

# ARTERIOVENOUS GRAFT DESIGNED TO PREVENT THROMBOSIS AND GRAFT FAILURE

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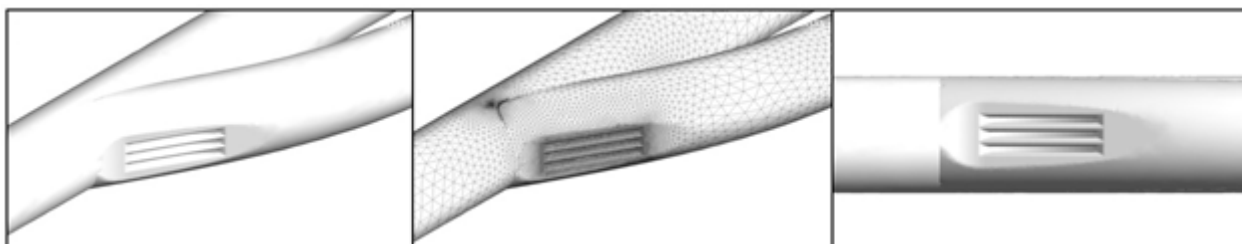
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## Technology Description

Prof. Mohamed Zayed and colleagues have developed an arteriovenous graft cuff with features designed to normalize the blood shear rate and decrease risk of thrombosis at the venous end anastomosis. This device could reduce the failure rate of these grafts, thereby improving their longevity and lowering associated medical costs.

Arteriovenous grafts are often used to facilitate hemodialysis in patients with end stage renal disease. However, the majority of these grafts fail due to thrombosis, presumably caused by aberrant blood flow that promotes blood clot formation. This new arteriovenous graft custom cuff attachment is designed to prevent that damage and improve graft patency. Specifically, the device includes a tear-drop indentation with custom micro-digit grooves that alter the flow field of the incoming blood to resemble physiological direction and velocity. By reducing unhealthy high and low shear stress on the adjacent vein wall, this geometry has the potential to drastically reduce the incidence of venous end thrombosis and improve graft patency.



*Drawings of tailored anastomosis device combining micro-digit grooves and tear-shaped indent for improved flow.*

## Stage of Research

The inventors performed computational dynamics simulations to determine the optimal geometry (angle, grooves and tear-shaped indent) for dramatically improving the shear environment at the venous anastomosis of the graft. They plan to build and test a prototype with this design.

## Publication

- Williams, D, Zayed, M, Genin, G, & Leuthardt, E. (2019). [A Novel Design for Shear Rate Optimization of the Venous-End Anastomosis of an Arteriovenous Graft](#). *Arteriosclerosis, Thrombosis, and Vascular Biology*, 39(Suppl\_1), A272-A272.
- Williams D, Leuthardt EC, Genin GM, & Zayed M. (2021). [Tailoring of arteriovenous graft-to-vein anastomosis angle to attenuate pathological flow fields](#). *Scientific Reports*, 11:12153.

- Jefferson, B. (2021). [Improving dialysis through design](#). *The Source*.

## Applications

- Arteriovenous graft for hemodialysis

## Key Advantages

- **Reduced failure rate** – design is predicted to optimize shear rate at the venous end, thereby preventing the blockage that leads to graft failure

**Patent:** [US 11,369,381](#)

**Related Web Links:** [Zayed Profile](#), [Zayed Lab](#)