

EVAR for Ruptured Abdominal Aortic Aneurysms

Tips for improving survival rates among patients who undergo endovascular repair of rAAAs.

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Ruptured abdominal aortic aneurysms (rAAAs) are being treated by endovascular aneurysm repair (EVAR) and other endovascular techniques with increasing frequency. Endovascular procedures offer many potential advantages over open repair (OR); they are less invasive, eliminate damage to periaortic and abdominal structures, decrease bleeding from surgical dissection, minimize hypothermia, and lessen the requirement for deep anesthesia.

Because of these advantages, EVAR has been used extensively to treat rAAAs by several groups who have achieved good results.¹⁻⁸ In contrast, some other groups have been unable to demonstrate the superiority of EVAR over OR in the rAAA setting.^{9,10} This article describes some of the strategies, techniques, and adjuncts that facilitate the endovascular treatment of rAAAs. We believe that these all contribute to improved outcomes in terms of enhanced survival rates in a group of patients that is difficult to treat.

STRATEGIES, TECHNIQUES, AND ADJUNCTS

Standard Approach and Protocol

Having a standard approach and protocol promotes effective decision making and treatment for patients in confusing and stressful circumstances.^{6,7} They are also important in facilitating education in and recognition of rAAAs by

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generalists, emergency department personnel, and others to enable early diagnosis and mobilization of the specialized caregivers who are best trained to optimize treatment.

Fluid Restriction

Fluid resuscitation (hypotensive hemostasis) should be restricted even if the patient becomes hypotensive. Experience has shown that systolic arterial pressures of 50 to 70 mm Hg are well tolerated for short periods and limit internal bleeding and its associated loss of platelets and clotting factors.^{2,3,7,11} Whether or not pharmacological lowering of blood pressure is beneficial remains to be conclusively shown.^{3,7}

Treatment Site

EVAR procedures are optimally performed at a site that is equipped for excellent fluoroscopic imaging and

open surgery because some patients will require OR or open adjuncts to their EVAR, such as an iliac conduit, femorofemoral bypass, or laparotomy for relief of abdominal compartment syndrome.

Anesthesia and Catheter-Guided Placement

The latter should be achieved percutaneously under local anesthesia. This permits arteriography to define aortic and arterial anatomy, facilitates large sheath and supraceliac balloon placement if needed, and prevents circulatory collapse caused by the induction of general anesthesia. Whether general anesthesia is used later to eliminate motion and improve fluoroscopic imaging to permit precise graft deployment remains controversial. One group has successfully used local anesthesia supplemented by sedation throughout as an alternative.^{1,3,7}

Supraceliac Aortic Sheath Placement and Balloon Control

Most experienced groups favor this approach only when there is severe circulatory collapse. In such cases, deflation of the balloon before sealing the rupture site will result in immediate recurrence of the circulatory col-

lapse. Therefore, techniques have been developed to maintain continuous aortic control until the endograft has sealed the leak.^{2,3,7,12,13} These techniques use multiple balloons to minimize renal and visceral ischemia by placing secondary balloons within the endograft while the supraceliac balloon is deflated and removed through its supporting sheath.

Endograft Type and Configuration

Both bifurcated and aorto-uni-iliac (or femoral) grafts can be used successfully, although some patients have unilateral iliac disease, which mandates a unilateral configuration. Modular and unibody grafts have been used successfully in both configurations. An appropriate inventory of suitable grafts and accessories must be stocked sterile in the treatment site and be available for the procedure and unexpected contingencies.

Abdominal Compartment Syndrome

Abdominal compartment syndrome is a major cause of morbidity and mortality after EVAR for rAAA. It is advantageous to keep a high index of suspicion for this entity. Laparotomy and hematoma evacuation have alleviated



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OVERVIEW

The purpose of this program will be to educate healthcare providers who care for patients with vascular lesions amenable to embolization. The course will highlight important developments in the treatment of these patients so that they can integrate them into their clinical practices and procedures.

The Symposium on Peripheral vAsCular Embolization (SPACE) will offer didactic lectures related to the natural history of vascular lesions, the treatment options available for complex vascular lesions and case management presentations by a panel of expert faculty. Concepts regarding patient selection, best technical approaches, potential synergies of different embolization materials, and techniques for patient surveillance will be reviewed.

OBJECTIVES

After completion of this course, you will be able to:

- Differentiate the equipment and procedural techniques for performing peripheral vascular embolization in patients with peripheral aneurysms to prevent rupture or embolization.
- Evaluate the role of embolization and as adjunct for the treatment of aortic aneurysms to prevent rupture or embolization.
- Assess the role of embolization for the treatment of visceral/renal artery aneurysms to prevent rupture or embolization.
- Assess the role of embolization for congenital and acquired/traumatic vascular lesions to prevent rupture or embolization.
- Demonstrate clinical management and surveillance protocols used for peripheral vascular lesions to follow treatment.

TARGET AUDIENCE

Vascular Surgeons, Interventional Radiologists, Interventional Cardiologists, Cardiovascular Surgeons and other allied health professional involved in the care of complex vascular lesions.

the hypotension, high ventilatory compliance, and oliguria that occurs with the full-blown syndrome. Monitoring bladder pressure has been helpful in the early detection of the syndrome,^{3,7} and early laparotomy with open abdomen treatment and suction/sponge dressings may decrease mortality and allow survival in otherwise hopeless circumstances when small bowel and mesenteric edema cause loss of domain for the abdominal viscera.^{7,14}

EVAR for the Highest-Risk Patients

It is probable that EVAR is most beneficial in augmenting survival when it is used in the highest-risk patients who are unlikely to survive an OR. Patients with hemodynamic instability and profound circulatory collapse, a hostile abdomen, or those unable to receive transfusion would fall into this category. If such patients, particularly those who are hemodynamically unstable, are excluded from EVAR, it is likely that the improved survival that can accrue from this form of treatment will be diminished.⁸

DISCUSSION

It is clear that several centers in which the physicians and surgeons are enthusiastic about EVAR treatment for rAAAs attempted to perform the procedure preferentially in every AAA patient with suitable anatomy.⁸ This includes patients who are hypotensive and hemodynamically unstable, as well as those with frank hemorrhagic shock. These centers have achieved favorable results with EVAR for rAAAs in these unstable patients and believe that it is precisely these high-risk, unstable, hypotensive patients in whom EVAR offers the greatest survival benefit over OR. In these centers, between 28% and 79% (mean, 49.1%) of all rAAA patients were treated by EVAR. In addition, the proportion of patients treated by EVAR increased with time as devices and skills improved and enthusiasm for the procedure increased, and it is likely that the proportion will increase further as new devices and techniques are introduced. All of these centers that are enthusiastic about EVAR treatment of rAAAs emphasize several key factors that are important in achieving favorable outcomes in these patients. Proper use of aortic balloon control, adequate recognition and treatment of abdominal compartment syndrome, and the establishment of a structured system and protocol for the treatment of rAAA patients all contribute to improved survival outcomes in patients with this diagnosis.

CONCLUSION

Although there may be other ways to deal with these and other factors and still achieve good outcomes with

EVAR in the rAAA setting, the strategies, techniques, and adjuncts outlined in this article are one way of doing so that has proven to be effective. ■

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