The Role of Neutrophils and Neutrophil Extracellular Traps in the Perioperative Period of Patients with Thoracoabdominal Aortic Aneurysms Undergoing Branched Endovascular Aortic Repair (BEVAR) and Their Impact on One-Year Follow-Up

Milena Michalska, MD PhD, Medical University of Warsaw, Poland, Warsaw, Poland
Tadeusz Grochowiecki, Prof, Medical University of Warsaw, Poland, Medical University of Warsaw
Aleksandra Wyczałkowska Tomasik, MD PhD, Medical University of Warsaw, Poland, Warsaw, Poland
Leszek Paczek, Prof, Medical University of Warsaw, Poland, Warsaw, Poland
Katarzyna Jama, MD PhD, Medical University of Warsaw, Poland, Warsaw, Poland
Tomasz Jakimowicz, Prof, Medical University of Warsaw, Poland, Warsaw, Poland
Andrzej Cacko, Prof, Medical University of Warsaw, Poland, Warsaw, Poland
Jacek Kurnicki, MD PhD, Medical University of Warsaw, Poland, Warsaw, Poland
Daniel Jarosz, dr, Medical University of Warsaw, Poland, Warsaw, Poland
Łukasz Wielocha, dr, Medical University of Warsaw, Poland, Warsaw, Poland
Zbigniew Gałązka, Prof, Medical University of Warsaw, Poland, Warsaw, Poland

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Objective:
Neutrophils and neutrophil extracellular traps (NETs) play a key role in the immune response. This study examines the behavior of neutrophils and the formation of NETs during the perioperative phase of branched endovascular aortic repair (BEVAR) in patients with thoracoabdominal aortic aneurysm (TAAA) and their influence on one-year outcomes.

Methods:
This prospective, single-center cohort study included 30 TAAA patients treated with T-branch devices. Inflammatory markers, including dsDNA, ssDNA, citrullinated histone H3 (CitH3), neutrophils, lymphocytes, and the neutrophil-to-lymphocyte ratio (NLR), were measured. Peripheral venous blood samples were collected 24 hours preoperatively, three days postoperatively, and on the fifth postoperative day. Patients were followed for one year to assess mortality and hospitalization risk. Cox regression analysis was used to identify predictors of these outcomes.

Results:
Postoperative inflammatory markers significantly correlated with increased risks of hospitalization and mortality. Key parameters such as dsDNA, ssDNA, and NLR were identified as independent predictors. Specifically, dsDNA (HR=1.000259, 95% CI=1.000029 1.000488, $p<0.05$), ssDNA (HR=1.000060, 95% CI=1.000009 1.000111, $p<0.05$), and NLR (HR=1.225678, 95% CI=1.043126 1.440176, $p<0.05$) were strongly associated with adverse outcomes. Markers measured in the early postoperative period had greater predictive value than those measured later during follow-up. The Cox regression results are detailed in Table 1.

Conclusion:
Early postoperative assessment of NET-related markers, particularly dsDNA and ssDNA, provides valuable insights into predicting mortality and hospitalization risk in TAAA patients after BEVAR. These markers show greater predictive accuracy compared to traditional post-implantation syndrome criteria. Regular monitoring in the postoperative period is crucial to identify high-risk patients who may benefit from enhanced surveillance and care.

	Parameter evaluation	p-value	Hazard ratio (HR)	95% CI HR lower value	95% CI HR upper value
I-dsDNA [ng/ml] (before surgery)	0,000079	0,743579	1,000079	0,999605	1,000554
II-dsDNA [ng/ml] (3rd post-op day)	0,000259	0,027230	1,000259	1,000029	1,000488
III-dsDNA [ng/ml] (5th post-op day)	0,000152	0,082215	1,000152	0,999981	1,000324
I-ssDNA [ng/ml] (before surgery)	0,000030	0,514037	1,000030	0,999941	1,000118
II-ssDNA [ng/ml] (3rd post-op day)	0,000060	0,022323	1,000060	1,000009	1,000111
III-ssDNA [ng/ml] (5th post-op day)	0,000028	0,109813	1,000028	0,999994	1,000063
I-CitH3 [ng/ml] (before surgery)	0,013386	0,742733	1,013476	0,935623	1,097807
II-CitH3 [ng/ml] (3rd post-op day)	0,005819	0,328322	1,005836	0,994168	1,017641
III-CitH3 [ng/ml] (5th post-op day)	0,002959	0,884390	1,002964	0,963745	1,043778
I-neu/limf ratio (before surgery)	-0,042911	0,860599	0,957996	0,593431	1,546526
II-neu/limf ratio (3rd post-op day)	0,203494	0,013395	1,225678	1,043126	1,440176
III-neu/limf ratio (5th post-op day)	0,164460	0,015853	1,178757	1,031318	1,347274

Table 1. The Cox analysis od selected parameters

Fig 1