Limits of the Zenith Endograft for Endovascular Abdominal Aortic Aneurysm Repair and How They Can Be Extended

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NOTES

Endovascular aneurysm repair (EVAR) continues to improve with increasing operator experience and device improvements. Ongoing refinements in available endografts continue to expand the pool of patients who are eligible for EVAR as well as to improve outcomes and minimize morbidity. The Zenith endovascular graft (Cook, Inc., Bloomington, IN) showed excellent results in the US multicenter trial and is used widely throughout the world.

The graft is a modular, bifurcated system made of full-thickness, woven polyester graft material that is fully supported by a series of self-expanding Z stents attached by braided polyester and monofilament polypropylene sutures.

Proximal fixation is assisted by means of a suprarenal stent system with multiple barbs. Several ancillary components are available including both proximal and distal extensions, as well as a converter and contralateral iliac occluder for conversion to an aorto-uni-iliac configuration. In addition to these components, several recent advances of the device will help broaden its applicability.

The Zenith graft has iliac limbs that are available in a wide range of lengths and diameters (up to 24 mm) permitting the treatment of ectatic iliac arteries without the need to extend the graft into the external iliac artery. However, patients with larger, aneurysmal common iliac arteries still require hypogastric artery occlusion with extension of the graft into the external iliac artery. Branched iliac grafts contain a bifurcation with limbs that can be placed in both the external and internal iliac arteries. These grafts can be used to treat patients with common iliac artery aneurysms and/or those patients without an adequate distal landing zone without the need for hypogastric artery embolization. Branched iliac grafts thereby preserve flow to the internal iliac artery with effective exclusion of the aneurysm. Fenestrated and branched visceral grafts can permit a greater number of patients with difficult proximal anatomy to be treated with EVAR. Fenestrated grafts have scallops, large fenestrations, or small fenestrations that serve various functions. Scallops are small cutouts of the graft fabric at the proximal end of the graft. These cutouts are placed around a vessel or vessels with the aim of preserving the target vessel and allowing placement of the graft more proximally in the aorta than would be permitted if the graft had to be placed entirely below these vessels. Large and small fenestrations are cutouts made in the body of the graft that are designed to preserve a given branch vessel. These fenestrations may then be cannulated and stented branch grafts placed into the target vessels.

Patients with tortuous anatomy present another challenge. In many cases, it is not possible to deliver the graft to the intended target site when excessive tortuosity is present. If delivered and deployed, the graft may not have an adequate seal or may not assume an acceptable configuration increasing the risks of limb occlusion or dislodgement. The Zenith Flex graft, a modification of the original design, addresses some of these concerns. There is an increased width of the gap between the Z stents of the main body that allows greater conformability to tortuous anatomy. The length of the main body itself is extended to permit greater longitudinal stability as well as ease of cannulation of the contralateral limb. The introducer sheath was similarly modified for greater flexibility and enhanced visualization on the basis of a radiopaque tip.

The recently approved Renu graft can be used to salvage previously placed endovascular grafts that have migrated distally. The graft can be used either as a traditional proximal extension or in an aorto-uni-iliac configuration with a femorofemoral bypass and contralateral iliac occlusion. In both cases the proximal fixation is assisted by suprarenal fixation with barbs, as in the traditional Zenith graft.

All of the refinements listed above can expand the limits of the Zenith graft for primary EVAR as well as for the salvage of migrated, previously placed grafts. Ongoing research and development will more fully define the role of these refinements and should further improve the outcome of EVAR.