

# Pulsed field ablation for complex variant pulmonary vein and posterior wall isolation using the Varipulse catheter: a case report

Sebastian E. Beyer \*, Moneeb Khalaph, Thomas Fink, and Christian Sohns 

Clinic for Electrophysiology, Herz- und Diabeteszentrum NRW, Universitätsklinikum der Ruhr-Universität Bochum, Medizinische Fakultät OWL der Universität Bielefeld, Georgstr. 11, Bad Oeynhausen 32545, Germany

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**ESC curriculum** 2.1 Imaging modalities • 2.4 Cardiac computed tomography • 5.3 Atrial fibrillation

## Case description

A 65-year-old male patient with paroxysmal atrial fibrillation (AF) was admitted to our hospital for pulmonary vein isolation (PVI). Computed tomography (*Figure 1A and B*) showed the inferior pulmonary veins (PVs) joining posterior to the left atrium, forming a variant ‘common inferior ostium’. The common ostium measured 6.8 cm × 3.7 cm. 3D mapping (*Figure 1C and D*) with a multielectrode catheter revealed areas of low voltage (<0.5 mV) related to the ‘common ostium’ affecting the posterior wall. The patient underwent pulsed field ablation (PFA)–guided PVI and posterior wall isolation (PWI) using the Varipulse catheter. Each PV was isolated separately with four ablation cycles consisting of three PFA applications. Afterwards, we performed PWI with two additional ablation cycles (2 × 3 applications) (*Figure 1E*). Re-mapping using a high-density mapping catheter demonstrated isolated PVs and an isolated posterior wall (*Figure 1F*). No complications occurred during or after the procedure. At 2.5 months post ablation, the patient has not experienced any symptomatic recurrences of AF.

Pulmonary venous anatomy is known to vary.<sup>1</sup> Prior reports have linked anatomical variations to a reduction in acute success and an increase in AF recurrence following AF ablation.<sup>2</sup> Studies describing the

use of thermal ablation in patients with a common ostium of the inferior PVs have shown that extensive ablation with substrate modification and PWI is often required.<sup>3,4</sup> This can be especially problematic given the close proximity of the oesophagus to the inferior PVs. Among 18 patients with a common ostium of the inferior PVs, close contact (<5 mm) with the oesophagus was seen in almost 50% of patients.<sup>5</sup> Additional challenges specific to ablation using cryoballoon include an oval ostium and a larger frontal angle of the inferior PVs.<sup>5</sup> The use of PFA has the potential to contribute to increased safety in patients with a common ostium of the inferior PVs, likely avoiding the risk of oesophageal injury if extensive substrate modification and PWI are required. For PFA using the Varipulse catheter, it has been suggested to perform segmental isolation and apply twice the number of ablations if the common ostium is large.<sup>6</sup> However, acute success rate and risk of AF recurrence in patients with variant PV anatomy are unknown. In our case, additional ablation cycles were necessary to isolate the region between the segmentally isolated right and left inferior PVs. Further, this report highlights the benefit of pre-procedural 3D imaging to identify anatomical variations and help individualize treatment, considering that the common ostium of the inferior PVs has been linked to the location of ectopic foci in AF<sup>3</sup> and given the frequently associated low-voltage areas observed in our as well as prior reports.<sup>4</sup>

