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Review

Endovascular ruptured abdominal aortic aneurysm repair – setting up your hospital for an endovascular approach

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ABSTRACT

In recent years, major improvements have been made, making elective repair of abdominal aortic aneurysm (AAA) a safe procedure. In selected series, mortality rates are less than 5%. Many of the patients with AAA, however, remain asymptomatic until they present with rupture. Once rupture has occurred, the overall mortality approaches 90%. Despite many advances in the management of ruptured AAA, the mortality rate of conventional open surgery has not improved significantly during the last 15 *years*. Over the last decade, endovascular techniques have been used increasingly to repair AAA, and there is increasing evidence that endovascular aneurysm repair (EVAR) is technically feasible and safe for ruptured AAA. This review studies the evidence and aids the clinician in setting up a practice to manage rAAAs utilizing an endovascular approach.

Introduction

Rupture of an abdominal aortic aneurysm (AAA) is associated with significant morbidity and mortality.[1] Although elective open AAA repair has been associated with a constant decline in operative mortality to nearly 5% during the past decades, a similar decline has, unfortunately, not occurred for ruptured AAAs (RAAAs), which have a mortality range persisting in the 50% range and this figure has not changed over the past 15 years.[2,3]

In the last two decades a new minimally-invasive technique, endovascular aneurysm repair (EVAR), has offered an alternative therapy to conventional open repair for selected patients with AAA. EVAR is the luminal exclusion of an aneurysm from circulatory flow using a conduit (endograft) inserted from a remote access vessel and deployed under fluoroscopic guidance. It has enabled definitive improvements in 30-day mortality rates and shown that there is a persistent reduction in aneurysm-related death in EVAR patients at four years when compared with traditional open surgical repair in the elective setting [4–6]. Endovascular ruptured abdominal aortic aneurysm repair (rEVAR) was first reported by Yusuf et al. in 1994. The potential morbidity and mortality benefit has led to some centres to implement an endovascular approach to this moribund condition. Mehta et al. demonstrated an overall mortality rate of 18% for patients undergoing EVAR for RAAA after implementing an endovascular protocol[8] and recent reviews have supported this reduction in

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Table 1 – Results of ruptured abdominal aortic aneurysm, recent administrative data, systematic reviews and meta-analysis.

Author	Source and Date	Open		rEVAR		
		# Subjects	30 day mortality	# Subjects (% rEVAR)	30 day mortality	Difference
Dillavou 2006 (6)	CMS 2003	5042	52%	598 (11.9%)	33%	$P < .001$
Greco 2006 (26)	2000–2003 4 states	5508	47%	290 (5.3%)	39%	$P = .005$
McPhee 2007 (27)	NIS 2001–2004	18,839	38%	2093 (11.1%)	29%	
Harkin 2007 (28)	Systematic review	5983	34%	891 (14.9%)	18%	
Hoornweg 2008 (3)	1991–2006 Meta-analysis	60,822	48.5%			
Mastracci 2008 (29)	Systematic and Meta-analysis	3213		436 (13.6%)	21%	
Lesperance 2008 (30)	NIS 2003–2004	8982	42%	949 (10.5%)	18%	$P < .001$

mortality.[9,10] These reviews of the literature identified the current experience with endovascular management of RAAAs (Table 1). Despite the impressive reductions in mortality rates reported, many clinicians have been hesitant to integrate this technology into the management of these complicated patients. This article supports the interested reader in setting up a practice to manage RAAAs utilizing an endovascular approach.

Building your institution

Naturally, there are many issues to be resolved and many problems to overcome to introduce a program, such as organization difficulties, availability of a wide range of stent grafts, appropriate training of medical and paramedical personnel, implementation of an out-of-hours emergency endovascular on-call rota, and centralization of the vascular services. The creation of an endovascular ruptured aneurysm protocol requires trained, experienced personnel and a commitment by the hospital to support this RAAA treatment. It is imperative that the centre has a reasonable experience in the elective setting prior to embarking on a rupture program.

Patient selection

It is important to establish an endovascular protocol to manage this seriously moribund patient population in a timely and efficient manner. Local protocols can be adopted from the published literature like that of the Albany Group (Fig. 1).[8] The optimum institutional set up is where there is a care pathway to identify and admit patients with RAAAs speedily. This necessitates an emergency department that can rapidly assess and appropriately resuscitate patients and perform CT angiogram when required within minutes. Cardiovascular instability does not prevent the use of the endovascular technique however the majority of the ruptured AAA treated with EVAR in the literature were presenting with haemodynamic stability (systolic blood pressure > 80 mmHg) without cardiac arrest. Nevertheless, the detailed anatomical assessment required for EVAR has lead to concerns of surgical delay and death during cross-sectional imaging.[11] However most patients who present with ruptured AAA experience a significant delay prior to surgery and studies have suggested it is safe to assess the majority of RAAA patients for EVAR.[12,13] It is important all the same to curtail any delays and this may require repeated rehearsal with all key members of the rupture team. In addition, in assessing suitability and measuring for device selection in patients with ruptured abdominal aortic aneurysm for EVAR focused training may be required.[14]

Assessment of AAA morphology

Pre-operative contrast-enhanced spiral CT-scan from the thoracic aorta to the common femoral arteries is currently required in all cases before EVAR. As well as making the positive diagnosis of aortic rupture, it is used to assess the suitability for EVAR and to predict graft size. Unsuitable access or inadequate graft landing zones may result in endoleak or

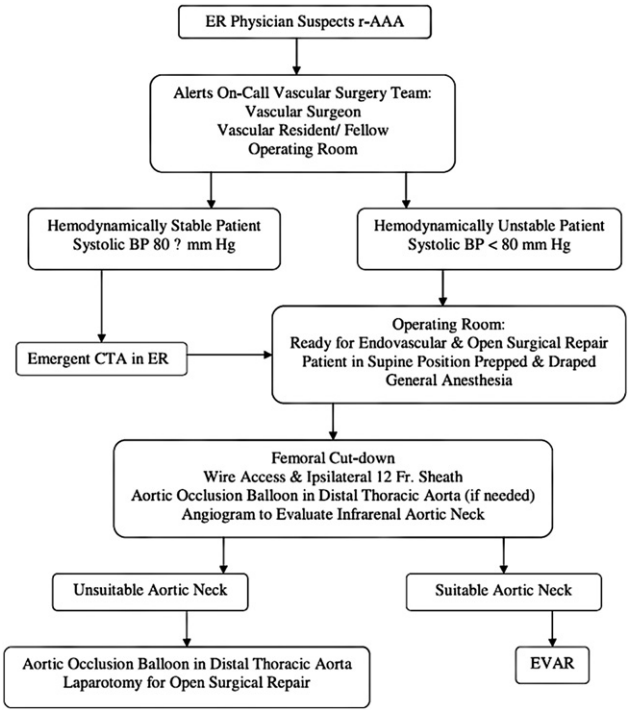

Fig. 1 – Triage protocol established by Albany Group[8] for endovascular repair of ruptured abdominal aortic aneurysm (r-AAA). ER, Emergency room; CTA, computed tomographic angiography; BP, blood pressure; EVAR, endovascular aneurysm repair.