

## BACKGROUND

- Abdominal aortic aneurysm (AAA) rupture is associated with significant mortality rates
- Fenestrated endovascular aneurysm repair (FEVAR) is one treatment option for symptomatic or ruptured AAA but not all patients are suitable candidates, largely related to patient aortic neck anatomy
- Physician-modified endografts (PMEGs) are customized devices designed to help address individual variability, shown to be safe and effective<sup>1</sup> but are currently considered outside device use instruction
- Data on long-term outcomes following FEVAR is limited, for PMEGs even more so
- This study sought to determine what the effect of aortoiliac angulation is for patients undergoing physician-modified FEVAR and what the impact is on outcomes and other operative complexities

## METHODS



All patients who underwent PMEG repair, under a physician-sponsored investigation device exemption study, for the treatment of juxtarenal aortic aneurysms at a single academic center from April 2011 to November 2021 were reviewed. Two independent reviewers analyzed CT angiographs,



measuring the center luminal line and geometric distance of seven predetermined variables using *TeraRecon software*. Tortuosity index (TI = Centerline/Geometric Line) was calculated for each variable. Chart review was performed to collect endoleak incidence. Aortic and iliac tortuosity were stratified into low (<1.15) and high tortuosity (>1.15). Outcomes were compared using univariable and multivariable analysis.

## RESULTS

**Table 1: Postoperative Outcomes in Patients with Low vs. High Aortic and Iliac Tortuosity**

	All Patients n=108(%)	Aortic Tortuosity			Iliac Tortuosity		
		Low n=72(%)	High n=36(%)	P-value	Low n=65(%)	High n=42(%)	P-value
Adverse Events (Any)	24 (22)	12 (17)	12 (33)	0.09	18 (28)	6 (14)	0.15
Death <30 days	5 (5)	2 (3)	3 (8)	0.33	4 (6)	1 (2)	0.65
Endoleak (Any)	54 (50)	39 (54)	15 (42)	0.31	30 (46)	23 (55)	0.43
Endoleak (I or III)	17 (16)	3 (4)	12 (33)	0.38	3 (5)	12 (29)	<b>0.001</b>
Technical Success	105 (97)	71 (99)	34 (94)	0.26	63 (97)	41 (98)	1.00
Reintervention	72 (67)	23 (32)	12 (33)	1.00	20 (31)	16 (38)	<b>0.04</b>
Reintervention for Endoleak	15 (14)	10 (14)	5 (14)	1.00	5 (8)	10 (24)	<b>0.02</b>
Pulmonary Complications	3 (3)	3 (4)	0 (0)	0.55	3 (5)	0 (0)	0.28
Myocardial Infarction	5 (5)	3 (4)	2 (6)	1.00	5 (8)	0 (0)	0.15

- 108 CTAs were analyzed, 72 patients with low aortic tortuosity were identified while there were 36 with high tortuosity; 65 patients were identified with low iliac tortuosity and 42 with high iliac tortuosity
- Analysis group was compromised predominately of white males with a mean age of 77
- Univariate analysis revealed an association between high aortic tortuosity and increased fluoroscopy time without a difference in operative outcomes
- High iliac tortuosity was associated with increased incidence of Type I or III endoleaks and reintervention upon univariate analysis. The association remained after multivariate analysis adjusted for age, sex, congestive heart failure, COPD, and renal insufficiency.

## DISCUSSION

Among patients with high iliac tortuosity, Type I and Type III endoleaks, as well as reintervention, is more likely. This was not seen for patients with high aortic tortuosity. This study demonstrates that for patients with high iliac tortuosity long-term follow-up could have a beneficial impact in identifying and addressing Type I and III endoleaks after FEVAR. There were limitations to this cohort study, including selection bias, as those with even more severely angulated tortuosity would've initially been considered unsuitable candidates for PMEG repair. Additionally, there was paucity of patients in the study who self-identified as racial or ethnic minorities. Future studies should strive to be more inclusive in order to more accurately reflect the diversity of the population.

## CONCLUSIONS

- High iliac tortuosity resulted in increased rates of Type I or III endoleak and reintervention among patients who underwent PMEG repair
- Patients with high iliac tortuosity would benefit from long-term follow-up to sooner identify and address any Type I or III endoleak that may arise
- Future studies with more inclusive samples that would more accurately represent the diversity of the U.S. population are needed

## REFERENCES

1. Starnes, Benjamin W., MD, FACS. Physician-modified endovascular grafts for the treatment of elective, symptomatic, or ruptured juxtarenal aortic aneurysms. *Journal of vascular surgery*. 2012;56(3):601-607. <https://www.clinicalkey.es/playcontent/1-s2.0-S0741521412002789>. doi: 10.1016/j.jvs.2012.02.011.