Commentary: Hybrid small-caliber artificial vascular grafts: Will this “sandwich” technique come to the “market”?

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The lack of a biocompatible intimal surface is the Achilles' heel of small-caliber synthetic vascular grafts. This results in poor patency rates and has limited their use in clinical practice.

In this edition of the *Journal*, Fang and colleagues¹ report the development of a hybrid, small-caliber artificial vascular graft using a heparinized, bilayer porcine small intestinal submucosa with a curdlan and dipyrindamole (DIP) mixture prepared as a “sandwich” filler. Their aim was to construct a graft that combined the features of low immunogenicity and degradability that are associated with small intestinal submucosa with the antiplatelet adhesion properties of heparin and the inhibition of cellular hyperplasia seen with DIP, to form a more biocompatible endothelial surface without intimal thickening in a small artificial vascular conduit.

In an intact rabbit model, this artificial vascular graft was anastomosed end to side to a segment of the left carotid artery using 8-0 Prolene sutures. The native carotid artery was ligated proximal and distal to the graft anastomosis to prevent competitive flow. After 2 months, all grafts treated with the “sandwich” technique were patent, and at 3 months, the patency was 87.5%, compared with 34.3% of the grafts that did not contain the “sandwich” technique. Grafts containing the “sandwich” technique exhibited a circumferential, intact endothelial layer without intimal hyperplasia or the presence of mural thrombi.

These are impressive results, but there are several limitations. The studies were performed in a rabbit model. It is unknown whether this “sandwich” technique will be equally protective in humans when these grafts are exposed to hypertension, hypercholesterolemia, and hyperglycemia. The incorporation of heparin in these grafts is of concern. Eventually over time, the heparin will be “leached” from

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Central Message

The patency of small-caliber artificial vascular grafts is enhanced using heparinized, bilayer porcine small intestinal mucosa with a curdlan and DIP mixture using a “sandwich” filler.

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these grafts and may contribute to the formation of heparin-induced thrombocytopenia antibodies, which could result in heparin-induced thrombocytopenia syndrome and potentiate thromboembolic events. It is unclear as to how this “sandwich” filler can be prepared for use during clinical surgery and whether it can be incorporated into existing small-caliber artificial grafts. Finally, the length of the conduit was only 2 cm, and the follow-up period was only 3 months. The authors noted that 91% of the DIP was released from the grafts after 3 months. A longer follow-up period with longer length grafts anastomosed in an end-to-end fashion will be needed to determine the patency of these grafts when the DIP is no longer present.

Despite these limitations, Fang and colleagues¹ are to be congratulated for developing this “sandwich” technique to enhance the biocompatibility of vascular conduits in an attempt to improve the patency of small-caliber grafts.

Reference

1. Fang Q, Gu T, Fan J, Zhang Y, Wang Y, Zhao Y, et al. Evaluation of a hybrid small caliber vascular graft in a rabbit model. *J Thorac Cardiovasc Surg*. 2020;159:461-73.