Impact of Clinical Presentation and Surgeon Experience on the Decision to Perform Surgical Ablation

Niv Ad, MD, Linda Henry, PhD, Sharon Hunt, MBA, and Sari D. Holmes, PhD
Inova Heart and Vascular Institute, Falls Church, Virginia

Background. Patients with atrial fibrillation (AF) undergoing cardiac surgery have higher morbidity and decreased survival. Recent data revealed that surgical ablation (SA) is performed in only 39% of these patients, with variability among surgeons. The aim of this study was to determine the impact of clinical presentation and surgeon experience when making the decision to treat AF concomitantly with another cardiac surgical procedure.

Methods. Since 2005, we identified 983 nonemergent patients with preoperative AF at our institution with 41% (n = 401) having a concomitant SA. Logistic regression identified independent predictors for SA. The number of SAs performed captured surgeon experience in AF ablation.

Results. Major growth in the percent of SA performed for AF was noted (31% in 2005 vs 49% in 2010; p < 0.001). Independent predictors ($\chi^2 = 283.5, p < 0.001$, area under the curve = 0.80) for SA were found, including concomitant mitral valve surgery (odds ratio [OR] = 5.81) and lower creatinine (OR = 4.34). Surgeon experience predicted SA with 6% greater odds for every 10 SA cases performed (OR = 1.06, p < 0.001). The group of surgeons with 50 or greater SA cases ablated, 57% of AF patients (301 of 526), compared with those with less than 50 cases ablated, 22% (101 of 457; p < 0.001).

Conclusions. We demonstrated that patient acuity and surgeon experience are significantly associated with the decision to perform concomitant SA for AF. Only the most experienced surgeons performed SA in patients with more complex clinical presentation. These findings, together with the negative impact of AF on patient outcomes, should prompt a comprehensive approach to educate and train surgeons in the performance of SA for AF when clinically justified.

© 2013 by The Society of Thoracic Surgeons

Atrial fibrillation (AF) is increasingly prevalent among patients presenting for cardiac surgery, with the population living longer, healthier lives [1]. Recent figures indicate AF is increasing 0.44 percent a year, translating to an additional 13,485 patients with preoperative AF [2, 3]. Several studies have demonstrated that patients with preoperative AF undergoing cardiac surgery have higher postoperative morbidity and decreased survival over time [4–8].

According to the latest figures released from the Society of Thoracic Surgeons Adult Cardiac Surgery Database (STS ACSD), the percentage of patients from 2005 to 2010 with preoperative AF has increased from 10.0% to 12.2%. During this same time period over 91,801 surgical AF ablations have been performed, of which 4,893 (5.3%) were performed as stand-alone procedures. Interesting enough, only 40.6% of the patients with preoperative AF actually underwent a concomitant surgical ablation procedure, which was a decline of 1.6% over the study period [2, 9].

The decline in the percent of surgical ablation procedures performed may be explained in part by surgeons’ hesitation to perform a left atriotomy for the ablation procedure and extend the surgical time when it is not otherwise indicated. Recent data from the STS ACSD demonstrate that only about 24% of patients with AF undergoing coronary artery bypass grafting (CABG) surgery had their AF ablated at the time of surgery [2, 9, 10]. Concerns have also been raised about the extra time spent on the cardiopulmonary bypass machine and the potential for other atrial arrhythmias to occur as a result of the ablation procedure. Finally, with the different methods of reporting outcomes, confusion abounds about what the true outcome and success rate of the procedure is over time [11, 12]. The aim of this study was to determine the association between clinical presentation and surgeon experience in surgical ablation for AF when making the decision to treat AF concomitantly with another cardiac surgical procedure.

Accepted for publication March 25, 2013.


Address correspondence to Dr Ad, Cardiac Surgery Research, Inova Heart and Vascular Institute, Falls Church, VA 22042; e-mail: nivad@inova.org.

© 2013 by The Society of Thoracic Surgeons
Published by Elsevier Inc
Material and Methods
This was a prospective study. Data of all patients presenting for cardiac surgery with a history of AF were considered for analyses. Since 2005, we identified 983 nonemergent patients with preoperative AF at our institution, with 41% (n = 401) undergoing a concomitant surgical ablation procedure for AF. Patients who presented for stand-alone AF surgical ablation were not included. Data were entered and analyzed using our AF registry and merged with data from our local STS ASCD database [13, 14]. This study was approved by our Institutional Review Board and patient consent was waived (No. 06.022 and No. 12.055).

