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Original research article

Surgical ablation for atrial fibrillation as a concomitant cardiac surgery procedure. A single-centre study with 1-year follow-up

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ARTICLE INFO

Article history:
Received 24 February 2015
Received in revised form
3 March 2015
Accepted 4 March 2015
Available online 3 April 2015

Keywords:
Surgical ablation
Atrial fibrillation

ABSTRACT

Introduction: Surgical ablation procedures have been shown to be effective in treatment of atrial fibrillation (AF), but convincing evidence showing relationship between clinical confounders, surgical technique and intermediate-to-long term outcomes is still lacking. Therefore we conducted a retrospective single-centre database study to identify predictors of sinus rhythm (SR) maintenance at 12 months after surgery with insights into standard medical care provided by general practitioners and/or outpatient cardiologists in the setting of a newly introduced method.

Methods: Data from consecutive 376 patients, who underwent heart surgery which included surgical left atrial (LA) ablation for AF between July 2006 and December 2010, were collected. Primary outcome was maintenance of SR at 12 months. A stepwise backward multivariate logistic regression analysis was used to identify predictors of the primary outcome.

Results: RF ablation was performed in 210 patients and 166 patients underwent cryoablation. In 273 subjects the 12-month follow-up data were available. The success rate in maintaining the sinus rhythm 1 year after surgery was 48.9% (63.1% for cryoablation, and 37.8% for RF ($p < 0.0001$)). None of the patients underwent repeated ablation procedure within the 12-month follow-up period. Paroxysmal AF, mitral valve surgery, and smaller LA diameter were associated with the primary endpoint; cryoablation was superior to RF ablation. Nevertheless, prescription rate of amiodarone/propafenone in patients with documented sinus rhythm at 12-month follow-up was 36.0%.

Conclusions: Using multivariate analysis of retrospective data we identified clinical confounders and technical aspects associated with better outcomes after surgical ablation for AF.

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http://dx.doi.org/10.1016/j.crvasa.2015.03.003

Introduction

Surgical ablation procedures have been shown to be effective in treatment of atrial fibrillation (AF) and are considered a valuable option especially for patients requiring a cardiac surgery for other reasons such as valvular and/or ischaemic heart diseases [1–3]. Various lesion sets and energy sources have evolved and now have largely replaced the traditional cut-and-sew method [4,5], but convincing evidence about relationship between surgical technique, clinical confounders, and intermediate-to-long term outcomes is still lacking.

The ambiguity in comparing the individual approaches to the surgical ablations might be due to unclear, non-uniform criteria for heart rhythm outcome evaluation as seen in many studies [1,6,7]. Similarly, the intra- and inter-centre differences of patient populations undergoing these procedures influence interpretation of outcomes and limit power of conclusions [6]. Results of a single-centre retrospective database analysis are presented and discussed in this manuscript. The study was aimed to contribute to ongoing discussion regarding the surgical technique, and also the influence of left atrial (LA) diameter on sinus rhythm (SR) maintenance at 12 months after surgery.

Methods

All the patients who underwent heart surgery which included surgical left atrial (LA) ablation for AF between July 2006 and December 2010 in our centre were identified by procedure codes, and relevant data were collected from their electronic medical records in our institution. Patients who underwent biatrial ablation for AF were not included in this study since our institution had only a limited number of such cases in the study period. Primary outcome was maintenance of SR at 12 months after surgery validated by electrocardiogram and/or 24-h Holter monitoring.

Surgical technique

The energy sources used to create transmural lesions in the LA were either bipolar radiofrequency (RF) energy or cryothermy. Isolator® Synergy™ Ablation System by AtriCure® was used to apply RF energy whereas cryothermy was administered by Cardioblate® CryoFlex™ Argon-Powered Surgical Ablation System by Medtronic. The choice of energy source in each individual case was in competence of the operating cardiac surgeon.

Lesion set in the left atrium comprised of isolation lines around ostia of pulmonary veins bilaterally, a line connecting the left and right pulmonary veins, and a connecting lesion to the left atrial appendage which was resected. With the cryoablation technique a lesion to the mitral valve annulus was added. This was not performed in RF technique due to risk of damage of structures in the coronary sulcus [8,9]. Cryoablation lesions in patients undergoing mitral valve surgery were performed from the endocardial approach while the other patients were ablated from the epicardial surface.

Unless postoperative bradycardia occurred the patients were commenced on amiodarone treatment after surgery and electrical cardioversion was added if necessary. A standard 3-month course of antiarrhythmic drug treatment therapy was recommended, but it was left to supervision of the referring cardiologist and/or GP. A follow-up scheme consisting of 3-month and 6-month consultations at the referring cardiologist office, and a 12-month check-up at our facility was proposed to the patients unless clinical circumstances required otherwise. Depending on outcome of the 12-month evaluation at our centre, most patients were recommended to continue with clinical ambulatory care by their referring cardiologist and/or GP.

Follow-up data

The primary outcome – restoration and maintenance of sinus rhythm at 12 months after surgery – was validated by physician's office 12-lead electrocardiogram. 24-h Holter monitoring of ECG at 3 and 6 months was recommended in the follow-up instructions, but the decision whether or not to perform Holter monitoring was entirely in competence of the referring cardiologist/GP, prior to the follow-up consultation at our facility. The primary endpoint was met if the patient was free from AF, atrial flutter (AFL), and atrial tachycardia (AT) [1] and had not undergone pacemaker implantation by the time of the follow-up evaluation.

Hearth rhythm assessment was performed in our facility on the occasion of 1-year post-operative check-up. In patients who did not present for follow-up evaluation we obtained ECG records through their primary care physician's office. Information regarding patients' follow-up medication was obtained by the same means. The mortality data were collected through the general medical insurance registry of the Czech Republic.

Since a significant portion of the postoperative care between the surgical intervention and the follow-up appointment was provided by outside facilities, we were unable to obtain detailed history to assess if the criteria for antiarrhythmic drug discontinuation as described in the HRS/EHRA/ECAS Expert Consensus Statement were met [1]. Therefore we opted to define our primary outcome as freedom from AF, AFL, and AT regardless of antiarrhythmic medication (AAM).

Statistical analysis

Pearson Chi-square test, Wilcoxon rank-sum test, and Student's t test were used to compare categorical and continuous variables across the RF and cryoablation groups. For stepwise backward multivariate logistic regression analysis these clinical confounders were used: age, gender, type of surgery (mitral valve surgery, tricuspid valve surgery, aortic valve replacement, coronary artery bypass graft), type of LA ablation (cryothermy vs. bipolar radiofrequency (RF)), surgical ablation approach (endocardial vs. epicardial approach), type of AF (paroxysmal vs. longstanding persistent) and LA size, and left ventricular ejection fraction. The study was approved by Ethics Committee of our centre and it waived the need for patient informed consent for this retrospective study.

Results

In total 376 patients were enrolled in the study. RF ablation was performed in 210 patients and 166 patients underwent