Med. J. Cairo Univ., Vol. 90, No. 7, December: 2093-2097, 2022
www.medicaljournalofcairouniversity.net

Complete Biatrial Ablation Versus Pulmonary Vein Isolation in Atrial Fibrillation Patients Undergoing Cardiac Surgery: A Retrospective Study

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Abstract

Background: Surgical ablation is inovated for patients with atrial fibrillation undergoing cardiac procedure.

Aim of Study: Comparing postoperative rhythm outcomes and incidence of pacemaker implantation in complete biatrial ablation or pulmonary vein isolation (PVI) in consistent with other cardiac surgery.

Patient and Methods: Between 2019 January and January 2022 a total of 59 patients with surgical procedure underwent either biatrial ablation or PVI in the National Heart Institute, Egypt. Assessement of the patients was done by 12 lead ECG and holter. All data on outcomes and patient characteristics were collected retrospectively.

Results: 30 patients underwent complete biatrial procedure whereas 29 underwent PVI. In patients with persistent/long-standing atrial fibrillation, freedom from atrial fibrillation there was no big statistical difference between biatrial ablation and PVI, 24 patient (80%) and 23 (79.3%) respectively this is due to the selection of type of AF for each procedure and the incidence of CHB is more common in biatraial ablation procedure. The incidence of permanent pacemaker insertion was more common after biatrial ablation 4 (13.3%) and 1 (3.4%) respectively; p=0.353, no sex predilection but the incidence of postoprtative AF was more common in patient above 65 years old.

Conclusions: Patients with persistent AF biatrial ablation is more effective than PVI in management of postoperative atrial fibrillation. Though the needing of a permanent pacemaker is higher after biatrial ablation, compared to PVI.

Key Words: *Pulmonary Vein Insolation PVI – PPM – Biatrial Ablation AF – CHB.*

Introduction

THERE is no consensus that the most common arrhythmia worldwide is the atrial fibrillation (AF) it may reach 2 % of all types of arrhythmia. The incidence of stroke increases up to five-fold and accounting for up to 25 percent of all strokes cause **[1]**.

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Left atrial appendage closure and Surgical ablation should be done in all patients with AF undergoing another surgery, according to the guidelines from the European Society of Cardiology **[2]**.

Up to 90% was free from AF after biatrial ablation **[1,3]**. Pulmonary vein isolation (PVI) is considered to be a good alternative to biatrial ablation as it is less complex and not time consuming the European Heart Rhythm Association recommend the biatrial procedure over PVI specially with persistent or long-standing persistent AF **[4]**.

In clinical practice, surgeons didn't prefer to do complete biatrial ablation specially when they operating on a patient that had no mitral pathology and they may perform only PVI, regardless of the type of AF. More over in a randomized trial, Gillinov et al. **[5]** they observed that the biatrial procedure resulted in more patients in need of a permanent pacemaker post ablation.

We should balance the caust benifite from beeing freedom from AF against the risk of requiring a permanent pacemaker.

Material and Methods

It is retrospective study in the National Heart Institute that we investigated the efficacy of concomitant surgical ablation to treat atrial fibrillation using either PVI or biatrial ablation. The study population comprised adult patients with any type of AF regardless the type, duration or the cause either valvular or ischemic heart disease.

The definition of AF according to AHA-ACC-HRS guidelines in 2014 as follows:

The Paroxysmal AF lesser than seven days, while persistent AF was defined as non-self-terminating AF persisting more than seven days,

and long-standing persistent AF was defined as continuous AF lasting more than one year [6].

The Inclusion criteria were surgical ablation concomitantly with adult cardiac surgery due to mitral or aortic valve or coronary artery disease performed between 2019 and 2022. Exclusion criteria were concomitant surgery for congenital heart disease, younger age below 18 years and absence of monitoring by 48 hours ECG Holter or 12 leads ECG.

Methods:

Left atrial appendage exclusion was done in all patients.

Placing the bipolar radiofrequency ablation clamp on the left atrial wall clear of the pulmonary veins. Repetition with the clamp in the same place until noticing a steep impedance in five seconds. Then repetition twice for each ablation line.

Left atrium then opened completion of the box-lesions (inferior and superior left atrial lines connecting the pulmonary veins).

With the developement of the ablation techniques and energy sources during the study, but the practice in recently has been to perform PVI by bipolar radiofrequency ablation of the left- and right-sided pulmonary veins.

