

Intrapulmonary haemorrhage during pulsed field ablation

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Two 55- and 76-year-old men were referred for ablation of paroxysmal atrial fibrillation. One had undergone previous cryoablation 4 years before.

Pulsed-field ablation (PFA) of the four pulmonary veins was performed under general anaesthesia and fluoroscopy. No intracardiac echography was used. Patients were intubated and ventilated. Heparin was administered shortly after the transseptal puncture and throughout the procedure when needed (total 10 000 UI in each patient, ACTs between 240 and 280 s). A stiff angled-shaped 0.035 guidewire (Radifocus[®], Terumo Corp., Tokyo, Japan, see figure) was used for positioning the Farawave catheter at the ostium of each of the pulmonary veins once pushed more distally in the vein.

During the otherwise unremarkable procedures, some arterial blood was visualized into the pipes of the ventilation system. Since all pulmonary veins were on the way to being disconnected at this time, the procedure was achieved. The haemoptysis stopped once heparin was reversed by protamin.

A thoracic CT scan performed immediately after the procedure revealed intrapulmonary haemorrhage in the left superior pulmonary lung from both patients (Panel 1).

Oral anticoagulation (apixaban and rivaroxaban) was transiently interrupted for 24 h (one case with subcutaneous heparin in-between) then therapy was resumed. Asymptomatic patients were discharged with oral anticoagulation 1- and 3 days after the procedure. A control thoracic CT scan was performed 1 month later in each patient, showing full regression of the initial images.

Both cases highlight a novel potential serious complication occurring over the course of PFA. In both cases, a relevant haemoptysis occurred which was probably not related to the pulsed-field energy or PFA material itself, but more likely to the use of the guidewire. Non-J-tip stiff guidewires may possibly have injured the distal pulmonary vein vasculature and penetrated the pulmonary alveoli. The tissue selectivity of PFA¹ makes vasculature injury by pulsed-field energy very unlikely. The level of anticoagulation needed in ablation procedures has probably helped in revealing this haemorrhage.

Haemoptysis may occur in 3.5% after cryoablation but is mainly delayed and mild, attributed to direct inadvertent bronchial cryolesions. While mild pulmonary haemorrhage was noted in left superior pulmonary lobes in some animals using radio-frequency (RF),² only exceptional acute or delayed cases have been reported after RF ablation in humans, suspected to be caused by mechanical ventilation, lung injury related to anaesthetic agents or upper respiratory obstruction during extubation. While only one case out of 1758 patients was reported in a recent registry about PFA,³ multiple small blood clots were observed in 40% of patients during bronchoscopy (oral communication DGK meeting 2021).

Fortunately, this did not translate into late and irreversible lesions in our cases, although patent intrapulmonary haemorrhages were seen on the initial CT scan. Even if we cannot demonstrate that the non-J-tip guidewire was directly responsible for such a perforation and pulmonary injury, the use of a J-tip guidewire only is probably safer for the future.

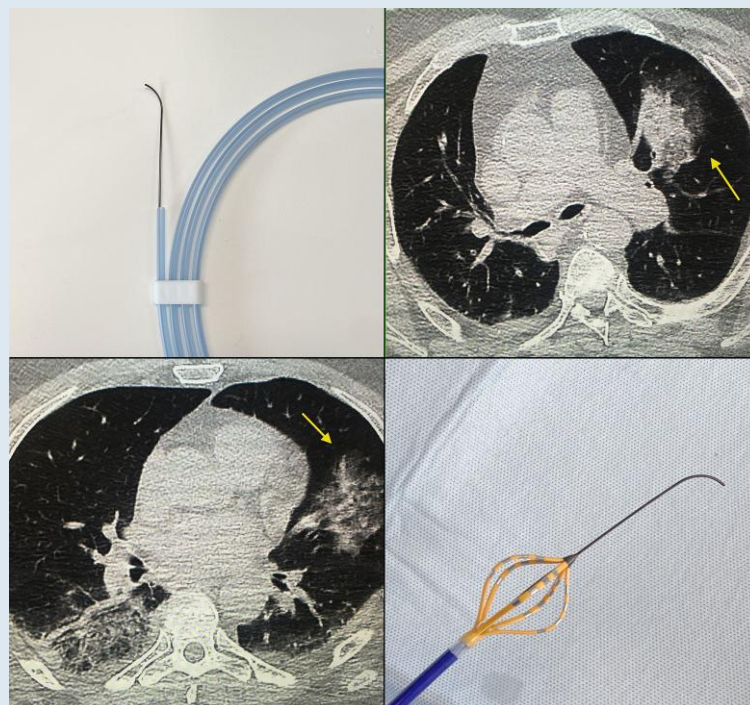
Conflict of interest: None declared.

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Panel 1 acute thoracic CT scan showing hemorrhage in the left superior pulmonary lung in each case (arrows). Tip of the stiff angled-shaped 0.035 guidewire used in both procedures.