Hybrid Ablation Versus Repeated Catheter Ablation in Persistent Atrial Fibrillation: A Randomized Controlled Trial

van der Heijden, C.A.J. et al. (2023). JACC: Clinical Electrophysiol, in press

Introduction

Combining thoracoscopic surgical ablation with endocardial catheter ablation (CA) in a single hybrid ablation (HA) procedure has been shown to be feasible and safe when treating patients with persistent atrial fibrillation (persAF).[1] However, directly comparing effectiveness between HA and endocardial CA alone to restore sinus rhythm has not been tested until now. Thus, the aim of the HARTCAP-AF trial was to demonstrate if HA improved freedom from atrial tachyarrhythmias (AT) over CA alone at 12 months, even with permitted repeat CA within 6 months after the index procedure.[2]

Methods

HARTCAP-AF (NCT02441738) was a single-center, prospective, randomized-controlled, open label, unblinded superiority trial designed to evaluate the safety and effectiveness of HA performed in a single stage compared to CA with elective repeat CA, within 6 months, in ablation-naïve patients with persistent and long-standing persistent AF (LSPAF). Primary effectiveness was freedom from any recurrent supraventricular tachyarrhythmia (SVT) episodes ≥5 minutes while off anti-arrhythmic drugs (AAD) as recorded with a 12-lead ECG and 7-day Holter after a 3-month blanking period through 12 months. The primary safety endpoint was a composite of major adverse events and complications occurring within 12 months of follow-up.

In the HA arm, epicardial ablation for pulmonary vein isolation (PVI) and left atrial posterior wall box was performed using the Isolator Synergy clamps and Coolrail pen. In all patients, the left atrial appendage (LAA) was excluded using an AtriClip PRO or PRO2, or LARIAT device. After the surgical portion, endocardial touchup ablation was performed as needed. Repeat ablation was considered a treatment failure in the HA arm if it occurred after a 3-month blanking period.

In the CA arm, the minimal lesion set was endocardial PVI and posterior wall box. Redo ablation within 6 months of the initial procedure was not considered a treatment failure in the CA arm.

Results

Patients (90% PersAF and 10% LSPAF) were enrolled between October 2016 and December 2018 and randomized 1:1 to receive HA (n=19) or CA (N=22).

In the HA group, 14 (74%) and 5 (26%), underwent a left-sided or bilateral approach, respectively. Additional epicardial ablation of the ganglionated plexi was performed in 5 (26%) patients. Among HA participants, 17 (89%) underwent LAA exclusion with AtriClip and 2 (11%) underwent LAA closure with LARIAT. Endocardial touchups were needed to address lesion gaps in 8 (42%) patients. Cavotricuspid isthmus (CTI) ablation was performed in 14 (74%) patients.

In the CA group, PVI silencing was confirmed in all patients and posterior wall box isolation in 20 (91%) patients. Additional CTI was performed in 10 (46%) patients.

At one year, compared to CA, HA patients achieved greater freedom from any SVT episode of more than 5 minutes in duration while off AADs (89% vs 41%, P=0.002) and episodes greater than 30 seconds off AADs (89% vs 36%, P<0.001). See Table. Regardless of AAD use, freedom from AT was significantly higher in the HA group as compared to CA alone (95% vs 41%, P<0.001) at 1 year, while fewer patients in the CA were off AADs at the 12-month timepoint (36% vs 95%, P=0.005). Although redo ablations were permitted in the CA arm within 6 months, none were performed in that timeframe. There was one redo ablation in the HA arm to mitigate AT and atrial flutter. In the CA group, 13 patients experienced AT recurrence for which 5 underwent repeat ablation and 4 underwent cardioversion, where patients successfully returned to sinus rhythm.

Major adverse events and complications did not significantly differ between study arms. In the HA arm, 1 patient had a pericarditis requiring pericardiocentesis. In the CA arm, 1 patient had bleeding from the femoral artery that required surgical intervention. There were no other major complications, such as cardiac tamponade, conversion to sternotomy, strokes, or deaths for both groups. Length of hospital stay was

significantly longer in the HA arm while radiation dose and exposure time were greater in the CA arm. Quality of life (QoL) scores by EQ-5D-5L did not improve over baseline for either group and did not differ between groups.

