

Atrial Fibrillation Ablation: Burn or Freeze?

Ablación de fibrilación auricular: ¿quemar o congelar?

EMILCE TRUCCO¹, LLUÍS MONT²

The main objective of atrial fibrillation (AF) ablation is to improve symptoms and quality of life. However, the presence of short-term recurrence in approximately 30% of patients and the possibility of severe complications limits its use. (1) In recent years, attempts have been made to introduce new and simpler learning techniques to achieve more reproducible results and with lower complication potential. The cryoballoon ablation technique was developed for this purpose. (2)

Cryo balloon ablation (CBA) has been proven effective in paroxysmal AF (PAF); however its efficacy in patients with persistent AF is being evaluated. Probably, patients with long standing persistent AF (more than 1 year evolution) are not good candidates given the existence of intense atrial dilatation and remodeling. (3)

We have read with interest the articles of Orosco et al. (4) and Gonzalez et al. (5) who conclude that in their initial experience CBA is a safe and effective technique, with high acute success rate and low PAF recurrence.

The work of Orosco et al (4) is an observational study describing the initial CBA experience with 28 mm Artic Front® cryoballoon (Medtronic, Inc) performed between 2013-2015 in the first 100 patients with FAP, excluding patients with persistent AF, heart disease or severe comorbidities. The procedures were performed under general anesthesia, with intracardiac echocardiography and intraesophageal temperature monitoring. Procedure duration and fluoroscopy time were short (mean: 78 and 20 minutes, respectively) and the immediate success rate was of 100%, with just one case of transient phrenic nerve paralysis. The first cases were performed with first-generation catheters and 64% with second-generation catheters. After 6-month follow-up performed in 72% of patients, AF-free rate was 81.9%.

The study of González et al. (5) aims to discuss the immediate results of the first 23 CBA at a single center performed between 2013 and 2015 in patients

with symptomatic PAF refractory to at least one antiarrhythmic drug, and with normal size left atrium. Pre-procedure CT angiography was done to exclude patients with unfavorable anatomy. The procedure was carried out under general anesthesia with invasive blood pressure control and intraesophageal temperature monitoring. Transseptal puncture was guided by fluoroscopy. It was possible to isolate the pulmonary veins in 97.8% of cases and after 9 months of follow-up 91% of patients remained in sinus rhythm assessed by 48-hour Holter monitoring. There was only one temporary phrenic nerve paralysis complication. The average duration of the procedure was 169 minutes and fluoroscopy time was 39 minutes.

Remarkably, high effectiveness, short procedure times and low number of complications were observed in both studies. Several groups have reported approximately 60% success in patients with FAP using this technique. (3, 6) The Packer et al.(3) study evaluated the safety and effectiveness of this new technology compared with medical treatment in 245 patients with PAF whose mean CHADS2 score was 0.6. Mean age was 56 years and 77% of patients were men, 163 of whom were randomized to cryo ablation therapy. In this study long-term effectiveness was 69.9% after 12-month follow-up. Mean fluoroscopy exposure time was 63 min, which is typical in the early stages of the learning curve; with increased operator experience, the duration of the procedure and fluoroscopic exposure decrease. Other studies, as the one reported by Chung et al, (7) describe an acute 98% success in pulmonary vein isolation with CBA; during mean follow-up of 270 days, 70% of patients remained in sinus rhythm. The remarkable high success and low complication rate reported, including the learning curve, reinforce the concept that CBA is a simpler procedure with a faster learning curve than radiofrequency ablation (RF). (8) Moreover, the occurrence of adverse effects appears to be equivalent to that of RF ablation.

Rev Argent Cardiol 2015;83:388-389. <http://dx.doi.org/10.7775/rac.v83.i5.7264>

SEE RELATED ARTICLE: Rev Argent Cardiol 2015;83:429-433. <http://dx.doi.org/10.7775/rac.v83.i5.6806>

SEE RELATED ARTICLE: Rev Argent Cardiol 2015;83:424-428. <http://dx.doi.org/10.7775/rac.v83.i5.6234>

Address for reprints: Dr. Lluís Mont - Hospital Clínic, Universitat de Barcelona - Sección de Arritmias, Servicio de Cardiología - C/ Villarroel, 170 - 08036 Barcelona - Catalonia (España) - e-mail: lmont@clinic.ub.es

¹ Arrhythmia Section, Department of Cardiology - Hospital Clínic, Universitat de Barcelona

² Chief of the Arrhythmia Section, Department of Cardiology - Hospital Clínic, Universitat de Barcelona

For example, the STOP AF study reported 32 complications (14.2%) in the CBA group, 24 of which were transient phrenic nerve paralyses. (3) However, more recent series show very infrequent phrenic nerve paralysis using the larger diameter balloon (28 mm) and implementing careful monitoring of phrenic nerve capture during application in the right pulmonary veins. Furthermore, the use of continuous control of intraesophageal temperature is currently recommended. (9)

In the STOP-AF study, acute pulmonary vein isolation was close to 100% applying 300-second freeze cycles. (3) However, the long-term success after a single procedure was 62% and increased to 77% after multiple procedures. (6, 10) The addition of two freeze cycles neither provided significant improvements. (11) The second-generation balloon was then introduced to improve the first-generation limitations. Regardless of their identical external shape, the cooling system located in a more distal portion allows homogeneous and complete freezing. This new design led to recommend shorter freezing cycles of 240 seconds, improving the verification range of pulmonary vein isolation from 49% to 76%. (12) However, subsequent studies reported up to 19% significant increase of phrenic nerve paralysis, (13-14) which again calls for restraint when applying new technologies.

