

Long-term success and complications in antral isolation of pulmonary veins using the cryoballoon in predominantly paroxysmal atrial fibrillation

J. Vogt¹, J. Heintze¹, D. Horstkotte¹

¹Cardiological Clinic, NRW Heart and Diabetes Center, Ruhr University in Bochum, Bad Oeynhausen;

Background: In an RF ablation of atrial fibrillation (AF) that is refractory to medication, a circumferential substrate modification of the lung vein antrum is superior to segmental isolation but is also associated with a risk of lung vein (PV) stenoses and esophageal/left-atrial fistulas. This study reports on the long-term success and complications of cryo-isolation of the ostia and parts of the antrum of the PV using the cryoballoon.

Methods: The isolation is performed using the 28- or 23-mm balloon (Arctic Front, Cryocath, Canada), depending on the PV diameter. By inflating the over-the-wire balloon using laughing gas, the venous ostium and parts of the PV antrum are occluded. To each PV, 2 cryoimpulses (CI) are applied for 6 minutes (min) (temperature -35 to -75 °C). Residual currents registered by means of Lasso mapping are ablated using additional CI or a touch-up technique (Freezor max, Cryocath Canada).

Results: We treated 251 patients (P), 79 women, average age 59±10 years, 233 with paroxysmal, 18 with persistent AF, left atrium 43±5 mm, 118 with lone AF, 93 with hypertension, 40 with mild structural heart disease. In 2.4±1.2 CI, we were able to isolate all PV using the balloon (B) in 201 P (80), in 20% in addition with touch-up. In the last 145 P, all veins were only isolated using the B, in 44% using a combination of both B-diameters. The procedural time is now 164±31 min, the x-ray load 26 ±7 min. We observed as complications an n. phrenicus paralysis in 3%, 8 P (7 with the 23-mm B) with recovery of function after 3-9 months. Damage was completely avoided by means of stimulation control during the CI. In 5 patients, we observed reversible coughs, short-term hemoptyses and edemas around individual PV due to co-freezing lung tissue. In an average follow-up of 8.5 ± 6 months and 1.1 percent/P (23 redos), 136 P (81%) of 168 P were subjectively and in a serial 7-day long-term ECG free of AF, after a procedure 72% were, and in P with common ostium 85% were. PV stenoses or esophagus damage was not observed. In additional interventions, it was necessary to perform 4 groin revisions, 2 left-atrial substrate modifications and 7 later ablations of typical atrial flutter.

Conclusion: Antral cryoballoon isolation of the PV is highly effective over the long-term. It was possible to minimize phrenicus paralysis by means of stimulation monitoring. Freezing of lung tissue can result in hemoptyses, coughing and peri-PV edemas/hematomas. Therefore, placing a balloon in the veins should be avoided. Early cryotherapy can be used safely and preventatively as first-line therapy.

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