The majority of ablation patients (82%; 331 of 405) underwent a procedure utilizing the full Cox-maze III/IV lesion pattern as previously described [15]. The remainder of ablation patients (18%; 74 of 405) underwent a limited left atrial surgical ablation procedure (pulmonary vein isolation, lesion to the left atrial appendage and left atrial appendage removal). The determination to perform the full Cox-maze procedure or only a left sided procedure with left atrial appendage removal was made based on the type of AF at presentation. Patients who presented with paroxysmal AF as defined by the Heart Rhythm Society (HRS; AF duration of less than 7 days that converts to sinus rhythm without any intervention) underwent a left sided ablation with left atrial appendage removal. Patients who presented with persistent or long-standing persistent AF as defined by the HRS (AF that does not convert to sinus rhythm without chemical or electrical means of cardioversion with duration >1 year) underwent a full Cox-maze procedure with left atrial appendage removal [16, 17]. At the end of either procedure a transesophageal echocardiogram was performed to assess the quality of the closure of the left atrial appendage.

Statistical Analysis
Occurrence and distribution of preoperative characteristics as well as perioperative and postoperative outcomes were evaluated by descriptive statistics. For group comparisons of those who had a surgical ablation and those who did not, categoric variables were assessed by the χ² or Fisher exact test, and continuous variables assessed by the Student’s t test. A p value less than 0.05 was considered statistically significant. All analyses were conducted using SPSS version 17.0 (SPSS Inc, Chicago, IL).

Factors Associated With Performance of Surgical Ablation for AF
Logistic regression was used to identify the independent predictors for surgical ablation from an a priori set of clinically relevant variables. These include age, gender, ejection fraction, body mass index, chronic pulmonary disease, extracardiac arteriopathy, cerebrovascular disease, previous cardiac surgery, creatinine greater than 2 mg/dL, critical preoperative state, unstable angina, previous myocardial infarction, concomitant mitral valve surgery, and total number of concomitant surgeries greater than 2.

After the prediction model was ascertained, a “comorbidity score” was calculated for all patients by summing the total number of significant predictor variables from the model (comorbid conditions) present for each patient. To include continuous predictor variables in this score, clinically relevant cutoff points were used to create yes or no groups for those factors (age ≥ 70 years and EF ≤ 0.40).

Role of the Surgeon Experience
Surgeon experience was captured by the number of surgical ablations for AF performed by each surgeon. Logistic regression was used to examine the association between the numbers of surgical ablation cases performed (experience) as a continuous variable with the decision to perform a concomitant AF surgical ablation procedure. In addition, using a cutoff point meaningful when discussing surgical experience, we separated the surgeons into 2 groups: surgeons with 50 or greater surgical ablation cases versus surgeons with less than 50 cases of surgical ablation experience. The χ² analysis was used to compare the proportion of patients who presented with AF and were treated with surgical ablation and those who were not by these surgeon groups. Then, to examine the association of clinical presentation and surgeon experience together, spline curve graphs were used to visualize the impact of surgeon experience in the relationship between number of comorbid conditions and the probability of undergoing a surgical ablation procedure.

Results
Patient Characteristics
The group of patients with AF left untreated were significantly older (69.6 ± 11.5 vs 66.5 ± 11.9 years, p < 0.001), had lower ejection fraction (0.505 ± 0.131 vs 0.551 ± 0.116, p < 0.001), and were more likely to be male (69% vs 62%, p = 0.02). They also differed on clinical characteristics such that preoperative morbidities were present more often in the group without surgical ablation (Table 1). These morbidities included chronic pulmonary disease (24% vs 16%, p = 0.001), cerebrovascular disease (26% vs 14%, p < 0.001), creatinine greater than 2 mg/dL (6% vs 2%, p < 0.001), history of myocardial infarction (35% vs 14%, p < 0.001), and peripheral vascular disease (17% vs 9%, p < 0.001).

Predictors for the Performance of Surgical Ablation
Major growth in the percent of surgical ablation for AF performed was noted (31% in 2005 vs 49% in 2010; p < 0.001). The variables that independently predicted the performance of a surgical ablation for AF are found in Table 1 (χ² = 283.5, p < 0.001, area under the curve = 0.80). Concomitant mitral valve surgery (odds ratio [OR] = 5.81) and lower creatinine (OR = 4.34) were the strongest positive predictors for the application of surgical ablation in this sample of AF patients. Several other clinical preoperative variables were also predictive as noted. There were lesser odds of performing surgical ablation for patients with chronic pulmonary disease,
history of myocardial infarction, unstable angina, and critical preoperative state (Table 1).

