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## Cryoablation vs Radiofrequency Ablation in Atrial Fibrillation: Results of the latest trials

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### Abstract

In the recent years the importance of atrial fibrillation escalated rapidly. Despite having only 2% occurrence of total population in EU, becomes serious both medical and socioeconomical problem. According to the latest data one percent growth in the next ten years may be observed. There are many complications resulting from this disease such as: all cause deaths, brain strokes, heart failure and burden of health care caused by hospitalisations and lack of life quality. Pharmacological treatment of such disease is based on two strategies: antiarrhythmic drugs and cardioversions or ventricular rhythm control for permanent atrial fibrillation. Aiming at the specific group of patients with paroxysmal or persistent AF (atrial fibrillation) in both groups further invasive treatment should be considered. There are two main invasive treatments of AF – Radio frequency ablation (RF) and cryoballoon ablation (CRYO) as for the left atrium veins isolation. According to the *The Cryo Vs RFA* trial 208 patients underwent randomised clinical trial comparing CRYO, RF and COMBINED

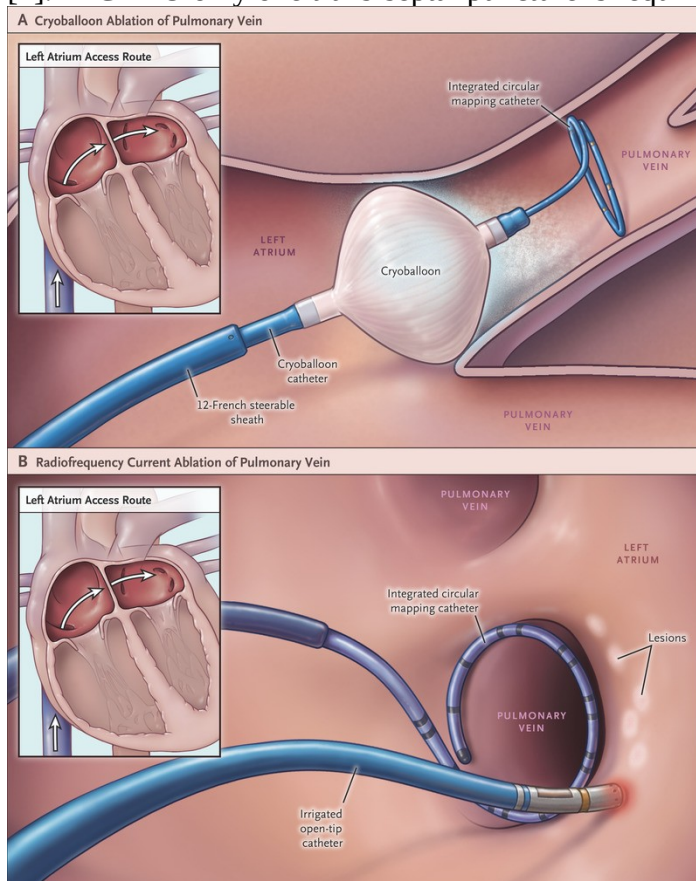
strategy. At 5 years of follow up, 57% of COMBINED patients remained free of AF after a single procedure compared to 47% CRYO and 19% RF patients. CRYO turned out to be superior to RF. Both of techniques combined had a significantly higher ratio of success in a single procedure efficacy.

Aim of this study is to review newest trials comparing both of these techniques.

**Key words:** Atrial Fibrillation, Catheter Ablation, Radio frequency Catheter Ablation, Cryo Balloon Ablation, Pulmonary Vein Reconnection,

## Introduction

Pulmonary venous isolation, remains crucial in invasive AF treatment. The effectiveness of the single procedure in preventing recurrence of AF is 60-80%. Catheter ablation to isolate pulmonary veins (PVs) is an effective treatment for drug-refractory paroxysmal atrial fibrillation (PAF) [1,2]. PV isolation is conventionally achieved using radiofrequency (RF) energy to create transmural point-to-point lesions encircling the veins [1]. This is however time consuming, technically challenging and PV reconnection causing AF recurrence remains a common problem. [2,3]. On the other hand, CRYO approach using cryoballoon for persistent tissue lesions in the pulmonic veins area tend to be associated with lower risk of thermal injury (such as PV stenosis or atrio-oesophageal fistulation.) [4,5]. Furthermore, CRYO procedure is reversal, because of the gentle tissue hypothermia for short time. [6.]. In both strategies circular mapping catheter for electrophysiology study is required [Figure 1], [7]. In CRYO only one trans-septal puncture is required causing less tissue damage. [8.]



[Figure 1] Catheter Ablation Methods. [7].

## Results

According to *The Cryo Vs RFA* trial 203 patients underwent first catheter ablation of PAF were randomized cryoballoon (CRYO n=67), radiofrequency (RF n=67), or combined procedure (COMBINED, n=69). Excluding criteria were: severe left atrium dilatation (>50mm in diameter), severe valvular disease or previous atrial ablation. The study included 3,6 and 12 months follow-up with 7-day ECG Holter recording. All antiarrhythmic drugs were stopped post ablation. The median follow-up duration was 5 years. Primary end point of the study was a success rate following a single procedure without antiarrhythmic drugs. Secondary end point was success rate after one or more procedures.

