Hybrid Atrial Fibrillation Ablation: Long-Term Outcomes From a Single Center 10-Year Experience

Luigi Pannone, et al. Europace 2023;25:1–9

Introduction

Recurrence of atrial fibrillation (AF) is common in patients who have undergone endocardial pulmonary vein isolation (PVI) alone.[1,2] In fact, approximately 20% of patients with persistent and long-standing persistent AF with AF recurrence have confirmed PVI during redo procedures.[3]

Hybrid AF ablation may offer advantages over PVI alone as it combines both thoracoscopic surgical ablation to deliver epicardial lesions and traditional endocardial catheter ablation to confirm PVI and an ability to create additional lesions from the endocardium. Hybrid ablation has shown significant promise to reduce AF recurrence in patients with more advanced forms of AF, however, long term outcomes of hybrid ablation are not well known.[4]

Methods

A single site, retrospective analysis, led by Luigi Pannone (University Hospital in Brussels, Belgium), evaluated long-term outcomes of 120 consecutive patients with paroxysmal and PAF. Patients underwent de novo or repeat ablation with a single-stage hybrid approach in which thoracoscopic ablation followed by endocardial mapping and ablation were conducted in this sequence. Cohorts were parsed by hybrid as a first, second, or third procedure. Among the cohorts, 70.8% underwent hybrid as first procedure; 16.7% as second procedure, and 12.5% as third procedure for which 100%, 30% and 33.3% had PAF, respectively.

Hybrid AF Procedure

Baseline characteristics were similar except for diabetes, left atrial volume and left ventricular ejection which differed between cohorts. There was also a greater number of paroxysmal AF patients who underwent hybrid as second or third procedures while no PAF patients underwent hybrid as their first procedure. Of patients (68/85) who underwent hybrid as a first procedure, most were classified as having long-standing persistent AF (LSPAF) as compared with only 10% and 1% of patients with LSPAF who underwent hybrid as a second or third procedure, respectively.

Among 85 patients who underwent hybrid as first procedure, all had PVI+LAPWI. Additional lesions were performed including: cavotricuspid isthmus (CTI) in 12.9%, anterior mitral line in another 12.9%, posterior mitral line in 9.4% and complex fractionated atrial electrograms (CFAE) in 25.9%. Repeat ablation was performed in 25.9%. PVI and LAPWI were confirmed in 68.2% and 90.9% of patients, respectively.

Among 20 patients in the second procedure cohort, 75% and 25% had a previous PVI with cryoablation or RF ablation, respectively. PVs were isolated in 70%, while hybrid re-PVI patients with confirmed PVI reconnections underwent LAPWI. Additional CTI occurred in 15%, anterior mitral line in 10%, posterior mitral line in 15%, CFAE in 30% of patients.

Among 15 patients in the third procedure cohort, 80% and 20% had previous PVI with cryo and RF, respectively. PVs were isolated and hybrid LAPWI were performed in all patients. Additional CTI occurred in 13.3%, anterior mitral line in 20%, posterior mitral line in 13.3%, CFAE in 20%.

A total of 15 patients experienced complications including: one LA perforation, two with a vein lesion requiring conversion to sternotomy, one with an intraprocedural perforation of the LAA, mitigated with clipping, one with late tamponade treated with pericardial drainage and extracorporeal membrane oxygenation. There were no procedural deaths and no strokes.

Hybrid Atrial Fibrillation Ablation: Long-Term Outcomes

After a mean follow-up of 62.3 ± 20.3 months, overall freedom from atrial tachyarrhythmia (AT) recurrence was 47.5%. Among 63 (52.5%) patients who experienced AT recurrence, 55% and 44.4% were due to AF and AT, respectively. AT-free survival without antiarrhythmic drugs as 76.7%, 67.5%, 60.5%, 53.6%, and 46.1% at 12, 24, 36, 48, and 60 months, respectively. There were no differences in AT-free survival between patients who underwent hybrid as first, second, or third procedure nor a difference in AT-free survival between patients with PAF, persistent or LSPAF.

Per a Cox multivariate analysis, left atrium volume index, and recurrence during the blanking period were independent predictors of AT recurrence.

Among 35 patients who underwent hybrid as a repeat procedure, 29 (82.8%) patients had confirmed isolated PVs. All paroxysmal patients were in the repeat ablation group. AT-free survival in this group was 55% at 5 years.

Key Takeaways

- In this long-term, single-site analysis of patients who underwent hybrid as a first, second, or third procedure, overall AT-free survival was 47.5% at 5-years of follow up.
- There was no difference in clinical outcome between patients who underwent hybrid ablation as a first or repeat procedure.