Table. Outcomes after hybrid ablation and catheter ablation through 12 months

	Hybrid Ablation N=19	Catheter Ablation N=22	P-value
Freedom from any SVT episode ≥ 5 min off AAD	89%	41%	0.002
Freedom from any SVT > 30 sec off AAD	89%	36%	<0.001
Freedom from Class I/III AAD	95%	68%	0.050

AAD=antiarrhythmic drugs; SVT=supraventricular tachycardia

Limitations

- With the exceptions of a 12 lead ECG and 7-day Holter required at the 1-year follow-up, patients in both groups were inconsistently monitored for rhythm throughout follow-up.
- Logistical planning of a redo ablation within 6 months of the index procedure also proved difficult. The authors suggested future trials should consider extending the length of time for repeat ablation.
- Left atrial appendage isolation in the HA group may have also contributed to the significant reduction in AT recurrence.

Key Takeaways

- As compared to CA alone, HA ablation was more effective in reducing rate of AT recurrence in symptomatic de novo ablation patients with PersAF and LSPAF and without increased complications.
- Several key advantages of HA include use of bipolar radiofrequency clamps that may increase the likelihood for achieving transmurality versus unipolar devices typically used in CA. Then, after epicardial ablation, endocardial ablation can be used to target conduction gaps and the mitral or cavotricuspid isthmus without increasing the risk for pacemaker events.
- Overall, the authors recommend HA as first line therapy for this patient profile.

EPi-Sense® Guided Coagulation System
U.S. Indications: *The EPi-Sense Guided Coagulation System is intended for the treatment of symptomatic long-standing persistent atrial fibrillation (continuous atrial fibrillation greater than 12 months duration) when augmented in a hybrid procedure with an endocardial catheter listed in the instructions for use, in patients (1) who are refractory or intolerant to at least one Class I and/or III antiarrhythmic drug (AAD); and (2) in whom the expected benefit from rhythm control outweighs the potential known risks associated with a hybrid procedure such as delayed post-procedure inflammatory pericardial effusions.* ***Contraindications*** *include patients with Barrett's Esophagitis, left atrial thrombus, a systemic infection, active endocarditis, or a localized infection at the surgical site at the time of surgery.* ***Adverse Events:*** *Reported adverse events associated with epicardial ablation procedure may include, but are not limited to, the following: pericardial effusion/cardiac tamponade, pericarditis, excessive bleeding, phrenic nerve injury, stroke/TIA/neurologic complication. Please review the Instructions for Use for a complete listing of contraindications, warnings, precautions and potential adverse events located at the following AtriCure web address: https://www.AtriCure.com/EPi-Sense-Coagulation-Device.* ***Warnings:*** *Physicians should consider post-operative anti-inflammatory medication to decrease the potential for post-operative pericarditis. and/or delayed post-procedure inflammatory pericardial effusions. Physicians should consider post-procedural imaging (i.e. 1-3 weeks post-procedure) for detection of post-procedure inflammatory pericardial effusions.* ***Precautions:*** *Precautionary measures should be taken prior to considering treatment of patients: (1) Deemed to be high risk and who may not tolerate a potential delayed post-procedure inflammatory pericardial effusion. (2) Who may not be compliant with needed follow-ups to identify potential safety risks. To ensure patients undergoing treatment with the EPi-Sense device are well informed, the benefits, potential risks and procedural outcomes associated with the EPi-Sense Hybrid Convergent procedure should be discussed with the patient. Physicians should document accordingly in the medical record. Qualified operators are physicians authorized by their institution to perform surgical sub-xyphoid pericardial access. The coagulation devices should be used by physicians trained in the techniques of minimally invasive endoscopic surgical procedures and in the specific approach to be used. Operators should undergo training on the use of EPi-Sense device before performing the procedure. Safety and effectiveness of concomitant left atrial appendage closure was not evaluated in the CONVERGE study. Follow-up should be conducted at approximately 30 days post-procedure to monitor for signs of delayed onset pericarditis or pericardial effusion.* ***Rx Only.***

Reference:
1. *Pison, L. et al. (2012). J Am Coll Cardiol, 60(1):54-61.*
2. *van der Heijden, C.A.J. et al. (2023). J Am Coll Cardiol, in press.*

Summary written by: *Stacey Neuman, PhD, Scientific Affairs*

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