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Original research article

Clinical impact of left atrial appendage resection versus preservation during surgical ablation of atrial fibrillation



Vojtěch Kurfírst^{a,b,*}, Bohuslav Kuta^a, Júlia Čanádyová^a, Aleš Mokráček^{a,b}

^a Cardiac Surgery Department, Hospital of České Budějovice, Czech Republic

^b Faculty of Health and Social Studies, University of South Bohemia, České Budějovice, Czech Republic

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ABSTRACT

Introduction: Resection of left atrial appendage (LAA) during surgical ablation of atrial fibrillation may decrease the incidence of postoperative cerebrovascular events and increase the induction and maintenance of sinus rhythm (SR). This study evaluates the effect of LAA resection after the surgical ablation of atrial fibrillation.

Materials and methods: A retrospective analysis was made of 599 patients who underwent surgical myocardial revascularization and/or valve surgery with concomitant surgical ablation of atrial fibrillation. The LAA was resected in 140 patients and preserved in 459 patients. Postoperative, 1-month and 1-year results were compared between the groups in terms of TIA/CVA, maintenance of sinus rhythm, pacemaker dependence and mortality.

Results: The patients who underwent LAA resection were older, had more frequent persistent AF and underwent more frequently biatrial ablation set. In this group, longer times of extracorporeal circulation and longer cross-clamp times were observed. During the follow-up period, the resection group has shown lower incidence of TIA/CVA and the overall mortality was also lower in this group of patients.

Conclusion: The resection group in our study has shown the trend toward lower incidence of TIA/CVA and statistically significant decrease of overall mortality. This finding can support routine LAA resection during surgical ablation of atrial fibrillation.

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* Corresponding author at: Cardiac Surgery Department, Hospital of České Budějovice, Boženy Němcové str. 54, 37087 České Budějovice, Czech Republic. Tel.: +420 387874201; fax: +420 387874202.

E-mail addresses: vojtech.kurfirst@post.cz (V. Kurfírst), b.kuta@seznam.cz (B. Kuta), canadyova.julia@gmail.com (J. Čanádyová), a.mokracek@seznam.cz (A. Mokráček).

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Introduction

LAA plays an important role in human physiology. It is a producer of atrial natriuretic peptide (ANP) in spite of the fact that the production in right atrial appendage is 40 times higher [1]. LAA has influence on induction of thirst [2] and affects the relationship between pressure and blood volume, and has the function of reservoir. Occlusion of the left atrial appendage leads to an increase in pressure and volume in the left atrium. It has positive effect on cardiac output [3,4], although this effect was not confirmed in elderly patients [5]. In patients with hypertension, LAAs were found bigger with depressed ejection velocity [6]. In patients with long-term atrial fibrillation (AF) LAAs with higher volume were identified as well as wall fibrosis and reduction of musculi pectinati.

LAA also plays an important role in pathogenesis of thromboembolism (TE) in patients with AF. The risk of TE is five times higher in patients with AF than without AF and the source of emboli is in 90% in LAA [7] in case of non-valvular AF. In actual guidelines of European Society of Cardiology, it is clearly declared that TE can have an alternative source of emboli to LAA in patients with AF, but the resection of LAA during the MAZE procedure is fully authorized [8].

On this count there are a few clinical studies that compare the clinical impact on LAA resection or preservation in terms of sinus rhythm maintenance, TE events, pacemaker dependence and mid-term mortality [9–11].

Materials and methods

Between January 2004 and December 2013, a total of 599 patients underwent cardiac surgery procedure with concomitant surgical ablation of atrial fibrillation at the Cardiac Surgery Department of Hospital of České Budějovice, Czech Republic. The decision to resect the LAA during the procedure was influenced by several factors such as presence of hypertension, diabetes mellitus, higher age, prevalent TE event and type of AF (paroxysmal, persistent). The decision was finally up to the attending surgeon and based on her/his view and experiences in LAA resection.

Surgical technique

A median sternotomy approach was regularly used in all patients and all procedures were performed on cardiopulmonary bypass. For the ablation of AF Cardioblate CryoFlex Surgical Ablation Probe (Medtronic, Minneapolis, USA) was used. In the beginning of the reported period, the left-sided ablation procedure was performed in patients with paroxysmal AF. It consisted of both-sided pulmonary veins isolation and possible LAA resection. The bilateral ablation procedure was performed in patients with persistent AF and in the latest period also for patients with paroxysmal AF. It consisted of bilateral vein isolation, as well as upper and lower box lesion that connected opposite pulmonary veins and lesion from lower box lesion to mitral isthmus. The bilateral ablation was finished with a right sided lesion set which consisted of an

intercaval lesion and an isthmus line connecting the inferior vena cava with the cavotricuspidal isthmus.

Follow-up

All patients were monitored during the postoperative period with Holter monitoring till the discharge from the hospital. They were routinely administered warfarin for minimally 3 months postoperatively, with a target range of international normalized ration from 2 to 3. Patients who presented with AF events during the hospitalization, patients who underwent electrical cardioversion or patients with continuing AF at the discharge from hospital were given amiodarone for 1-month period.

Follow-up rhythm monitoring was performed with 24-h Holter monitoring at 1, 3, 6 and 12 months after the surgery and patients had a medical examination from the attending physician. AF events were defined as any AF episodes during the Holter monitoring that were recorded after the healing period (3 months after the surgery). Any symptoms suggestive of neurologic deficit were evaluated by attending neurologist and examined with imaging studies.

Statistical analysis

The obtained data set was evaluated using the following statistical parameters: medians (MD) with ranges or as means (M) with standard deviation (SD). The normal distribution was tested by the D'Agostino–Pearson omnibus K^2 tests and with the Shapiro–Wilk normality test.

The non-parametric Mann–Whitney test was used for comparing and studying the relationships between the continuous variables. Moreover, Fischer's exact test was used for comparing the categorical variables. A confidence level of 95% was accepted as significant.

The statistical analysis was performed with MS Excel 2003 for Windows XP and the statistical analysis system GraphPad Prism version 5.01 (Graph-Pad Software, Inc., San Diego, CA, USA).

Results

The preoperative characteristics of the patients are listed in Table 1. The patients who underwent resection of the LAA were older than those who underwent LAA preservation (71.0 ± 7.0 vs. 69.1 ± 7.6 years). The group of patients who underwent LAA preservation had higher percentage of paroxysmal AF (45.3%); on the other hand the group of patients who underwent LAA resection had higher percentage of persistent AF (70.1%). These differences were found to be statistically significant. In the other variables (gender, diabetes, hypertension, renal insufficiency, preoperative TIA/CVA, COPD and ejection fraction) no differences reaching statistical significance were found.

The perioperative characteristics of the patients are listed in Table 2. The group of patients who underwent LAA resection had longer times of extracorporeal circulation (108.3 ± 38.2 vs. 99.7 ± 40.6 min) and aortic cross-clamp times (75.6 ± 28.6 vs. 66.6 ± 32.3 min). The left sided ablation set was more common in the preservation group (61.4%); otherwise the biatrial ablation set was more common in the resection group (82.1%). The distribution of patients according to the type of surgery is listed in Table 2.

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