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The Effect of Neutrophil-lymphocyte Ratio on 10-year Survival Outcomes Following Elective Open and EVAR Procedures

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PC: POSTER COMPETITION

PC030.

Long-term Anticoagulation Is Associated With Type II Endoleaks and Failure of Sac Regression After Endovascular Aneurysm Repair

Daniel Kong, Mark Balceniuk, Doran Mix, Kathleen Raman, Jennifer Ellis, Adam J. Doyle, Roan Glocker, Michael C. Stoner. University of Rochester, Rochester, NY

Objectives: Within the context of endovascular aortic repair (EVAR), the role of antiplatelet and anticoagulation therapy on endoleak development and subsequent reintervention is unclear with conflicting data in the literature. The hypothesis of this study is that chronic anticoagulation is associated with persistent endoleak and failure of sac regression in patients undergoing endoluminal repair of intact infrarenal aortic aneurysms.

Methods: Retrospective cohort abstracted from the Vascular Quality Initiative index hospitalization and long-term follow-up datasets for EVAR (2003-2017) were included in the analysis. Patients not taking aspirin (ASA) pre- and postoperatively were excluded. Patients taking anticoagulation and ASA concomitantly (treatment) following the index procedure were compared against patients taking ASA alone (control). Anticoagulation included warfarin and novel oral anticoagulants, including factor Xa inhibitors and direct thrombin inhibitors. One-to-one greedy matching using propensity scores was implemented to match patients. Primary endpoints were failure of aneurysm sac regression, risk of endoleak, and reintervention rate for endoleak at follow-up. Sac regression was defined as a decrease of at least 5 mm after the intervention.

Results: A total of 9004 patients received ASA alone and 332 patients received both ASA and anticoagulation. Propensity scores were used to create 301 matching pairs to account for differences in baseline characteristics and comorbidities between the treatment and control group. Anticoagulation use was independently associated with significantly decreased AAA sac regression (41.59% vs 58.41%; $P = .001$) and increased risk of type II endoleaks (11.96% vs 6.31%; $P = .023$; relative risk = 1.89; 95% confidence interval, 1.11-3.23; $P = .016$) (Table). There were no significant differences in type I, III, or indeterminate endoleaks. There was no statistical difference in 2-year reintervention (4.32% vs 2.66%; hazard ratio, 1.43; 95% confidence interval, 0.55-3.77; $P = .461$) (Fig). There was no difference in any primary outcome between warfarin and novel oral anticoagulants. Subgroup analysis demonstrated no difference in any endoleak, maximum aortic sac diameter, or reintervention in patients on dual-antiplatelet therapy.

Conclusions: These data demonstrate that chronic ASA plus anticoagulation use is associated with lack of aortic sac reduction and persistent type II endoleak, but not increased risk for subsequent reintervention. As prior studies have demonstrated that sac regression is a correlate of survival, these findings associating regression failure suggest a potential therapeutic failure for patients undergoing EVAR who also require chronic anticoagulation therapy. Although not a contraindication, chronic anticoagulation should be considered when counseling patients with a surgical indication aortic aneurysm.

Table. Endoleak and reintervention in long-term follow up following EVAR

	ASA (n = 301)	%/SEM	AC + ASA (n = 301)	%/SEM	*P* value
Endoleak at followup					
Type I	10	3.32	5	1.66	.296
Type II	19	6.31	36	11.96	**.023**
Type III	0	0	2	.66	.499
Indeterminate	7	2.33	6	1.99	1
Reintervention					
Reintervention	8	2.66	13	4.32	.375
Endoleak and sac growth	4	1.33	8	2.66	.383
Other	3	1.00	5	1.66	.725

AC, Anticoagulation; *ASA*, aspirin; *EVAR*, endovascular aneurysm repair; *SEM*, standard error of the mean.
Boldface *P* values represent statistical significance.

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PC032.

The Effect of Neutrophil-lymphocyte Ratio on 10-year Survival Outcomes Following Elective Open and EVAR Procedures

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Objectives: The neutrophil-lymphocyte ratio (NLR) is a useful and inexpensive inflammatory marker associated with surgical outcomes.