Although cryo ablation seems a very promising technique, its positioning in the near future will depend on the results of randomized studies such as the FIRE AND ICE, a prospective, multicenter, randomized European study which has already completed its enrolment. (15)

Conflicts of interest

None declared.

(See authors' conflicts of interest forms in the website/Supplementary material).

REFERENCES

1. Wokhlu A, Monahan KH, Hodge DO, Asirvatham SJ, Friedman PA, Munger TM, et al. Long-term quality of life after ablation of atrial fibrillation: the impact of recurrence, symptom relief, and placebo effect. *J Am Coll Cardiol* 2010;55:2308-16. <http://doi.org/dpz4rv>
2. Camm AJ, Lip GY, De Caterina R, Savelieva I, Atar D, Hohnloser SH, et al. 2012 focused update of the ESC guidelines for the management of atrial fibrillation: an update of the 2010 ESC guidelines for the management of atrial fibrillation. Developed with the special contribution of the European Heart Rhythm Association. *Europace* 2012;14:1385-413. <http://doi.org/f2z436>
3. Packer DL, Kowal RC, Wheelan KR, Irwin JM, Champagne J, Guerra PG, et al. Cryoballoon ablation of pulmonary veins for paroxysmal atrial fibrillation: first results of the North American Arctic Front (STOP AF) Pivotal Trial. *J Am Coll Cardiol* 2013;61:1713-23. <http://doi.org/f2m68n>
4. Orosco A, Giniger A, Albina G, Rivera S, Vergara JM, Fontinier V et al. Preliminary Experience with Cryoballoon Ablation in Paroxysmal Atrial Fibrillation: 100-case series. *Rev Argent Cardiol* 2015;83:429-33
5. González JL, Galizio N, Palazzo AA, Robles F, Carnero G, Mysuta M. Balloon Cryoablation for Paroxysmal Atrial Fibrillation. Initial Experience. *Rev Argent Cardiol* 2015;83:424-8
6. Vogt J, Heintze J, Gutleben KJ, Muntean B, Horstkotte D, Nölker G. Long-term outcomes after cryoballoon pulmonary vein isolation: results from a prospective study in 605 patients. *J Am Coll Cardiol* 2013;61:1707-12. <http://doi.org/f2m68k>
7. Chun KRJ, Schmidt B, Metzner A, Tilz R, Zerm T, Köster I, et al. The 'single big cryoballoon' technique for acute pulmonary vein isolation in patients with paroxysmal atrial fibrillation: a prospective observational single centre study. *Eur Heart J* 2009;30:699-709. <http://doi.org/fvh2df>
8. Neumann T, Vogt J, Schumacher B, Dorszewski A, Kuniss M, Neuser H, et al. Circumferential pulmonary vein isolation with the cryoballoon technique: results from a prospective 3-center study. *J Am Coll Cardiol* 2008;52:273-8. <http://doi.org/dt6dpq>
9. Metzner A, Burchard A, Wohlmuth P, Rausch P, Bardyszewski A, Gienapp C, et al. Increased incidence of esophageal thermal lesions using the second-generation 28-mm cryoballoon. *Circ Arrhythm Electrophysiol* 2013;6:769-75. <http://doi.org/75d>
10. Neumann T, Wójcik M, Berkowitsch A, Erkapic D, Zaltsberg S, Greiss H, et al. Cryoballoon ablation of paroxysmal atrial fibrillation: 5-year outcome after single procedure and predictors of success. *Europace* 2013;15:1143-9. <http://doi.org/75f>
11. Chun KR, Füllkrantz A, Köster I, Metzner A, Tönnis T, Wohlmuth P, et al. Two versus one repeat freeze-thaw cycle(s) after cryoballoon pulmonary vein isolation: the Alster extra pilot study. *J Cardiovasc Electrophysiol* 2012;23:814-9. <http://doi.org/75g>
12. Füllkrantz A1, Bordignon S, Schmidt B, Gunawardene M, Schulte-Hahn B, Urban V, et al. Improved procedural efficacy of pulmonary vein isolation using the novel second-generation cryoballoon. *J Cardiovasc Electrophysiol* 2013;24:492-7. <http://doi.org/75h>
13. Casado-Arroyo R, Chierchia GB, Conte G, Levinstein M, Sieira J, Rodríguez-Manero M, et al. Phrenic nerve paralysis during cryoballoon ablation for atrial fibrillation: a comparison between the first- and second-generation balloon. *Heart Rhythm* 2013;10:1318-24. <http://doi.org/578>
14. Chierchia GB, Di Giovanni G, Sieira-Moret J, de Asmundis C, Conte G, Rodríguez-Manero M, et al. Initial experience of three-minute freeze cycles using the second-generation cryoballoon ablation: acute and short-term procedural outcomes. *J Interv Card Electrophysiol* 2014;39:145-51. <http://doi.org/75j>
15. Füllkrantz A, Brugada J, Albenque JP, Tondo C, Bestehorn K, Wegscheider K, et al. Rationale and Design of FIRE AND ICE: A multicenter randomized trial comparing efficacy and safety of pulmonary vein isolation using a cryoballoon versus radiofrequency ablation with 3D-reconstruction. *J Cardiovasc Electrophysiol* 2014;25:1314-20. <http://doi.org/75k>