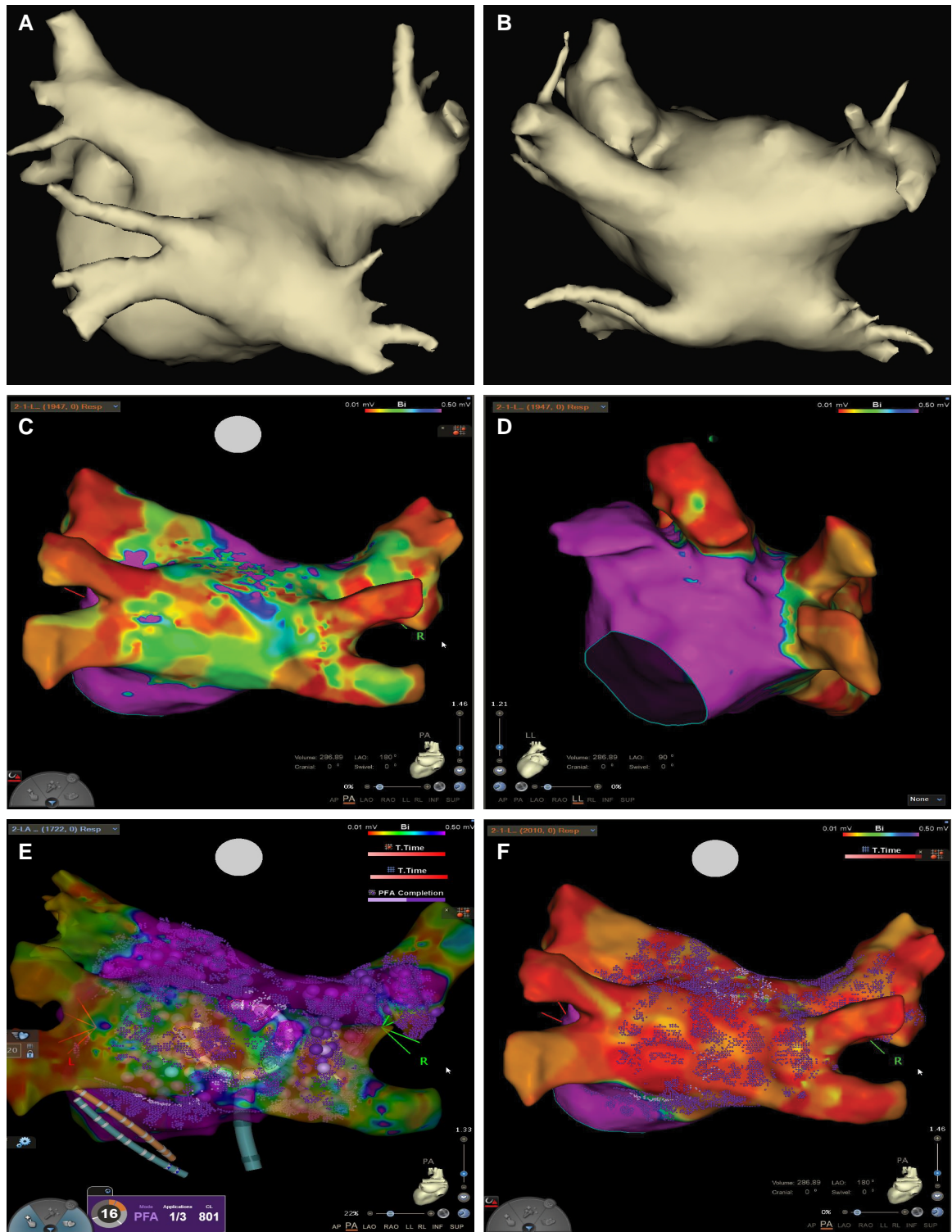
\* Corresponding author. Tel: +49 5731 97 1521, Email: [sbeyer@hdz-nrw.de](mailto:sbeyer@hdz-nrw.de)

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**Figure 1** Posterior-anterior (A) and superior (B) computed tomography-based 3D reconstruction of the pulmonary veins. The inferior pulmonary veins join posterior to the left atrium, forming a ‘common inferior ostium’. (C) Posterior-anterior (C) and left-lateral (D) voltage mapping prior to catheter ablation of the left atrium. Confluent areas of low voltage ( $<0.5$  mV) are seen along the ‘common ostium’ and the posterior wall. (E) Posterior-anterior view of the left atrium showing the ostial pulsed field ablation lesions as well as the Varipulse catheter oriented towards the ‘common ostium’. (F) Posterior-anterior view of the left atrium showing the voltage map together with the ablation grids (in purple) following ablation. There is an absence ( $<0.01$  mV) of local signals in the posterior wall in addition to the pulmonary vein ostia.

**Consent:** The authors confirm that written consent for submission and publication of this case has been obtained from the patient in line with the Committee on Publication Ethics (COPE) guidelines.

**Conflict of interest.** None declared.

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## Data availability

The original data are available from the authors upon reasonable request.

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