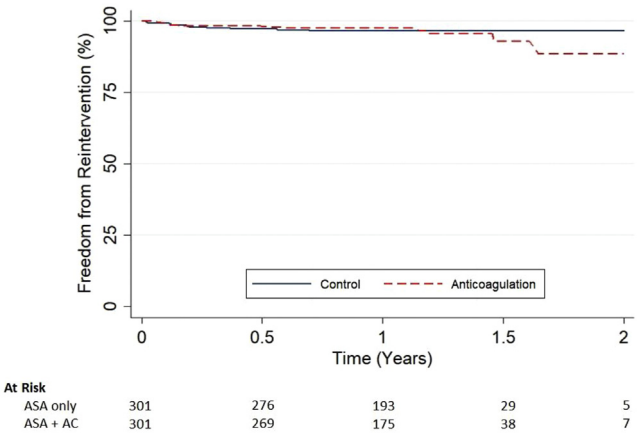

Fig. Freedom from reintervention. *AC*, Anticoagulation; *ASA*, aspirin.

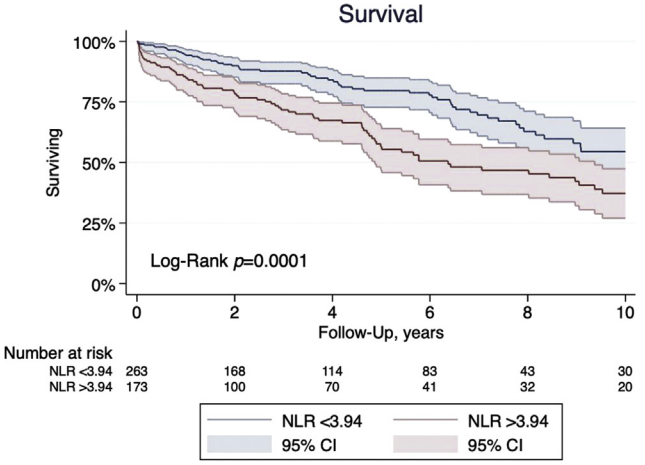

Fig. Survival by neutrophil-lymphocyte ratio (*NLR*) stratification.

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This study evaluates the effects of NLR on survival after elective endovascular (EVAR) and open aortic repair (OAR) of abdominal aortic aneurysm.

Methods: We retrospectively reviewed patients from 1989 to 2019 who underwent elective OAR or EVAR at two separate academic centers. Baseline comorbidities were assessed. A receiver operating characteristic (ROC) curve was used to determine a cutoff point where NLR was associated with outcome. Kaplan-Meier survival analysis was used to compare survival through 10-year follow-up.

Results: Overall, 437 patients (mean age, 72.0 ± 10.1 years; 74.1% male) underwent 213 EVARs and 224 OARs. Median duration of follow-up was 4.55 years. The analysis of the ROC curve yielded an NLR of 3.94 with the highest specificity and sensitivity for 10-year survival. Baseline characteristics were similar between groups, except for an increased age in the group with NLR >3.94 (73.5 vs 70.9 years; $P = .008$) (Table). Kaplan-Meier analysis revealed that patients with NLR >3.94 had decreased 10-year survival (37.2% vs 54.2%; $P = .0001$) (Fig). By univariate analysis, NLR >3.94 ($P = .0001$), chronic obstructive pulmonary disease ($P = .006$), and increased age ($P = .0001$) were associated with increased mortality. On multivariable cox regression analysis, an NLR >3.94 (odds ratio [OR], 1.69; 95% confidence interval [CI], 1.19-2.40), increased age (OR, 1.05; 95% CI, 1.03-1.07), and chronic obstructive pulmonary disease (OR, 1.44; 95% CI, 1.01-2.07) were associated with increased risk of mortality. Between OAR and EVAR, no difference in late survival was noted (49.9% vs 43.5%; $P = .24$).

Conclusions: An NLR >3.94 is associated with increased mortality over a 10-year follow-up period after open and endovascular aortic repair. Future studies to further understand the driving force between an elevated NLR and increased mortality are warranted.

Table. Baseline characteristics

Characteristic	NLR < 3.94, No (%)	NLR > 3.94, No (%)	*P* value
CAD	85 (32.3)	67 (38.7)	.18
PAD	34 (12.9)	27 (15.6)	.48
COPD	78 (29.7)	55 (31.8)	.67
Diabetes	54 (20.5)	30 (17.3)	.46
HTN	211 (80.2)	143 (82.7)	.62
HLD	122 (46.4)	71 (41.0)	.28
CVA	27 (10.3)	20 (11.6)	.75
Any smoking	224 (85.2)	133 (76.9)	.03
Mean age ± standard deviation, years	70.9 ± 10.0	73.5 ± 10.1	.008

CAD, Coronary artery disease; *COPD,* chronic obstructive pulmonary disease; *CVA,* cerebrovascular accident; *HLD,* hyperlipidemia; *HTN,* hypertension; *NLR,* neutrophil-lymphocyte ratio; *PAD,* peripheral artery disease.

