Endovascular Repair of Abdominal Aortic Aneurysms

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Endovascular abdominal aortic repair (EVAR) offers a less invasive approach to treatment of abdominal aortic aneurysms (AAA) compared to traditional open repair. EVAR is illustrated with before and post-repair CT angiographic images. Procedure indications, usage and available outcomes data are summarized; however, the long-term outcome of current endografts is not known.

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Abdominal aortic aneurysms (AAAs) occur predominantly in the elderly population with an average age of presentation of about 70 years. The overall prevalence of AAAs (defined as a focal dilation of the abdominal aorta greater than 3.0 cm) is estimated at 2%-5% in the general population over age 65. Population-based studies have demonstrated an increase in AAA prevalence partly due to the aging population, increased use of screening ultrasound, and a true increase in the incidence of the disease.1

Risk factors for aneurysm development include increasing age, male gender, hypertension, cigarette smoking, chronic obstructive pulmonary disease, coronary and peripheral arterial occlusive atherosclerosis and family history.2

The goal of elective AAA repair is to prevent deaths from rupture. In asymptomatic patients, the most accurate predictor of rupture is AAA diameter. Estimated 1-year rupture rates are 0.5%-5% for 4-5 cm, 3%-15% for 5-6 cm, 10%-20% for 6-7 cm, 20%-40% for 7-8 cm and 30%-50% for AAA with diameter greater than 8 cm.3 Five-year rupture rates are higher. Both large and small aneurysms expand, and rates are not linear. Repair is generally recommended for aneurysms greater than 5.5 cm diameter.3

Endovascular abdominal aortic aneurysm repair (EVAR) offers a less invasive approach compared to traditional open repair. Patient eligibility for EVAR is based on anatomic criteria. The procedure requires radiological and surgical expertise. There must be adequate “landing zones” for the aortic and iliac components of the endograft. The proximal neck,
defined as the segment of the aorta immediately below the renal arteries, must be sufficient in length (typically >15 mm) and small enough in diameter (<28 mm) to allow for adequate attachment of the device. Distally, there must be landing zones in either the common or external iliac artery. Embolization of the internal iliac artery may be required when extending the graft into the external iliac artery.
Poor candidates for EVAR include those with AAAs that extend within 10 mm of the renal arteries, those with aortic neck diameter greater than 28 mm or significant angulation (more than 60° between the long axis of the proximal neck and long axis of the aneurysm sac), or those with thrombus within the proposed landing zones. The stent-graft is intro-
duced via the femoral artery and then deployed under fluoroscopic or endovascular ultrasound guidance. Increasing experience and technological advances such as smaller deployment devices and better attachment systems should allow for broader use.

Use of EVAR is increasing, despite uncertainties about its effectiveness, and concerns about long-term durability and high re-intervention rate. EVAR has its advantages. It is associated with lower operative morbidity (lower cardiac, pulmonary and gastrointestinal complications, and length of hospital stay) compared with traditional open repair. It is also likely associated with lower operative mortality. Operative (30-day) mortality associated with traditional open AAA repair ranges from 5%–6%, with myocardial infarction as the leading post-operative cause of death.

However, EVAR has a unique set of complications and requires indefinite intensive surveillance by imaging to monitor for development of endoleaks (persistent perfusion of the aneurysm sac), graft occlusion, graft migration, AAA expansion, material fatigue, and graft limb thrombosis. Imaging findings can be subtle and complications may be missed.

Successful EVAR results in complete exclusion of blood flow within the aneurysm sac. Endoleaks (perfusion of the aneurysm sac) are common, complicate 10% to 20% of repairs, and can lead to rupture. Attachment site endoleaks (type I) require re-intervention due to risk of future rupture. Management of branch or collateral leaks (type II) is more controversial with recommendations for intervention by some and observation by others. Intervention is required with type II leaks if the aneurysm sac persists or enlarges. Mid-graft leaks (type III) are caused by graft fabric tears or device component separation and require re-intervention. Type IV leaks are due to graft fabric porosity and usually resolve spontaneously.

Re-intervention rates are as high as 25% with EVAR, compared with re-intervention rates of less than 10% with traditional open repair. Long-term (over 10 years) results show the durability of conventional repair. Presently, long-term rupture rates associated with EVAR are unknown, but higher rupture rates are likely. Long-term survival with open repair (75% at 5 years, 49% at 10 years) is primarily influenced by age, prior history of congestive heart failure, chronic pulmonary disease or renal insufficiency. Long-term survival with EVAR has not yet been adequately documented.

Results with traditional open repair are good and getting better. The long-term outcome of the current endografts is not known and patients must undergo indefinite imaging surveillance. Presently, there is no predictive data to indicate who will do well with an endograft. In general, endovascular AAA repair should be reserved for individuals with high surgical risk factors and with suitable anatomy.

REFERENCES


