World Journal of Surgery and Surgical Research

Research Article
Published: 20 Feb, 2020

Atrial Fibrillation, Immediate Surgical Results to Totally Non-Invasive Cyberheart a New Option

Federico Benetti, José Ameriso and Natalia Scialacomo*

Department of Cardiac Surgery, Benetti Foundation, Argentina

Abstract

Introduction: In the USA atrial fibrillation is the second cause of heart disease after arterial hypertension, affecting 4 million Americans every year for many patients the heart rate control is inadequate to improve their quality of life or reduce the symptoms of heart failure, the failure in the control of the heart rate generates multiple hospitalizations and many times a great state of anxiety and depression, having a reported recurrence up to 80% in the year in this work we will present the experience of the Benetti Foundation in the surgery of atrial fibrillation and the initial experience with the CyberHeart system between 2000 and 2019, 29 patients underwent treatment for atrial fibrillation with different procedures. Twenty-seven were operated; 18 patients concomitantly with coronary surgery without the use of extracorporeal circulation; 14 of them using microwave and 4 radiofrequency as a source for the ablation the average age was 62 (± 5 to ± 7) and 30% were women, the number of bypasses was 3.2 per patient. In two AF patients, after CT was used to delineate atrial anatomy and targets; radioablation was performed with assistance from radiation oncologists and physicists the operative mortality of this series was 0%. Hospitalization varied between 3 and 12 days with an average of 7.7 (± 4.6) conclusions our surgical experience of atrial fibrillation shows the possibility of reproducibility of different techniques in different pathologies. The combination of surgical treatment, electrophysiological treatment and adequate medical treatment undoubtedly open a great possibility to alleviate this disease that has really catastrophic consequences. A suitable dedicated team (Heart Team) is essential to improve the immediate and remote results of the treatment of atrial fibrillation in its different stages new technique totally non-invasive as CyberHeart open a new alternative of treatment more experience is needed.

Keywords: Atrial fibrillation; Surgical treatment; Microwave; CyberHeart

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Correspondence:
Federico Benetti, Department of Cardiac Surgery, Benetti Foundation, Alem 1846, Rosario, Santa Fe, CP 2000, Argentina,
E-mail: federicobenetti@hotmail.com

Received Date: *10 Jan 2020*
Accepted Date: *17 Feb 2020*
Published Date: *20 Feb 2020*

Citation:
Benetti F, Ameriso J, Scialacomo N. Atrial Fibrillation, Immediate Surgical Results to Totally Non-Invasive Cyberheart a New Option. World J Surg Surgical Res. 2020; 3: 1199.

Introduction

In the USA atrial fibrillation is the second cause of heart disease after arterial hypertension, affecting 4 million Americans every year [1]. The prevalence of the disease is 6% in those over 65 years and 10% in those over 80 years. 70% of individuals with Atrial Fibrillation are between 65 and 85 years old [2,3]. The proportion between men and women is similar, except that in women over 75 years old the proportion in women is 60%.

The incidence currently between the population of 20 and 59 years is 15.8%, but with the increase in obesity and hypertension a significant increase in this pathology is expected in the coming years [4,5] the rhythm control in atrial fibrillation requires drugs with low toxicity [6]. For many patients the heart rate control is inadequate to improve their quality of life or reduce the symptoms of heart failure, the failure in the control of the heart rate generates multiple hospitalizations and many times a great state of anxiety and depression, having a reported recurrence up to 80% in the year. In addition, Atrial Fibrillation doubles the risk of cardiovascular mortality of all causes independent of the anticoagulation situation and added risk factors [7-11]. Since the year 2000 there has been an exponential increase in the treatment of atrial fibrillation by catheters using radiofrequency, with a recurrence that varies between 1 and 3 years from 20% to 50% [12,13]. Recently in a series of 4,200 ablated patients by catheter, the incidence of complications related to the procedure was 5% and re-hospitalization at 9 days was 9% [14]. The traditional Cox Maze surgery is highly effective but requires the prolongation of operative times leading to greater morbidity and mortality, greater bleeding and high incidence of pacemaker implantation [15]. A few years ago we began to use different sources of energy to simplify this intervention [16]. Recently, sinus rhythm maintenance was reported at 84.7% at 6 months and from 58.8% at 8 years of follow-up in patients who underwent radiofrequency surgical ablation as a complement to valve or coronary surgery. [17] The results

with ablation surgery in both atria in patients with isolated atrial fibrillation show a 59% success rate per year, and 38% at 5 years with advantages over conventional sternotomy [18,19].

