87) h after completion of the procedure. Procedures without pericardiotomy had an 82% risk reduction of AF compared with those with pericardiotomy (adjusted odds ratio: 0.18; 95% confidence interval: 0.05 to 0.59).

Conclusions AF was a common complication of AVR with a cumulative incidence of >40% in elderly patients with degenerative AS who underwent either SAVR or TAVR. AF was most common with SAVR and least common with TF-TAVR. Procedures without pericardiotomy were associated with a lower incidence of AF. (J Am Coll Cardiol 2014;63:1510–9) © 2014 by the American College of Cardiology Foundation

Transcatheter aortic valve replacement (TAVR) has become the preferred therapy for inoperable patients with severe aortic stenosis (AS) and a safe alternative to surgical aortic valve replacement (SAVR) in those considered at high surgical risk (1,2). The established routes of access initially included the transfemoral (TF-TAVR) and transapical (TA-TAVR) approaches, with TF-TAVR being a first-line method in many centers and TA-TAVR reserved for those without adequate femoral access. In those patients in whom neither of these approaches is feasible, additional access sites such as the transaortic (TAo-TAVR) or antegrade transseptal

See page 1520

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can be used (3). Although effective and with comparable results to TF-TAVR, the TA-TAVR is associated with well-described procedural and post-operative risks because it involves a lateral thoracotomy, as well as a left ventricular (LV) puncture and entrance into the pericardium (4).

New-onset atrial fibrillation (AF) after aortic valve replacement (AVR) has been underappreciated in current guidelines that report mortality and morbidity after cardiac valve interventions (5). However, recent evidence suggests that the incidence of AF may be higher than previously expected and may also be associated with cerebrovascular accidents (CVAs) after TAVR (6,7). In addition, a higher incidence of AF has been found in patients who underwent TA-TAVR (6). The incidence of AF according to various access routes for TAVR has not been well characterized. We sought to evaluate the incidence, onset, duration, and predictors of new-onset AF among patients treated with SAVR and TF-, TA-, and TAo-TAVR.

Methods

Patients and procedures. Between March 2010 and September 2012, a total of 231 consecutive patients underwent isolated AVR for symptomatic severe degenerative AS at the University of Miami Hospital. Of these, 82 patients underwent SAVR and 149 patients underwent TAVR with a balloon-expandable valve (Edwards SAPIEN, SAPIEN XT, Edwards Lifesciences, Irvine, California). Patients were excluded from this analysis if they had a history of either chronic or paroxysmal AF or any evidence of atrial arrhythmia in the baseline electrocardiogram (80 patients), a bicuspid aortic valve (24 patients), or had died within 48 h after the procedure (4 patients). The final study population was 123 patients. TAVR was performed in patients who were deemed inoperable or had a surgical mortality risk of ≥15% on the basis of the consensus of our structural heart disease team. TF-TAVR was the preferred access approach in patients with an appropriate iliofemoral arterial diameter. Otherwise, TA- or TAo-TAVR was performed. TA-TAVR was performed using a well-described technique through the LV apex (8). TAo-TAVR was performed through a mini-upper sternotomy and without pericardiotomy (9).

Although the data for this study were retrospectively collected, all patients followed a pre-specified clinical and imaging evaluation at baseline, during hospitalization, and at 30 days. Echocardiographic findings were analyzed on the basis of the judgment of full-time academic echocardiographers, using standard guidelines (10). Comorbidities were defined according to the Society of Thoracic Surgeons (STS) criteria, and procedural complications were defined according to the Valve Academic Research Consortium Criteria. Blood transfusion was recorded if the patients received any blood transfusion related to the procedures, including pre-, peri-, and post-procedures. CVAs were classified as transient ischemic attack (TIA) or stroke. Stroke was further categorized in accordance with the modified Rankin scale (MRS) as major if the MRS was ≥2 at 30 days, or minor if the MRS was <2 at 30 days. All CVAs were evaluated by a neurologist and confirmed through neuroimaging techniques.

Atrial fibrillation or flutter. Patients did not receive routine pre- or peri-operative antiarrhythmic agents to prevent or decrease the occurrence of new-onset AF. However, all surgical patients received prophylactic atrial pacing for at least 24 h post-operatively. All patients were on continuous electrocardiographic telemetry monitoring until hospital discharge. Whenever an electrocardiographic or cardiac rhythm abnormality was noted by either the nursing staff or the monitoring device, rhythm strips were printed and attached to the patient's chart. In addition, routine rhythm strips were printed and charted every 2 h in the cardiac critical care units, and every 4 h in the telemetry units, regardless of the rhythm. A 12-lead electrocardiogram was routinely performed pre-operatively, immediately after the procedure, and on post-operative days 1 and 2. Episodes of AF or atrial flutter and their respective treatment were collected by reviewing the electrocardiographic rhythm strips, 12-lead electrocardiographic tracings, nursing and physician notes, orders lists, and daily medication lists. Decisions on AF management, including treatments for rhythm and/or rate control, as well as anticoagulation, were at the discretion of the primary cardiologist and/or the cardiothoracic surgeon managing the patients.

30-day follow-up. A routine clinical follow-up was scheduled 30 days after the procedure. Patients who were not able to attend their in-person follow-up visit were contacted by phone, and their physician's offices were contacted to obtain the necessary clinical information, including vital status, complications, hospitalizations, emergency department visits, CVAs, and atrial arrhythmias. Date of CVAs or atrial arrhythmias were noted on the date of diagnosis. Five patients died before the 30-day follow-up. Complete follow-up data were available in 92% of patients.

Statistical analysis. Descriptive estimates of the distribution of each risk factor were compared among the 4 different approaches. Discrete variables are expressed as frequencies with their respective percentages. Continuous variables are presented as mean ± SD or median (25th, 75th percentile), depending on variable distribution. Continuous variables were compared using the Student *t* test or Wilcoxon rank-sum, as appropriate, or 1-way analysis of variance or

Abbreviations and Acronyms

AF = atrial fibrillation
AS = aortic stenosis
AVR = aortic valve replacement
CVA = cerebrovascular accident
LV = left ventricular
MRS = modified Rankin scale
SAVR = surgical aortic valve replacement
STS = Society of Thoracic Surgeons
TAo-TAVR = transaortic transcatheter aortic valve replacement
TA-TAVR = transapical transcatheter aortic valve replacement
TAVR = transcatheter aortic valve replacement
TF-TAVR = transfemoral transcatheter aortic valve replacement
TIA = transient ischemic attack