All patients receiving a complete biatrial procedure, the Completion of the procedure was done additional lines using the bipolar radiofrequency ablation with connection inferior and superior line between the left and right pulmonary veins, a left and right atrial appendage line and an intercaval line.

Our routine is starting amiodaron orally once the patient extubated to maintain the patient rhythm.

If patient converted to AF a loading dose of 300mg amiodarone i.v. then shifting to oral treatment for three months If freedom from AF was not achieved within 48h by amiodarone therapy, followed by DC-conversion if unresponsiveness.

If AF was diagnosed in the outpatient clinic treatment Started with amiodarone and DC conversion if necessary after giving sufficient OAT and echocardiographic diagnosis of intracardiac thrombi before conversion with also warfarin once diagnosed.

The primary outcome was freedom from AF, with 12-lead ECG to be recorded, or was otherwise documented to last for at least 30s on Holter monitoring, as per current consensus statement [11]. Secondary outcome was pacemaker implantation rate.

Statistical analysis:

Values were presented as numbers and proportions for qualitative variables or mean and standard deviation for quantitative variables. The relations between qualitative variables were evaluated by Chi-square test or Fisher's exact test, as indicated. Quantitative variables were checked for normality by Shapiro-Wilk test. Means were compared with unpaired Student's test.

All tests were bilateral and a p-value of 5% is the limit of statistical significance. Analysis was performed by statistical package software IBM-SPSS version 24.

Results

Between February 2019 and February 2022 cardiac surgery with concomitant ablation of AF was performed in 59 patients, 29 patient PVI and complete biatrial ablation in 30 patient. Overall, 40 patients (67.8%) had paroxysmal AF and 19 patients 19 (32.2%) had persistent/long-standing persistent AF.

As a subgroup 13 patients (43.3%) of the persistent AF underwent complete biatrial isolation while 6 patients (20.7%) underwent PVI.

17 patients (56.7%) had a paroxysmal AF underwent complete biatrial procedure while 23 patient (79.3%) underwent PVI.

As a whole 59 patient underwent ablation procedure 40 paroxysmal, 19 persistent, 47 regained normal sinus rhythm (NSR), 7 patients (11.9%) AF while 5 patient (8.5%) got a complete heart block (CHB).

30 patients underwent ablation within the biatrial technique, 17 patient (56.7%) was paroxysmal AF, 13 patient (43.3%) persistent AF.

24 patient (80%) regained NSR, 4 patients (13.3%) had a CHB and they underwent permanent pacemaker 2 patients (6.7%) still was in AF in the follow-up in the outpatient clinic and all above 65 years old.

In the PVI group from 29 patient 23 patient 79.3% regained NSR AF developed in 5 patients (17.2%) only one patient (3.4%) developed CHB.

Though the 23 patients (79.3%) from this group was paroxysmal AF while 6 patients (20.7%) was persistent AF.

The mean left atrial diameter 4.57±0.76cm DC-conversion was required within the first year in one patient (3.4%) of the patients in the biatrial group and non of patients in the PVI group developed AF.

Post operative stroke only one patient (3.4%) had CVA and 2 patients (3.4%) developed bleeding 5 patients (8.5%) had CHB 4 from biatrial ablation (13.3%) while 1 patient only (3.4%) from PVI group and PPM was inserted.

Discussion

We found that the complete biatrial ablation had a significant better results than PVI in patients freedom from AF in Specially the persistent/long-standing persistent type. But the drawbacks of the procedure the higher rates of permanent pacemaker implantation postoperatively, compared to PVI.

This results are concordant with previous Studies of successful biatrial ablation **[12-15]** it is supported by Gillinov et al. **[16]** and an observational study from Blackstone et al. **[17]**, they also found PVI is less efficient compared to biatrial ablation in patients with persistent/long-standing persistent AF.

The incidence permanent pacemaker implantation increases after any surgical ablation postoperative **[5,18]**. We compared the risk of pacemaker implantation between patients in the biatrial and PVI groups. As has been shown in similar observational studies **[19,20]**. We observed a significantly higher proportion of permanent pacemaker implantation in the biatrial group compared to the PVI group.

The selection patients is very important as there is many complications of permanent pacemaker implantation as endocarditis, tricuspid valve regurgitation and right heart failure, so we should highlights the importance of selecting the right patients for surgical ablation.