Reference:

1. *Verma A et al. N Engl J Med. 2015;372(19):1812-1822*
2. *Bisignani A et al. J Arrhythmia 2021;37(5):1287-1294*
3. *Kuck KH et al. Circ Arrhythmia Electrophysiol.2019;12:1–9.*
4. *Pannone L, et al. Europace. 2023;25:1–9*

Summary written by: Stacey Neuman, PhD, Scientific Affairs

Hybrid Atrial Fibrillation Ablation: Long-Term Outcomes

RF Clamp

Argentina, Colombia, and Hong Kong Indications: *The ATRICURE Bipolar (Transpolar) System is intended to ablate soft tissue during General surgical procedures.*

Australia, Belarus, South Africa, South Korea, and Russia Indications: *The ATRICURE Bipolar (Transpolar) System is intended to ablate cardiac tissue during surgery.*

Canada and U.S. Indications: *The AtriCure Synergy Ablation System is intended to ablate cardiac tissue for the treatment of persistent atrial fibrillation (sustained beyond seven days or lasting less than seven days but necessitating pharmacologic or electrical cardioversion) or longstanding persistent atrial fibrillation (continuous atrial fibrillation of greater than one year duration) in patients who are undergoing open concomitant coronary artery bypass grafting and/or valve replacement or repair.*

Brazil, Chile, Costa Rica, EU, Kuwait, New Zealand, Saudi Arabia, Serbia, UAE, UK, and Taiwan Indications: *The ATRICURE Bipolar (Transpolar) System is indicated for ablation and coagulation of soft tissue in general, ENT, thoracic, urological, gynecological surgical procedures and ablation of cardiac tissue during surgery including pulmonary vein isolation and atrial connecting lesions for the Maze procedure for the treatment of cardiac arrhythmias, including atrial fibrillation.*

China Indications: *This device is intended for use in ablation of cardiac tissue.*

Japan Indications: *This device is intended for use in ablation of cardiac tissue during surgery by use of high-frequency current.*

Singapore Indications: *The ATRICURE Bipolar (Transpolar) System is indicated for ablation of cardiac tissue during surgery including pulmonary vein isolation and atrial connecting lesions for the treatment of atrial fibrillation.*

Isolator Linear Pen (MLP1):

China Indications: *The Isolator linear pen is a sterile, single use electrosurgery device intended to ablate cardiac tissue during cardiac surgery using radiofrequency (RF) energy when connected directly to the ASU or ASB in Ablation Mode.*

The Isolator linear pen may be used for temporary cardiac pacing, sensing, recording, and stimulation during the evaluation of cardiac arrhythmias during surgery when connected to a temporary external cardiac pacemaker or recording device.

Ablation pens are used for ablation of the present tissue, as well as a surgical pacing and standardization tool.

Australia, Belarus, Canada, Chile, Costa Rica, EU, Kuwait, New Zealand, Russia, Saudi Arabia, South Africa, South Korea, Taiwan, UAE,UK, and US Indications: *The Isolator linear pen is a sterile, single use electrosurgery device intended to ablate cardiac tissue during cardiac surgery using radiofrequency (RF) energy when connected directly to the ASU or ASB in Ablation mode. The Isolator linear pen may be used for temporary cardiac pacing, sensing, recording, and stimulation during the evaluation of cardiac arrhythmias during surgery when connected to a temporary external cardiac pacemaker or recording device.*

Coolrail®

Australia, Belarus, Chile, EU, Kuwait, New Zealand, Saudi Arabia, Taiwan, UAE, and UK Indications: *The Coolrail® linear pen is a sterile, single use electrosurgery device intended to ablate cardiac tissue using radiofrequency (RF) energy.*

Argentina, Canada, and South Africa Indications: *The Coolrail® linear pen is a sterile, single use electrosurgery device intended to ablate soft tissue using radiofrequency (RF) energy.*

Japan Indications: *This device is intended for use in ablation of cardiac tissue during surgery by use of high-frequency current.*

Hong Kong and U.S. Indications: *The Coolrail® linear pen is a sterile, single use electrosurgery device intended to ablate cardiac tissue during cardiac surgery using radiofrequency (RF) energy.*

AtriClip

Not all lengths and models are available in all countries. Please discuss with your investigator for region specific information.

Argentina, Australia, Belarus, Brazil, Chile, Colombia, EU Region, Hong Kong, Israel, Korea, Kuwait, New Zealand, Panama, Saudi Arabia, Serbia, Singapore, South Africa, Taiwan, UAE, UK Indications: *AtriClip LAA Exclusion System is indicated for open occlusion of the heart's left atrial appendage.*

Canada Indications: *The AtriClip LAA Exclusion System is indicated for the occlusion of the left atrial appendage, under direct visualization, in conjunction with other open cardiac surgical procedures.*

Japan Indications: *This device is intended for the occlusion of a left arterial appendage on cardiovascular surgeries in thoracotomy or thoracoscopic for patients with a risk of thrombosis embolism related to atrial fibrillation and so on.*

US Indications: *The AtriClip LAA Exclusion System is indicated for the exclusion of the heart's left atrial appendage, performed under direct visualization[1] and in conjunction with other cardiac surgical procedures.*

[1]*Direct visualization, in this context, requires that the surgeon is able to see the heart directly, with or without assistance from a camera, endoscope, etc., or other appropriate viewing technologies.*