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Eight years experience with thoracoscopic surgical ablation of stand-alone atrial fibrillation in Cardiocenter Kralovske Vinohrady – The evolution of methods and indications and summary of the results

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ABSTRACT

Aim: Atrial fibrillation (AF) can be successfully treated with interventional methods of catheter or surgical ablation. New surgical minimally invasive methods have been created for patients with a stand-alone form of AF.

Methods and results: In this article, we describe our eight years experiences with a thoracoscopic epicardial off-pump ablation. We narrate the methodology, indications and also summarize our outcomes.

Conclusions: AF can be safely and successfully treated through a minimally invasive surgical approach. Results can be improved with usage of bipolar radiofrequency energy and close collaboration with electrophysiologists.

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Introduction

Atrial fibrillation (AF) represents the most common sustained cardiac arrhythmia with a prevalence of nearly 2% in general population [1]. It increases with age and the number of patients suffering from AF in Europe is expected to double within next 10 years. Presence of any type of AF is associated with two-fold raise of mortality, increased risk of cerebrovascular thromboembolic events, increased rate of cardiac-related hospitalizations and also a deteriorative quality of life [2]. Because of its serious social and financial impact, AF is sometimes called an epidemic of the 21st century.

Effective treatment of AF still remains an opened problem. Pharmacological methods with amiodarone as the drug of first choice have a limited efficacy with significant reccurence rates and potential serious side effects. An important improvement in the field of antithrombotics present the group of novel oral anticoagulants (NOACs) that have been widely accepted as an equally effective alternative to warfarin [3]. The group of interventional (catheter and surgical) methods of AF treatment presents a dynamically evolving and so far the most effective method of sinus rhythm (SR) restoration nowadays.

Since the landmark article published by Haissaguerre in 1998 [4], the percutaneous catheter ablation (CA) became an effective method of paroxysmal AF treatment and currently is recommended for paroxysmal AF patients with symptomatic recurrences despite optimal medical therapy with a class I/A indication [4]. An electric isolation of pulmonary veins (PV) is a key component of procedures for paroxysmal AF treatment. Patophysiology of non-paroxysmal AF is much more complex. Therefore, the treatment of persistent and long-standing persistent AF with methods of CA is more complicated and the long-term success rate of these procedures is currently limited [5].

In 1987, an introduction of the MAZE procedure by Dr. Cox has started an expansion and evolution of surgical AF ablation techniques. The original procedure has been modified several times to improve the results and to simplify the surgery up to the Cox-MAZE IV modification [6]. As the original cut-and-sew technique for creating lesions was technically demanding procedure with a negligible risk of bleeding complications, a new ablation tools have been marketed to faciliate the ablation. A variety of energies and ablation devices have been tested and used, some of them were already abandoned (microwave, high-intensity focused ultrasound, laser). Based on very good efficacy and safety results, the concomitant surgical ablation of AF is nowadays recommended in all AF patient who undergo a cardiac surgery for some other primary diagnosis [4].

Since the open heart MAZE surgery is considered in most centers to be too invasive for patients with a stand-alone form of AF, a minimally invasive, off-pump modifications have been developed. An early review of mid-term results of those methods was published by Mack in 2009. An overall freedom from AF off of antiarhythmic drugs (AADs) after 6–12 months was 65% (57–87%) with better results for paroxysmal AF [7]. Most lately, a hybrid approach for treatment of stand-alone AF was introduced, combining an epicardial minimally invasive surgery with a following percutaneous catheter ablation [8]. This approach uses a both-sides advantageous cooperation of cardiac surgeons and cardiologists and also shows an irreplaceable role of electrophysiologists in AF treatment.

In this article, we describe our experiences with a minimally invasive, surgical treatment of stand-alone AF, as well as the evolution of methods, used energies and catheters, strategy of indications and briefly also a summary of our results.

Material and methods

Overlook

Program of the thoracoscopic AF ablation in Cardiocenter Kralovske Vinohrady has two separate phases. Pilot group of patients was operated between 2006 and 2010 with older microwave (MW) and monopolar radiofrequency (RF) ablation devices. Based on these results, we focused on patiens with non-paroxysmal AF later and since 2013 we started operating those patients with a bipolar RF device. More lately in 2013, we have switched our program to a double-staged hybrid procedure in cooperation with the department of arrhythmology of our Cardiocenter. The program has been supported by Charles University Cardiovascular Research Programme PRVOUK P35.

Patient selection, evolution of indications

In our pilot group, patients with all types of stand-alone AF, who were symptomatic and resistent to AADs, were indicated. All of them underwent a complex cardiological examination, including coronary angiography, echocardiography and spirometry. Patients without indications to cardiac (mainly coronary artery or valve) surgery were in general candidates for the procedure. All of them signed an informed consent with the pilot program. Protocol of the project was created in accordance with the Declaration of Helsinki and was approved by local ethics committee.

In 2013, we decided to start a hybrid program for patients with persistent and long-standing persistent AF. Indications are similar to the early group: absence of indication to other cardiac surgery, symptomatic patients and at least one of the AADs failed.

An absolute contraindication for all patients are pericardial adhesions (e.g. history of intrapericardial surgery). The commonly known risk factors of ablation failure (size of left atrium, age, duration of AF, etc.) are not considered contraindications in general and are assessed individually, as well as other risk factors, such as obesity or pulmonary diseases.

Surgical procedure, evolution of methods and used devices

The goal of the procedure remains the same from the very beginning: electrical isolation of pulmonary veins and posterior left atrium wall by creating a continuous circumferential ablation line around all four PVs (‘‘box-lesion’’) using