Role of Surgeon Experience

Surgeon experience in surgical ablation as a continuous variable was found to be an important predictor in performing surgical ablation for AF with 6% greater odds for every 10 surgical ablation cases performed (OR = 1.06, p < 0.001). Using surgeon experience as a categoric variable, the group of surgeons with 50 or greater surgical ablation cases ablated 57% of AF patients (300 of 526) compared with those with less than 50 cases who ablated 22% of AF patients (101 of 457; p < 0.001). The most experienced surgeon’s decision to perform surgical ablation was less influenced by comorbid factors, as visualized in Figure 1. The spline curves show that the predicted probability of receiving surgical ablation for AF is lower when plotted against greater total number of significant comorbid predictors. The dashed spline curve is for the most experienced surgeon and demonstrates that a greater number of significantly predictive comorbid conditions did not deter this surgeon from performing surgical ablation as drastically as for the remainder of surgeons who had almost no chance to perform surgical ablation in patients with greater than 2 of these comorbidities. In addition, even for patients with none of the significant comorbid conditions, there was only an approximately 60% chance that one of the other surgeons would add surgical ablation versus almost 100% chance for the most experienced surgeon.

Perioperative Outcomes

Secondary analyses examining perioperative outcomes found low occurrences for patients with concomitant surgical ablation despite longer cardiopulmonary bypass time compared with the group without surgical ablation (180.6 ± 57.1 vs 139.4 ± 66.7 minutes, p < 0.001). The STS-defined outcomes for the surgical ablation group included 1% with permanent stroke (4 of 401), 11% with new renal failure that required dialysis treatment (10 of 401), 2.5% with deep sternal wound infection (2 of 401), 2.5% with operative mortality (<30 days; 10 of 401), and 13% with a readmission within 30 days (53 of 401). Pacemaker implantation for sinus node dysfunction occurred in 0.5% of patients (2 of 401). Using the logistic European system for cardiac operative risk evaluation, the observed-to-expected ratio for operative mortality was 0.27 in patients with concomitant surgical ablation.

Table 1. Logistic Regression Model to Predict the Performance of Concomitant Surgical Ablation and Comparison of Surgical Groups on Variables Included in the Model. Data Presented as Mean ± SD or Percentage of Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (CI)</th>
<th>No Ablation n = 582</th>
<th>Surgical Ablation n = 401</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.99 (0.97–0.998)</td>
<td>69.6 ± 11.5</td>
<td>66.5 ± 11.9</td>
</tr>
<tr>
<td>Female</td>
<td>0.77 (0.56–1.08)</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>1.01 (0.99–1.04)</td>
<td>28.3 ± 5.6</td>
<td>27.9 ± 5.9</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>0.53 (0.36–0.78)</td>
<td>35</td>
<td>14</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>0.92 (0.44–1.94)</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>0.36 (0.13–0.95)</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>1.19 (0.60–2.38)</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Previous cardiac surgery</td>
<td>0.29 (0.19–0.45)</td>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td>Extracardiac arteriopathy</td>
<td>0.54 (0.24–1.20)</td>
<td>37</td>
<td>19</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>0.66 (0.45–0.97)</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>Ejection fraction</td>
<td>0.0102 (0.0101–0.0103)</td>
<td>0.505 ± 0.131</td>
<td>0.551 ± 0.116</td>
</tr>
<tr>
<td>Creatinine &lt; 2 mg/dL</td>
<td>4.34 (1.66–11.37)</td>
<td>94</td>
<td>98.5</td>
</tr>
<tr>
<td>Critical preoperative state</td>
<td>0.41 (0.19–0.90)</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Concomitant mitral valve surgery</td>
<td>5.81 (4.09–8.25)</td>
<td>21</td>
<td>59</td>
</tr>
<tr>
<td>Number of concomitant surgeries &gt; 2</td>
<td>0.63 (0.37–1.07)</td>
<td>8</td>
<td>11</td>
</tr>
</tbody>
</table>

a Denotes variables that independently predicted the performance of a surgical ablation for atrial fibrillation.

CI = confidence interval; OR = odd ratio.

Fig 1. Predicted probability by number of significant predictor variables (comorbidity score). Dashed line depicts the most experienced surgical ablation surgeon and solid line describes all other surgeons.
addition, return to sinus rhythm for the patients with a surgical ablation procedure was high across the first 2 years, even for those off anti-arrhythmic drugs (Fig 2).

