

Mini Review

Cyberheart

Federico Benetti, MD*

Cardiac Surgery, BENETTI FOUNDATION, Alem 1846, Rosario Argentina Zip 2000, Argentina

*Corresponding authors

Federico Benetti

Cardiac Surgery
BENETTI FOUNDATION
Alem 1846, Rosario Argentina Zip
2000, Argentina

E-mail: federicobenetti@hotmail.com

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Introduction

The management of many cardiac arrhythmias has progressed from a strategy of suppression by antiarrhythmic drugs to one of potential cure by destroying the arrhythmogenic substrate. The most commonly used energy source—radiofrequency—has limited ability to induce lasting lesions of predictable size, requires direct contact with heart muscle, and has the potential to cause collateral damage to the surrounding myocardium and extra cardiac tissue (1). Although other clinically available or experimental modalities, such as cryoablation, microwave,(2) ultrasound, and laser, offer certain advantages for specific procedures, all require invasive delivery.

In 2005 we developed the idea of treating the arritmias using radiation , based on the concept of producing cellular apoptosis (3) ,the Cyberheart system was create for this pourpose.; by Tom Fogarty and Roderick Young (4-5). Basically the 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 to perform noninvasive ablation of cardiac arrhythmias using a variety of radiosurgery platforms

Methods

Patients with VT refractory to antiarrhythmic drugs and catheter ablation, or ineligible for catheter ablation due to medical comorbidities, or drug-refractory symptomatic AF were enrolled. For patients with prior catheter ablation for VT, electroanatomic map(s) and CT, MRI, or PET were used to create an ablation target. In VT patients who had not undergone prior ablation, imaging and 12-lead ECG of VT localized an ablation target. In AF patients, CT was used to delineate atrial anatomy and targets. Planning software was used to design delivery of uniform, transmural ablative energy to the VT targets (cardioplan, Cyberheart Inc., Mountain View, CA); radioablation was performed with assistance from radiation oncologists and physicists (Cyberknife, Accuray, Inc., Sunnyvale, CA). Patients were monitored with ICD interrogation, ambulatory monitoring, ECG, echo, chest X-ray, and clinical follow up. All patients were treated under approved IDE and IRB approvals.

Results

The first five patients (VT=4, AF=1) were enrolled. One VT patient was successfully planned, but did not undergo ablation due to inability to deploy a tracking fiducial. Single dose delivered was 25 Gy for all patients. Two patients were treated for scar-based VT, and the one was treated for idiopathic VT originating from the LV summit, inaccessible with endocardial/epicardial ablation, and the AF patient was treated with wide-area circumferential ablation encircling the pulmonary veins. All patients experienced a reduction in arrhythmia burden. One VT patient died (pneumonia), unrelated to treatment. Two patients have an arrhythmia-free survival of >12 months and continued to be followed. The AF patient developed recurrence of arrhythmia between 6-12 months after treatment, and elected to continue a medical rhythm control strategy. No complications were seen. At 2018 many more patients are done all over the world.

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Conclusion

Although are the firsts experiences , for patients who have arrhythmia refractory to, or are contraindicated for current therapies, cardiac radiosurgery may offer another option. Also the Cyberheart System can be use in other pathologies like Hypertension and the system was conceived also to deliver Stem Cells more research is needed to accomplish the original goals (3).

Disclose

Federico Benetti is coinventor and shareholder of Cyberheart.

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