INTRODUCTION

Parodi published the first series of abdominal aortic aneurysms repaired using endovascular techniques (1). Since then, the field of aortic aneurysm treatment has been revolutionized by fast technological advancements in catheter-based covered stent-grafts. In the United States, clinical studies began only a few years after Parodi’s pioneering work (2,3) and trials have progressed rapidly since then, fueled by industry support and cheered by both physicians and patients. To date, four devices have been approved by the Food and Drug Administration (FDA) (Ancure, Guidant/EVT, Menlo Park, CA; AneuRx, Medtronic, Santa Rosa, CA; Excluder, W.L. Gore & Associates, Flagstaff, AZ; Zenith,
Cook, Bloomington, IN). One of the four (Ancure) has been withdrawn from the market by Guidant. In addition, numerous other devices are currently undergoing clinical trials. The FDA-approved devices can be used for the abdominal aorta, but ongoing trials are exploring the use of similar endovascular technologies for aneurysms of the thoracic aorta. Currently, a length of at least 15 mm for the proximal aortic neck and a 20-mm-long landing zone in the common iliac arteries away from any major named arterial branch are a prerequisite for being able to exclude an aneurysm by endovascular approaches. However, ongoing experimental techniques continue to push the frontiers of the endovascular approach by attempting to design ways in which one can maneuver around aortic branches, move them out of the way, or reconstruct stent-graft branches as part of the repair. Similarly, although currently a femoral cut-down is routinely used for endovascular aneurysm exclusion, the frontier of completely percutaneous aneurysm repair is actively being sought by numerous investigators and industry bioengineers. Currently, despite some early setbacks and still evolving technology, commercially manufactured endovascular systems are employed to treat abdominal aortic aneurysms (AAAs) in about 50% of elective aneurysm repairs and are continuing to spread widely throughout the world (4).

**EVOLUTION AND SETBACKS**

Technology has advanced rapidly since the advent of endovascular repair of abdominal aortic aneurysms, but rapid progress came with occasional significant setbacks. The initially unbridled excitement in Australia and Europe over the Vanguard endograft (Boston Scientific Corp., Natick, MA) was curtailed before the graft was widely used in the United States markets when a high incidence of graft-component disconnections was noted. The contralateral docking segment of this modular bifurcated graft and the length of intussusception were short, leading to a propensity for separation of the components of the contralateral limb. Subsequently, despite resolution of this design issue, fabric erosion leading to type III endoleaks became a major problem for this endograft. Yet, the Vanguard device, composed of a modular polyester graft supported with a nitinol frame, had initially yielded encouraging trial reports after analysis of the French Vanguard trial (5). This multicenter trial reported 100% success rate of implantation, no perioperative deaths, and an 8% rate of early reoperation. A 30% endoleak rate was noted on immediate perioperative computed tomography (CT) scans. One patient died of AAA rupture during the mean follow-up of 18 mo. An additional 12% and 11% endovascular reinterventions were required for the treatment of graft limb occlusions or endoleaks, respectively. Significant AAA expansion was noted in patients with persistent endoleaks.

The first endograft approved in the United States (Ancure) also had some limitations related to the deployment complexity of the unibody design. Specifically, the unsupported limbs had a predisposition to kink, and the infrarenal fixation with hooks limited candidates without calcification or thrombus at the proximal aortic neck. However, as time passed, and issues of ongoing infrarenal aortic neck dilatation with possible endograft migration have been recognized in other types of graft design, the Ancure hook fixation is now regarded as the most positive attribute of this endograft. Regrettably, issues of the deployment complexities among other FDA-related inquiries prompted Guidant to stopped marketing the device.

The thoracic Excluder graft (W. L. Gore & Associates, Flagstaff, AZ) was initially very well received (during clinical trials), because the great ease of the delivery and