

EP CASE REPORT

Permanent phrenic paralysis after cryoablation of atrial fibrillation

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Introduction

Pulmonary vein isolation performed with cryoablation by second-generation cryoballoons (CBs) is a highly effective procedure used in patients with atrial fibrillation who are non-responders to medical treatment.¹ Transient or persistent phrenic nerve paralysis (PNP) is the most common complication observed during the procedures (7–9%).² This complication is more frequently reported with the use of second-generation balloons (Arctic front advance) compared to those of first generation due to the different characteristics which enable the balloon to enter and freeze more deeply in the vein.

Phrenic nerve paralysis during ablation can be prevented by shorter application in the veins and by careful assessment of diaphragmatic function during ablation.

Case report

We present the case of a 63-year-old woman with a history of hypertension and symptomatic paroxysmal atrial fibrillation not responding to medical treatment with Class IC antiarrhythmic drugs. Structural cardiac disease was ruled out with computed tomography scan angiography and echocardiogram. A mild enlargement of the left atrium was observed. A cryoablation procedure was programmed in order to control symptoms. A chest X-ray performed 1 month prior to the procedure showed no alterations (*Figure 1A*). Computed tomography vein angiography showed two independent ostia in the right pulmonary veins (RPVs) and one anatomical variation consisting in a common left trunk. Cryotherapy was applied four times in the ostium of the common left pulmonary vein to achieve bi-directional electrical block, followed by two more applications in the ostium of the right superior (RSPV) and inferior veins under right phrenic nerve stimulation to ensure safety. A lack of diaphragmatic movement was detected after stimulation during cryoablation in the ostium of the RSPV, and the procedure was immediately discontinued. Ablation time and minimum temperature in both applications on the RSPV were 240 s/−41°C and 140 s/−51°C. Bidirectional conduction block was also demonstrated in the RPVs. Prior to discharge, right PNP was confirmed on chest X-ray showing a notable elevation of the corresponding hemidiaphragm, the follow-up at 3 months showed persistence of the paralysis, and the patient referred moderate dyspnoea. Spirometry at this time indicated a moderate restrictive ventilatory alteration attributable to persistent phrenic nerve palsy. Phrenic nerve paralysis was considered permanent after the follow-up evaluation at 76 months showing an absence of significant clinical and radiographic improvement (*Figure 1B*). Although PNP is the most frequent complication of pulmonary vein cryoablation, it often resolves within the first hours after the procedure. Only 4% of cases persist at discharge, and 78% resolve within 3

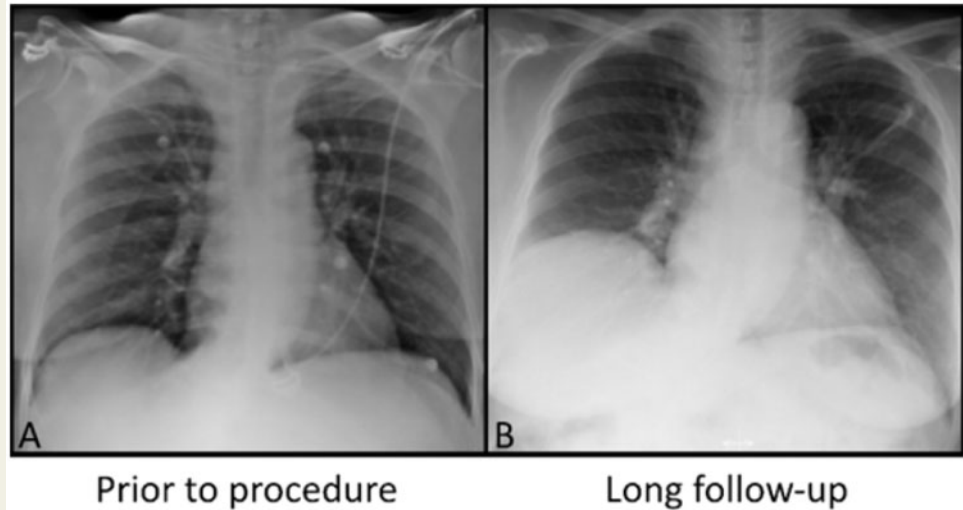


Figure 1 (A) Chest X-ray prior to ablation procedure. (B) Chest X-ray 76 months after cryoablation with persistence of right diaphragmatic elevation.

months.³ To our knowledge, this is the most prolonged persistence of PNP, lasting for more than 6 years. This case report might raise the hypothesis that very late recovery of phrenic nerve palsy after CB ablation is unlikely.

Conflict of interest: Dr Mont reports honoraries as consultant, lecturer and Advisory board from Boston Scientific, Abbott Medical, Johnson & Johnson, Biotronik and Medtronic; He is a shareholder of Galgo Medical SL.

References

1. Kuck KH, Brugada J, Fürnkranz A, Metzner A, Ouyang F, Chun KR et al. FIRE AND ICE Investigators. Cryoballoon or radiofrequency ablation for paroxysmal atrial fibrillation. *N Engl J Med* 2016;**374**:2235–45.
2. Casado-Arroyo R, Chierchia G, Conte G, Levinstein M, Juan S, Brugada P 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.
3. Saitoh Y, Irfan G, Ciconte G, Mugnai G, Sieira J, Brugada P et al. Persistence of phrenic nerve palsy following 28-mm cryoballoon ablation: a four-year single center experience. *Pacing Clin Electrophysiol* 2015;**38**:807–14.