Comment
The results of this study demonstrate that the decision to perform a concomitant surgical ablation procedure for AF during cardiac surgery is multi-factorial and associated with clinical variables and surgeon experience. A patient with a creatinine level less than 2mg/dL was over 4 times more likely to undergo a surgical ablation procedure compared with a patient whose creatinine level was greater than 2 mg/dL. The same held true if a patient was to undergo a mitral valve procedure where they were almost 6 times as likely to have a surgical ablation procedure compared with those who were not undergoing a mitral valve procedure. Patients who were older or had a history of chronic pulmonary disease, myocardial infarction, previous cardiac surgery, critical preoperative state, and unstable angina were also less likely to undergo a surgical ablation procedure. Surgeons who had performed less than 50 surgical ablation procedures were much less likely to perform an ablative procedure, especially if any of the aforementioned variables were present. Data regarding type and duration of AF were only available for patients who underwent surgical ablation and were therefore not able to be included in the decision-making statistical model. Future work should incorporate these AF specific factors to assess the degree to which they impact the decision to perform surgical ablation in relation to the other clinical factors that were found to be predictive in this study.

The positive impact of the mitral valve procedure in our study is consistent with results published using STS data [2, 9]. Gammie and colleagues [9] found that 52% of patients with AF who underwent mitral valve surgery also had a surgical ablation procedure, whereas only 28% and 24% of aortic valve and coronary artery bypass patients, respectively, had a surgical ablation procedure. A more recent study [2] using STS data demonstrated that 60% of patients with mitral valve procedures were ablated.

Lower odds for surgical ablation associated with a creatinine level greater than 2.0 mg/dL is also not a surprising finding. Recent studies have shown one of the leading predictors for prolonged length of stay after cardiac surgery is increased creatinine levels [18, 19]. In fact, the STS predictive risk model for mortality after CABG, valve, or CABG and valve surgery combined has determined that, compared with a level of 1, preoperative creatinine level of 1.5 increases the odds of dying by almost 2 and creatinine of 2.5 increases the odds almost 3 times [20, 21]. Therefore, at our center if a creatinine level greater than 2.0 is found immediately prior to surgery, consultation with a nephrologist may be undertaken before deciding whether to perform surgery. If the decision to perform surgery is made, the duration of cardiopulmonary bypass time is kept to a minimum by having the most experienced surgeon perform the ablative procedure.

Quader and colleagues from the Cleveland Clinic [4] first raised the question of whether preoperative AF reduces survival after CABG surgery. They concluded that patients with AF were sicker and experienced reduced long-term survival, encouraging surgeons to consider a surgical ablation procedure concomitantly. Ngaage and colleagues have studied the effect of preoperative AF on patients undergoing mitral valve, CABG, and aortic valve surgery [5–7]. They determined that preoperative AF was associated with increased morbidity and decreased survival (except for aortic valve surgery) if not corrected. We also investigated the effect of preoperative AF on morbidity and mortality in patients undergoing CABG surgery. Our findings suggest that preoperative AF, if not addressed, was associated with increased risk for morbidity and mortality, especially in patients with an ejection fraction greater than 0.40 [8]. These findings are important to address when discussing with surgeons the negative impact of untreated AF after surgery.

In this study, we identified surgeon experience as a significant variable associated with the decision to
perform concomitant surgical ablation for AF. The analysis demonstrates that for every 10 surgical ablation cases a surgeon had performed, the chances of performing an ablative procedure increased by 6%, such that surgeons who had performed 50 or greater cases were found to have ablated the majority of cases despite some of the significant clinical predictor factors being present. In our prior published work, we have discussed the safety and efficacy of the surgical ablation procedure in patients who were over the age of 75, had low ejection fractions and heart failure, as well as the addition of the procedure for patients who were undergoing a coronary artery bypass or aortic valve procedure [10, 22, 23]. Our results demonstrated that these variables should not be the lone disqualifiers for performance of a surgical ablation procedure, but should be thoughtfully considered given the circumstances of each individual patient and surgeon.