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PC034.

Female Sex Is Associated With Early Morbidity and Mortality but Similar Midterm Survival in Branched/Fenestrated Endovascular Aortic Aneurysm Repair

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Objectives: The objective of this study was to identify sex-related differences in surgical outcomes in patients undergoing branched and/or fenestrated endovascular aortic repair (B/FEVAR) for thoracoabodominal (TAAA) and juxtarenal (JRAA) aortic aneurysms.

Methods: Chart review and follow-up was completed on 213 patients (59 female; 27.7%) that underwent B/FEVAR between 2007 and 2020 at a single center. Median follow-up time was 3.6 years (interquartile range [IQR], 1.4-6.4 months).

Results: Mean age (75.4 ± 7.6 years) was similar for male and females. More male patients presented with JRAAs compared with female patients (61.7% vs 39%; $P = .003$). Aneurysm size was similar in male and female patients (67.7 ± 11.9 vs 65.7 ± 7.5 mm; $P = .248$). No difference in overall rate of successful target vessel revascularization was observed between male and female patients (96.5% vs 97.6%; $P = .449$). However, female patients had longer fluoroscopy times (107.9 ± 47.7 vs 124.1 ± 49.4 minutes; $P = .033$) and more contrast usage (198.1 ± 85.8 vs 235 ± 105.7 mL; $P = .012$). Technical success was similar in males and females (89% vs 93.2%; $P = .351$) but four female patients underwent open assisted target vessel revascularization, in comparison

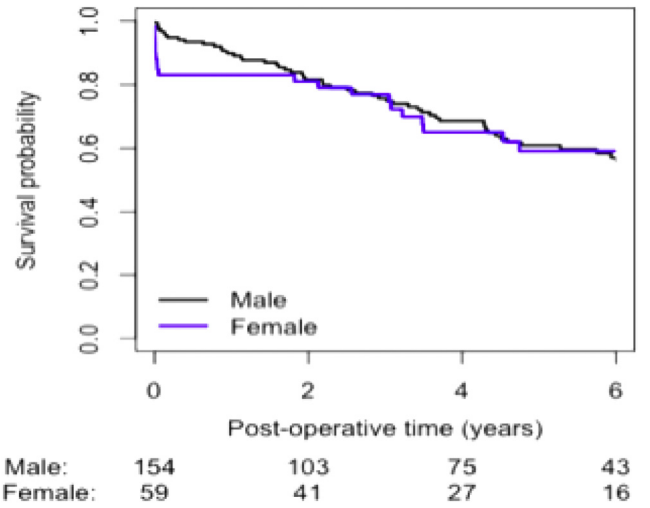

Fig. Kaplan-Meier survival curve for 213 patients receiving branched/fenestrated endovascular aneurysm repair (B/FEVAR) for thoracoabodominal (TAAA) and juxtarenal (JRAA) aortic aneurysms, stratified by sex (hazard ratio [HR], 1.05; 95% confidence interval [CI], 0.66-1.67; $P = .85$).

Table. In-hospital postoperative outcomes after B/FEVAR in 213 patients

Parameters	Male patients (n = 154)	Female patients (n = 59)	Total (n = 213)	*P* value[a]
In-hospital mortality	5 (3.2)	9 (15.2)	14 (6.6)	**.002**
ICU LOS	3.6 ± 6.0	4.3 ± 3.5	3.8 ± 5.4	.352
Hospital LOS	9.3 ± 10.7	11.8 ± 10.3	10.0 ± 10.6	.121
SCI	9 (5.8)	11 (18.6)	20 (9.4)	**.004**
Early	5 (3.2)	6 (10.2)	11 (5.2)	**.041**
Delayed	4 (2.6)	5 (8.5)	9 (4.2)	.056
Temporary paraparesis	5 (3.2)	3 (5.1)	8 (3.8)	.528
Temporary paraplegia	0 (0)	3 (5.1)	3 (1.4)	**.005**
Permanent paraparesis	2 (1.3)	2 (3.4)	4 (1.9)	.314
Permanent paraplegia	2 (1.3)	3 (5.1)	5 (2.3)	.102
Stroke	1 (0.6)	5 (8.5)	6 (2.8)	**.002**
TIA	1 (0.6)	1 (1.7)	2 (0.9)	.479
AKI	19 (12.3)	8 (13.6)	27 (12.7)	.81

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