

LETTERS TO THE EDITOR

To the Editor—Pulsed field ablation and phrenic nerve function: How safe is it?



We read with great interest the recent publication by Franceschi and colleagues entitled “First electromyographic monitoring of a progressive phrenic nerve palsy in a pulsed field ablation procedure.”¹ Pulsed field ablation (PFA) is a novel, nonthermal, energy allowing efficient and safe pulmonary vein isolation. However, alterations of phrenic nerve (PN) function (transient, ie, “stunning”; or persistent, ie, “palsy”) have been reported previously.² In their case report, Franceschi and colleagues¹ specifically evaluated right PN function using compound motor action potential monitoring during PFA-based pulmonary vein isolation. The authors observed a progressive dose-effect relationship between the number of PFA applications and both the intensity and the duration of PN stunning. Importantly, no PN palsy was observed at the end of the procedure.

Catheter ablation of ectopic beats triggering atrial fibrillation and originating from the superior vena cava has been hypothesized to improve atrial fibrillation catheter ablation efficacy,³ but with a risk of collateral damage of the right PN.⁴ We recently published our experience regarding successful PFA-based superior vena cava isolation in 105 patients.⁵ Using compound motor action potential monitoring, we also found that 64% of patients experienced PN stunning, with a similar dose-effect relationship as described by Franceschi and colleagues.¹ However, there was no evidence of PN palsy at the end of the procedure, even though minimal residual stunning could still be present. In conclusion, our study as well as previous animal data support a good safety profile of PFA regarding PN function, but dedicated studies using systematic monitoring of PN and/or diaphragmatic function are needed.

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Reply to the Editor—Pulsed field ablation and phrenic nerve function: How safe is it?



Phrenic nerve palsy (PNP) is a complication of pulsed field ablation (PFA),¹ but its true incidence remains unknown, as diaphragmatic monitoring has never been studied on a large scale. It can be hypothesized that several mechanisms may be involved—electrical if PNP are transient, or traumatic if they are persistent. Dr Ollitrault considers his recent publication² reassuring. However, his study has several major limitations concerning phrenic nerve monitoring:

- (1) Stimulation of the phrenic nerve is, surprisingly, performed with the pentaspline catheter, which is not designed for it. Moreover, the method is not detailed. The risk is to stimulate the nerve unreliably or below the conduction block level and thus underestimate the incidence of PNP.
- (2) Compound motor action potential (CMAP) values are not reported in the study. The authors defined PN stunning as a drop in CMAP amplitude >30%. This threshold is arbitrary, in the absence of published data on CMAP monitoring in PFA procedures. Incomplete CMAP recovery is probably not trivial, as CMAP amplitude reflects the number of diaphragmatic fibers that depolarize. For example, is the fact that 25% of fibers no longer depolarize after a PFA procedure a fact that should not be taken into account? What are the long-term consequences?
- (3) Chest radiography was performed in 20 patients, meaning probably only 12 patients with PN stunning. This figure is far too low. Moreover, chest radiographs can be falsely reassuring,³ and dynamic examinations (ultrasound or fluoroscopic sniff test) should be preferred.
- (4) Finally, applications in the superior vena cava are parallel to the phrenic nerve, unlike applications in the right pulmonary veins, which are perpendicular to the nerve. Assuming a traumatic mechanism, perpendicular applications should be more deleterious.

Under these conditions, no conclusions should be drawn from this study³ regarding the incidence of PNP in pulmonary vein isolation with PFA. It is imperative to remain vigilant, as PNP is undoubtedly a complication of PFA.¹ Diaphragmatic monitoring should be recommended to operators until further notice.