Sometimes biatrial lesions may cause sinus node dysfunction **[1,21]**, it may lead to unmasking of preexisting sinus node dysfunction, especially in long persistent AF. Over and above our patients in the biatrial group underwent valve surgery (mitral, aortic, or tricuspid), which entails a risk of atrioventricular block **[5]**.

Most of patients in the biatrial group underwent mitral valve and tricuspid valve surgery, while the majority of patients in the PVI group underwent aortic valve surgery and CABG. The most obvious explanation of complete atrioventricular block, which was found in (13.3%) of patients requiring a permanent pacemaker, is the concomitant heart valve surgery performed, since the biatrial lesion set itself cannot cause this.

We believe that the concomitant procedure might be considered an important determinant of the need of permanent pacemaker, which may have caused differences in the pacemaker implantation rates between groups.

We found that age <65 years predicted freedom from AF in the biatrial group, whereas absence of left atrial dilatation These findings are inconsistent with previous studies, including those by Schreiber et al. **[22]** and Sultan et al. **[23]**, who did not find age to be associated with a higher AF recurrence.

However, similar to what we found, Schreiber et al., also reported that left atrial dilatation was associated with AF recurrence. In this study the mean LA diameter was 4.57±0.76.

This is in accordance with Forleo et al. **[24]** who assessed whether gender was a predictor of postoperative freedom from AF, but found no differences in the incidences of AF recurrence between men and women. Importantly, the reports by Forleo et al. and Sultan et al., were comprised of patients who had undergone isolated catheter ablation of AF. Further studies may be necessary to elucidate whether gender plays a role on outcomes following surgical ablation.

Limitations:

The decision to perform biatrial ablation or PVI, was at the discretion of the procedure itself.

This study was not powered to address how ablation at the time of surgery will benefit the risk of long-term complications in terms of thrombosis, heart failure and mortality.

This study only investigated maximum of 12-months postoperative rhythm outcome and pacemaker implantation status. Even though our results correlate with previous reports, our study could have been enhanced by extending the follow-up period **[25]**.

Conclusions:

Biatrial ablation is the gold standard to obtain normal sinus rhythm in patients with long-standing persistent AF.

Permanent pacemaker is higher after biatrial ablation than after PVI. May be due to associated surgical procedure.

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مقارنة العزل الكامل للاذينين عن طريق الكى الجراحى بعزل الأوردة الرئوية فى مرضى الارتجاف الأذينى الذين يخضعون لجراحة القلب

تم عمل العزل بالكى الجراحى للمرضى الذين يعانون من الرجفان الأذينى الذين يخضعون لجراحة القلب. وهدفت دراستنا إلى مقارنة نتائج الارتجاف ما بعد الجراحة ومعدلات زرع جهاز تنظين ضربات القلب بعد العزل الكامل أو العزل الوريدى الرئوى فقط بالتزامن مع جراحة القلب الأخرى.

وخضع المرضى الذين يعانون من ضيق أو ارتجاع بالصمام الميترالى أو الأورطى لهذا الاجراء. وتم تقييم الحالات ما بعد الجراحة بواسطة رسام القلب الكهربائى وجهاز الهولتر.

خضع ٣٠ مريضاً لعملية عزل كامل للاذينين بينما خضع مريضاً لعملية عزل فقط للاوردة الرئوية فى المرضى الذين يعانون من الرجفان الأذينى المستمر/طويل الأمد، لم يكن هناك فرق إحصائى كبير بين الكى الأذينى الكامل وعزل الأوردة الرئوية (٨٠٪) و (٧٩.٣٪) ٢٣ مريضاً على الترتيب، هذا بسبب اختيار نوع الرجفان الأذينى لكل إجراء كان معدل زرع منظم ضربات القلب الدائم بعد العملية الجراحية أكثر شيوعاً بعد الكى الكامل (١٣.٣٪) ٤ و (٣.٤٪) ١ للعزل الوريدى فقط، ، p=0.353 كما لا يوجد تأثير للجنس ولكن حدوث الرجفان الأذينى بعد الجراحة كان أكثر شيوعاً فى المرضى فوق ٦٥ عاماً.

\الاستنتاجات : المرضى الذين يعانون من الرجفان الأذينى المستمر والمتوالى لفترة طويلة، يكون العزل الكامل للاذينين بالكى الجراحى أكثر فعالية من العزل للاوردة الرئوية فقط. على الرغم من أن الحاجة إلى جهاز تنظين ضربات القلب الدائم تكون أعلى بعد العزل الكامل للاذينين، مقارنة بعزل الأوردة الرئوية.