New different treatment methods open an expectation to improve current results in this true epidemic [20-23]. The CyberHeart system is a software that use an specific planning with 4D imaging of anatomic targets and tracking and compensate for movements the heart and patient with minimally radiation exposure to perform noninvasive ablation of cardiac arrhythmias using a variety of radiosurgery platforms [20,21]. In this work we will present the experience of the Benetti Foundation in the surgery of atrial fibrillation and the initial experience with the CyberHeart system.

Material and Methods

Between 2000 and 2019, 29 patients underwent treatment for atrial fibrillation with different procedures. Twenty-seven were operated; 18 patients concomitantly with coronary surgery without the use of extracorporeal circulation; 14 of them using Microwave and 4 Radiofrequency as a source for the ablation the average age was 62 (± 5 to ± 7) and 30% were women, the number of bypasses was 3.2 per patient, five patients received treatment during a mitral valve surgery with extracorporeal circulation 4 underwent a plastic and 1a Replacement. The technique used was bipolar ablation with radiofrequency in 3 and microwaves in 2 to 3, (60%) were women. The mean age was 53.9 (± 9.5). The size of the left atrium was 48.5 mm to 76.6 mm with an average of (62 mm ± 7 mm). The aortic clamping time was between 53 min and 144 min with an average of 91.1 ± 21.6, and the pump time between 69 min and 153 min, with a mean of 111.8 (± 32.3 min). Four patients were operated on of paroxysmal atrial fibrillation with the Mini Maze technique with videothoracoscopy using radiofrequency without extracorporeal circulation, 2 were women (50%). The median age was 53 years (± 8.7). In two AF patients, after CT was used to delineate atrial anatomy and targets; radioablation was performed with assistance from radiation oncologists and physicists The AF patients were treated with wide-area circumferential ablation encircling the pulmonary veins. Single dose delivered was 25 Gy for both patients.

Results

The operative mortality of this series was 0%. Hospitalization varied between 3 days and 12 days with an average of 7.7 (± 4.6) in the 14 patients undergoing coronary surgery without the use of extracorporeal circulation, ablated with Microwave. The (79%) that were 11 patients were in Sinus rhythm. Of the 4 patients with Radiofrequency 3 (75%) were in sinus rhythm. Of the patients undergoing concomitant mitral surgery of the 3 ablation with radiofrequency, 2 (67%) were in sinus rhythm, while in the 2 ablation with microwave only 1 (50%) was terminated in sinus rhythm. In the 4 patients subjected to Mini Maze 3 (75%) of this group were in sinus rhythm. One of AF patient treated with CyberHeart developed recurrence of arrhythmia before 6 months after treatment, and elected to continue a medical rhythm control strategy. The other was in sinus rhythm 2 years after no others complications were seen in this initially experience.

Discussion

There has been much debate among cardiac surgeons and electrophysiologists about the best technique to treat atrial fibrillation resistant to drug treatment. It is clear that both treatment by catheter or surgery is superior, in terms of results, to isolated medical treatment in patients with non-paroxysmal atrial fibrillation, lowering the incidence and decreasing the need for cardioversion and reducing hospitalizations for cardiac cause [24].

The Cox Maze surgical technique of cutting and sewing the left atrium, and eventually the right atrium plus the cryoablation points, is very effective but requires cardiopulmonary bypass and has a high incidence of bleeding and the need for a permanent pacemaker [15]. In this article we show our surgical results in the treatment of atrial fibrillation with different sources of ablation associated with coronary and valvular surgery, and in patients with paroxysmal atrial fibrillation without associated pathology.

Our initial mortality was 0% and immediate results similar to those of most authors. It is clear that this procedure is increasingly carried out and a reduction in mortality and incidence of immediate stroke has been clearly demonstrated in all situations of patients in whom surgical ablation is performed [25]. In any case, both catheter ablation and surgery have limitations because they do not have absolute effectiveness [26]. The combination of both treatments, according to the first results, would demonstrate superior effectiveness than any of the techniques in isolation [23]. In addition other way as CyberHeart of approaching the problem are being evaluated and open an interesting expectation of non-invasive treatment of this real epidemic that is atrial fibrillation [20,21].

Conclusion

Our surgical experience of atrial fibrillation shows the possibility of reproducibility of different techniques in different pathologies. The combination of surgical treatment, electrophysiological treatment and adequate medical treatment undoubtedly open a great possibility to alleviate this disease that has really catastrophic consequences. A suitable dedicated team (Heart Team) is essential to improve the immediate and remote results of the treatment of atrial fibrillation in its different stages new technique totally non-invasive as CyberHeart open a new alternative of treatment more experience is needed.

Statistical Evaluation

It was done using the social science statistical package system (SPSS version 15).

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