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Acute systemic inflammatory response across three pulsed field ablation systems for atrial fibrillation

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Introduction: Pulsed field ablation (PFA) is a novel non-thermal ablation modality based on irreversible electroporation, offering enhanced myocardial tissue selectivity in atrial fibrillation (AF) ablation[1]. PFA may elicit different systemic inflammatory and myocardial injury responses compared with thermal procedures[2]. This study aimed to compare periprocedural inflammatory response and myocardial injury among three PFA systems: VARIPULSE, PULSESELECT and FARAPULSE.

Patients and Methods: This single-center retrospective registry included patients with paroxysmal or persistent AF undergoing first-time PFA between April 2023 and January 2025. Venous blood samples were collected at admission and on the morning after the procedure. Biomarkers assessed before and after ablation included systemic immune-inflammation index (SII), systemic inflammation response index (SIRI), aggregate index of systemic inflammation (AISI), neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), monocyte-to-lymphocyte ratio (MLR), inflammation score (INFLA), C-reactive protein (CRP) and high-sensitivity troponin I (hsTnI).

Results: A total of 103 patients were included (median age 63 years, IQR 55–69; 68% male; 58% with paroxysmal AF), of whom 29 underwent ablation with VARIPULSE, 27 with PULSESELECT, and 47 with FARAPULSE (**Table 1**). Baseline characteristics, including heart failure, diabetes mellitus, previous myocardial infarction and chronic kidney disease, did not differ significantly among groups. Overall, 77% received class I or III antiarrhythmic drugs and 95% received beta-blockers. Following PFA, significant increases from preprocedural to postprocedural values were observed for SII, NLR, AISI, SIRI and MLR (all p<0.001), while PLR and INFLA did not change significantly. Postprocedural inflammatory indices did not differ significantly among PFA systems (all p>0.05). In contrast, postprocedural hsTnI differed significantly among systems (Kruskal–Wallis, p=0.009). Pairwise comparisons using Dunn's test with Holm correction showed significantly lower hsTnI with VARIPULSE than PULSESELECT (p=0.026) and FARAPULSE (p=0.012), whereas PULSESELECT and FARAPULSE did not differ significantly (p=0.947) (**Figure 1**). Similarly, postprocedural CRP differed significantly among systems (Kruskal–Wallis, p<0.001). Holm-corrected Dunn's comparisons showed significantly higher

TABLE 1. Baseline characteristics and postprocedural biomarkers.

	VariPulse (n=29)	PulseSelect (n=27)	FaraPulse (n=47)	P value
AGE	64 IQR: 55-70	62 IQR: 54-69	62 IQR: 55-68	0.489
SEX	63% male	67% male	72% male	0.639
AF TYPE	51% paroxysmal	66% paroxysmal	53% paroxysmal	0.447
hsTnI, ng/L (median, IQR)	3984, IQR: 2986-7061	6170, IQR: 4397-8979	6124, IQR: 4825-9650	0.009
CRP, mg/L (median, IQR)	17, IQR: 10-23	9, IQR: 6-11	9, IQR: 6-12	0.001

AF (atrial fibrillation), hsTnI (high sensitivity troponin I), CRP (C-reactive protein), IQR (interquartile range)

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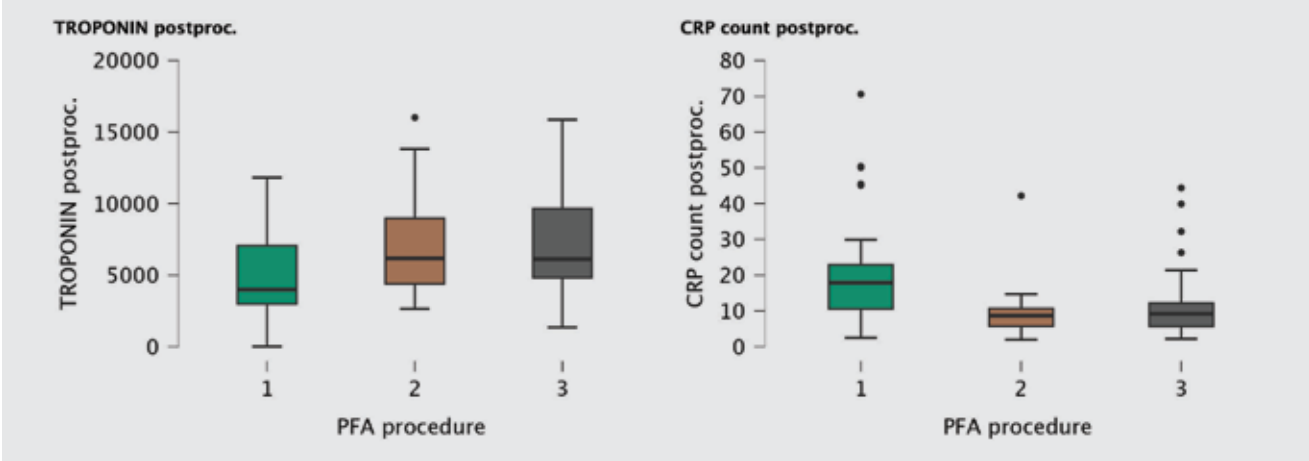


FIGURE 1. Box plots of post procedural hsTnI and CRP levels across three pulsed field ablation systems: VARIPULSE (Group 1), PULSESELECT (Group 2) and FARAPULSE (Group 3).

hsTnI (high sensitivity troponin I), CRP (C-reactive protein), PFA (pulsed field ablation)

CRP with VARIPULSE than PULSESELECT and FARAPULSE (both p<0.001), with no significant difference between PULSESELECT and FARAPULSE (p=0.400). The association between PFA system and postprocedural CRP remained significant after adjustment for baseline CRP values using ANCOVA.

Conclusion: PFA procedures are associated with postprocedural increases in most evaluated inflammatory indices. However, no significant differences in postprocedural inflammatory index values were found among systems. Higher CRP and lower hsTnI were observed after VARIPULSE compared with PULSESELECT and FARAPULSE. These findings suggest device-specific differences in acute biochemical responses among contemporary PFA platforms regarding myocardial injury and acute-phase inflammation. Whether these differences translate into clinically meaningful outcomes remains to be determined.

LITERATURE

1. Tzeis S, Gerstenfeld EP, Kalman J, Saad EB, Sepehri Shamloo A, Andrade JG, et al. 2024 European Heart Rhythm Association/Heart Rhythm Society/Asia Pacific Heart Rhythm Society/Latin American Heart Rhythm Society expert consensus statement on catheter and surgical ablation of atrial fibrillation. Europace. 2024 Mar 30;26(4):euae043. https://doi.org/10.1093/europace/euae043

2. Osmancik P, Bacova B, Hozman M, Pistkova J, Kunstatova V, Sochorova V, et al. Myocardial Damage, Inflammation, Coagulation, and Platelet Activity During Catheter Ablation Using Radiofrequency and Pulsed-Field Energy. JACC Clin Electrophysiol. 2024 Mar;10(3):463-474. https://doi.org/10.1016/j.jacep.2023.11.001