As demonstrated across multiple surgical subspecialties, surgeon experience in determining whether to perform a certain procedure is not a new phenomenon and can be reliant on knowledge of the procedure itself as well as the opportunity to adequately learn how to perform the operation [18, 24–26]. Jones and his group [25] reported on the effect of a specialist liver surgeon in ensuring that patients with metastatic colorectal cancer received appropriate care and were not denied potentially curative treatments. Seventy-three patients who were diagnosed with metastatic colorectal cancer and treated with palliative chemotherapy had their radiology reports and imaging reviewed by 6 liver surgeons blinded to the patients’ actual management. The review found that 63% of the patients had potentially resectable tumors. The investigators concluded that a liver specialist multidisciplinary team was needed to ensure appropriate treatment [25]. Other investigators have reported on decision making in treating knee replacement for osteoarthritis, and they hypothesized different surgeons would make different treatment choices for identical patients requiring knee replacement [26]. The investigators found that surgeons representing different levels of expertise had a variance among themselves of up to 59% on how to approach the knee replacement. They concluded that the radiographic findings did play a part in their decision-making [26].

Another factor that may impact a surgeon’s decision to undertake a surgical ablation is knowledge of which lesion set is best, although this was not measured in this study because all surgeons perform surgical ablation using the same lesion lines [27–30]. A meta-analysis of surgical ablation lesion sets concluded that bi-atrial ablation procedures are superior for patients with persistent or long-standing persistent AF [31]. However, different ways to perform surgical ablation continue to persist today. In 2 recent editorials we discussed that the full lesion set should be used and that ablating only the pulmonary veins will work only for patients with true paroxysmal AF [28]. We also addressed the inability to assess the real effects of surgical ablation due to the many different lesions in use today [29].

In order for surgeons to obtain the level of experience necessary to proficiently carry out the Cox-maze procedure or a surgical ablation procedure, despite the complexity of a case, more learning opportunities must be made available. Several recent articles have been published that investigated the use of simulation training in obtaining proficiency in certain surgical procedures [32–34]. This may be an avenue that can be developed further for arrhythmia surgery through such national organizations as the Heart Rhythm Society and the Society of Thoracic Surgeons.

In this study we set out to determine the factors that affected the decision making of surgeons on whether to perform a surgical ablation procedure or not. We have shown for the first time that surgeon experience as well as patient acuity, in particular creatinine levels, were significantly associated with the decision to perform concomitant AF surgical ablation. Only the most experienced surgeons performed a surgical ablation procedure in patients with a more complex clinical presentation. These findings, together with the negative impact of AF on long-term patient outcomes, should prompt a comprehensive approach to educate and train surgeons in the performance of surgical ablation procedures for AF when clinically justified.

References


16. Calkins H, Kuck KH, Cappato R, et al. Heart Rhythm Society Task Force on Catheter and Surgical Ablation of Atrial Fibrillation. 2012 HRS/EHRA/ECAS expert consensus statement on catheter and surgical ablation of atrial fibrillation: recommendations for patient selection, procedural techniques, patient management and follow-up, definitions, endpoints, and research trial design: a report of the Heart Rhythm Society (HRS) Task Force on Catheter and Surgical Ablation of Atrial Fibrillation. Developed in partnership with the European Heart Rhythm Association (EHRA), a registered branch of the European Society of Cardiology (ESC) and the European Cardiac Arrhythmia Society (ECAS); and in collaboration with the American College of Cardiology (ACC), American Heart Association (AHA), the Asia Pacific Heart Rhythm Society (APHRS), and the Society of Thoracic Surgeons (STS). Endorsed by the governing bodies of the American College of Cardiology Foundation, the American Heart Association, the European Cardiac Arrhythmia Society, the European Heart Rhythm Association, the Society of Thoracic Surgeons, the Asia Pacific Heart Rhythm Society, and the Heart Rhythm Society. Heart Rhythm 2012;9:632–96.


DISCUSSION

DR JOHN OFENLOCH (Clearwater, FL): I totally agree that the interest in A-fib [atrial fibrillation] ablation is very surgeon specific and that the comfort level with concomitant ablation is a very wide spectrum amongst surgeons. Having said that, I find it interesting that the percentage of patients who have an ablation as a part of their operation has increased, but the percentage of ablations performed with mitral valve surgery hasn’t increased over the past four or five years; it remains static at 60%, as indicated in your slide. I wondered if you had any thoughts about why the percentage seems to be increasing in other types of concomitant operations but not in mitral valve operations where it would probably be the easiest to have an impact.

DR AD: That is an excellent question. It did increase a little bit, if you look at the Gammie STS [Society of Thoracic Surgeons] paper, from 53% to 60% in the past five years, and it did increase slightly in the CABG [coronary artery bypass grafting] population, from the mid 20’s to close to 30%.

