Impact of anatomical location in the outcomes following endovascular repair of abdominal aortic aneurysms

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Introduction

The current approach to abdominal aneurysm (AAA) repair uses anatomical location during management and approach to surgery. However, there is limited research on the impact of AAA location on the outcomes after surgical repair. Our study evaluates how proximal and distal extent variations in anatomical location affects 30-day mortality and the major adverse events for endovascular AAA repair (EVAR).

Methods

Data was collected from the Targeted Vascular Procedure files from the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) between 2016 to 2020. All patients undergoing endovascular repair for an AAA with information on proximal and distal extent (n = 8003) were included. Logistic regression was used to calculate associations between proximal and distal extents and 30-day mortality, while adjusting for the effects of significant independent preoperative associations.

Results

Table 1. Demographic Information (n = 8003)

	Alive		Dead		
	N=7817	%	N=186	%	p-value
Characteristic					
Gender					**0.0427**
Male	6307	80.7	139	74.7	
Female	1510	19.3	47	25.3	
Age Category					**<0.0001**
21-64	1208	15.5	17	9.1	
65-79	4573	58.5	94	50.5	
80+	2036	26.1	75	40.3	
Proximal Extent					**0.0002**
Elective Surgery	6179	79.1	49	26.3	**<0.0001**
Severe COPD	1304	16.7	36	19.4	0.3345
Prior Abdominal Surgery	1834	26.1	40	28.2	0.5728
Congestive Heart Failure	175	2.2	11	5.9	**0.001**
ASA Category					**<0.0001**
Diabetes	1234	15.8	24	12.9	0.2857
Bleeding Disorder	946	12.1	44	23.7	**<0.0001**
Current Smoker	2610	33.4	63	33.9	0.8904
Hypertension	6035	77.2	140	75.3	0.5345
Distal Extent					0.1307
BMI					**<0.0001**
Average Aneurysm Diameter (mean, std)	5.77 (1.50)	6.93 (1.99)			**<0.0001**

Note: p-value indicates whether Chi-square test/Fishers exact test (categorical variables) or T-test (continuous variables) was performed.

Table 2. Adjusted Associations in endovascular repair group

Outcome variable	30-day mortality		
	aOR	95% CI	p-value
Proximal Extent			
Infrarenal	0.62	0.41-0.94	**0.0249**
Juxtarenal	2.27	1.29-3.99	**0.0043**
Pararenal	0.44	0.06-3.28	0.4237
Supra-renal	0.95	0.34-2.65	0.9181
Type IV TAAA	2.95	1.01-8.68	**0.0490**
Distal Extent			
Aortic	1.18	0.85-1.65	0.3224
Common Iliac	0.83	0.59-1.19	0.3112
Internal iliac	0.77	0.38-1.54	0.4556

Analyses adjusted for age, elective surgery, current smoker, ASA category, BMI category, average aneurysm diameter, and bleeding disorder.

Reference for each individual extent are the other extents.

Results (continued)

Table 3. Post-surgical adverse events

DISTAL EXTENT

	Aortic		Common iliac		External iliac		Internal iliac		p-value
Major adverse event	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Acute Renal Failure	11	0.3	13	0.4	4	0.9	1	0.2	0.1628
Ischemic Colitis	35	0.9	26	0.8	7	1.6	4	0.6	0.3436
Lower Extremity Ischemia Requiring Intervention	79	2.1	44	1.4	7	1.6	5	0.7	**0.0272**
Rupture of Aneurysm	18	0.5	18	0.6	3	0.7	3	0.5	0.8419
Average Postop Total Transfusion Amount	4.05 (7.71)		5.05 (10.00)		3.00 (2.64)		4.88 (5.45)		0.8894

p-value calculated using Fisher's Exact Test (categorical) or one-way ANOVA (continuous).

PROXIMAL EXTENT

	Infrarenal		Juxtarenal		Pararenal		Supra-renal		Type IV TAAA		p-value
Major adverse event	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Acute Renal Failure	22	0.3	1	0.3	2	2.0	2	1.0	1	1.8	**0.0104**
Ischemic Colitis	57	0.8	3	1.0	1	1.0	4	1.9	3	5.3	**0.0035**
Lower Extremity Ischemia Requiring Intervention	119	1.7	8	2.6	4	4.0	1	0.5	1	1.8	0.1562
Rupture of Aneurysm	34	0.5	2	0.7	2	2.0	2	1.0	1	1.8	0.1392
Average Postop Total Transfusion Amount (mean, std)	4.78 (8.87)		4.00 (3.74)		-		2.00 (1.00)		3.00 (2.16)		0.4958

p-value calculated using Fisher's Exact Test (categorical) or one-way ANOVA (continuous).

Summary and Conclusions

Proximal extent, especially juxtarenal and type IV AAA, act as effective predictors for 30-day mortality following endovascular AAA repair.

Distal extent does not serve as effective predictor for 30-day mortality following EVAR.

For major adverse events, proximal extent acts as a predictor for acute renal failure and ischemic colitis while distal extent acts as a predictor for lower extremity ischemia requiring intervention.

Both aneurysm rupture and average postoperative transfusion amount were not correlated to either proximal or distal extent. Future research is needed to identify how differing AAA proximal extents affects EVAR mortality.

Literature cited

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Appendix