In the 5 years follow up 57% of COMBINED strategy remained free of AF, 47% CRYO and 19% RF. The COMBINED strategy was superior to both RF and CRYO. [9.] Secondary end point results: 54% RF (mean 1.7), 49% CRYO (mean 1.7), 23% COMBINED (mean 1.3) of patients underwent one or more procedures. At the last procedure, (15%) in the CRYO, (11%) in the RF and (38%) in the COMBINED group had no reconnected PVs. [10.] Moreover Xu et al. [9] reported the outcomes from a metaanalysis of 1,104 patients from published studies, who underwent AF ablation using the cryoballoon (n=469) or RF (n=635). They found cryoablation to be associated with a significantly shorter procedure time (by a weighted mean of 30 min) and fluoroscopy exposure (by a weighted mean of 14 min), whereas ablation time was no significantly longer with cryoablation (by a weighted mean of 12 min). Moreover, cryoablation was also found to be associated with a higher rate of long-term success as compared with RF.

On the other hand, safety of both procedures remains similar. Most common complications are: groin complications, bleeding, thromboembolism, pericardial effusion, gastroparesis, and extraoesophageal fistula. [11.] Persistent iatrogenic atrial septal defect (IASD) may occur more severe with CRYO due to the use of the larger, 15-French transseptal sheath whereas smaller transseptal sheath for RF is generally used for performing the ablation. [12.] Both procedures require left atrium imaging before ablation. Some studies show that computer tomography (CT), magnetic resonance imaging or periprocedural fluoroscopy may be used for venous ostium imaging before procedure. [4, 13]. Because of the technical issues standard trans oesophageal echocardiography (TEE) is recommended for both RF and CRYO. [14]

## Conclusion

Despite all pharmacological methods of AF treatment, ablation of arrhythmia seems to play a key role in further therapy. Over the past year's ablation techniques improved by using more advanced catheters and cryoballoons. Among classical point-by-point RF ablation, CRYO seems to have overall better results. First of all, long-term safety (time without AF recurrence), gentler tissue damage, shorter procedure time and higher effectiveness of single procedure. Despite advantage in procedure reversal CRYO causes more serious complications such as thromboembolisms, bleeding, or oesophageal rupture. According to the newest data combined strategy should be performed for a highest therapy effectiveness. This trial proved that the 5-year outcome following a single catheter ablation procedure for PAF using a combined approach of RF followed by cryoballoon ablation is superior to each of techniques alone. Further examinations with longer follow-up and different indications for CRYO and COMBINED therapies should take place in the future.

## References

1. Natale Andrea, Raviele Antonio, et al. Verma Atul. Venice Chart international consensus document on atrial fibrillation ablation. J. Cardiovasc. Electrophysiol. 2007 May;18 (5):560–80

2. Arbelo Elena, Brugada Josep, et al. The atrial fibrillation ablation pilot study: a European Survey on Methodology and results of catheter ablation for atrial fibrillation conducted by the European Heart Rhythm Association. *Eur. Heart J.* 2014 Jun 07;35 (22):1466–78
3. Rajappan Kim, Kistler Peter M, et al. Acute and chronic pulmonary vein reconnection after atrial fibrillation ablation: a prospective characterization of anatomical sites. *Pacing Clin Electrophysiol.* 2008 Dec;31 (12):1598–605.
4. Kojodjojo Pipin, O'Neill Mark D, et al. Pulmonary venous isolation by antral ablation with a large cryoballoon for treatment of paroxysmal and persistent atrial fibrillation: medium-term outcomes and non-randomised comparison with pulmonary venous isolation by radiofrequency ablation. *Heart.* 2010 Sep;96 (17):1379–84.
5. Khairy P, Dubuc M. Transcatheter cryoablation part I: preclinical experience. *Pacing Clin Electrophysiol* 2008; 31:112–20.
6. Tse HF, Reek S, Timmermans C, et al. Pulmonary vein isolation using transvenous catheter cryoablation for treatment of atrial fibrillation without risk of pulmonary vein stenosis. *J Am Coll Cardiol* 2003; 42:752–8.
7. Karl-Heinz Kuck, Josep Brugada, et al. Cryoballoon or Radiofrequency Ablation for Paroxysmal Atrial Fibrillation *N Engl J Med* 2016; 374:2235-2245, Figure Catheter Ablation Methods.
8. Wong T, Markides V, Peters NS, et al. Percutaneous pulmonary vein cryoablation to treat atrial fibrillation. *J Interv Card Electrophysiol* 2004; 11:117–26
9. R A, Rj H, Wy L, et al. Long Term Outcome and Pulmonary Vein Reconnection of Patients Undergoing Cryoablation and/or Radiofrequency Ablation: Results from The Cryo Versus RF Trial. *J Atr Fibrillation.* 2018;11(3):2072. Published 2018 Oct 31. doi:10.4022/jafib.2072
10. Xu J, Huang Y, et al. cryoballoon ablation preferable to radiofrequency ablation for treatment of atrial fibrillation by pulmonary vein isolation? A meta-analysis. *PLoS One.* 2014; 9(2):e90323
11. Gian Battista Chierchia, Lucio Capulzini et al. Pericardial effusion in atrial fibrillation ablation: a comparison between cryoballoon and radiofrequency pulmonary vein isolation, *EP Europace*, Volume 12, Issue 3, March 2010, Pages 337–341
12. Ngai-Yin Chan, Chi-Chung Choy, et al. Persistent iatrogenic atrial septal defect after pulmonary vein isolation by cryoballoon: an under-recognized complication, *EP Europace*, Volume 13, Issue 10, October 2011, Pages 1406–1410,
13. Wong T, Markides V, Peters NS, et al. Percutaneous pulmonary vein cryoablation to treat atrial fibrillation. *J Interv Card Electrophysiol* 2004; 11:117–26
14. Kirchhof P, Benussi S, Kotecha D, et al.. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. *Europace.* 2016 Nov;18(11):1609-1678.