I believe the biggest problem we have with surgical ablation in general is the really outstanding confusion around the topic. I think, that is, general surgeons are not convinced that surgical ablation is necessary because most of the outcomes we measure are 30 days’ outcome, this is what we are judged for, and nobody is looking into 3, 6, and 12 months when the benefits of a successful ablation will start to show. Most of the surgeons were not exposed to a good training program with atrial fibrillation, and we don’t have any standards and thresholds for a surgeon to become successful in performing ablation procedures. Basically anybody can go and take a two-hour course, be trained, and use a device without knowing much about the device, nor atrial fibrillation, and obviously it raises the level of discomfort of many of us.
DR MICHAEL HALKOS (Atlanta, GA): You mentioned the comorbidity score and the higher the comorbidity the less likely the surgeon to perform these procedures. For someone that is not as experienced doing ablation procedures, are there certain things that you are looking out for that can provide a guide to those surgeons looking to increase their ablation practice but obviously without any detriment to patient safety and outcomes?

DR AD: I think that’s the key question. As you could see, we put all those ten variables into one score, which each score had the same weight, but we know that it is not. Obviously when you have patients with disturbed renal function and elderly patients and borderline symptoms and so on and so forth, you are very reluctant to perform the procedure. This is the first attempt in creating such a model and it is already teaching us a lot, but it is not perfect.

For me, the red flags to perform the procedure, if I have a triple valve patient in atrial fibrillation, I wouldn’t look much into the creatinine. I look into other factors that cannot actually come in a statistical model, such as RV [right ventricular] dysfunction and COPD [chronic obstructive pulmonary disease] that would basically turn down my enthusiasm to perform the procedure. RV dysfunction is really what I am most concerned about when I am performing a big case with a concomitant procedure. On the other hand, if I am not performing ablation I will take care of the left atrial appendage.

DR NEAL D. KON (Winston-Salem, NC): Great presentation, great paper, as usual. What I generally see when patients have more comorbid conditions is not the lack of doing an atrial fibrillation procedure, but when they have more comorbid conditions, surgeons tend to do lesser of a procedure, so just do pulmonary vein isolation as opposed to doing a more complete right- and left-sided maze procedure. Can you comment if that occurred, or do the surgeons at your place never do just pulmonary vein isolations?

DR AD: That’s a very good point. I would say that you have to treat atrial fibrillation like any other pathology. If you go back to coronary surgery, mitral valve surgery, et cetera, we have indications to perform the surgical procedures. We treat mitral valve disease in light of aortic stenosis if it is more than moderate and so on and so forth.

When you want to apply a lesion set to this patient, you always have to go back and ask yourself what type of atrial fibrillation the patient has. If the patient has paroxysmal atrial fibrillation and a small left atrium, even if it’s a more complex procedure, then PVI [pulmonary vein isolation] makes sense, and the numbers were shown by us and others that the results are pretty good. However, if the patient has permanent atrial fibrillation, a large left atrium, it would be a mistake to do a pulmonary vein isolation only. So if you are reluctant of doing anything, don’t set up the patient into a more severe arrhythmia, such as left atrial flutter or atypical flutter. Just leave him alone and take the appendage out.

DR KON: Does that knowledge make the incidence of atrial fibrillation decrease slightly in the last few years at your place, the knowledge that you should not do just a pulmonary vein isolation procedure in somebody with persistent atrial fibrillation?

DR AD: Bart Griffith gave this talk yesterday about hyper-specialization. I think what we see in our group, which, as you know, is a very busy group, that there is now a shift of all those patients towards myself and maybe one other surgeon. So when it’s more than just a usual case, we look to the attending, and often I would decide not to do the procedure.

My own percentage, for instance, for mitral valve disease in atrial fibrillation stands at about 80%. There are several patients I would never touch, such as RV dysfunction or patients that have other significant comorbidities and questionable long-term prognosis that one only wants to perform the only necessary surgical steps to get through the operation safely.

DR HERSH MANIAR (St. Louis, MO): Niv, thanks for a great talk. For the patients that are not offered a maze procedure, do most members of your group believe in offering some form of management for the left atrial appendage?

DR AD: No, it’s not, but we emphasize it more and more and more. So I think we are close to this concept. I can’t give you just a number, but I think we are around 90% now of patients that are having atrial fibrillation and the surgeon decided not to do anything with atrial fibrillation, that we do something with the appendage.