

Ruptured Abdominal Aortic Aneurysm: Open Or Endovascular Repair?

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Abstract

Rupture is the most important complication of the abdominal aortic aneurysms. Diagnosis is clinical and radiological. The mortality of patients who have undergone open repair remains high (between 30 and 50%) and it has not changed for two decades. Mortality in patients who underwent endovascular repair was lower (about 20%). Further studies are needed to establish the standard of care and the scientific debate is animate.

Keywords: Ruptured abdominal aortic aneurysm; EVAR; Aortic surgery

Background

Rupture is the most important complication of Abdominal Aortic Aneurysms (AAAs). Rupture was defined as blood or contrast clearly visible outside the aortic wall, detected by preoperative Computed Tomography (CT), intraoperative angiography, or during surgery. This catastrophic life-threatening condition represents one of the most intricate challenges for the vascular surgeons.

Nowadays, the incidence of ruptured AAAs is declining rapidly; in the United Kingdom the reduction of ruptured AAAs since 1997 is largely attributable to changes in smoking prevalence and increase in elective AAA repair in those aged 75 years and over [1].

However, the ruptured AAA is still one of the first ten causes of death in the male population over >50 years-old; furthermore, about 70% of the patients with a ruptured AAA died before arriving at the hospital [2].

Diagnosis and Risk Scores

Diagnosis is clinical and radiological

A classical clinical trial of symptoms exists: abdominal pain, severe hypotension, and abdominal pulsatile mass.

An early ultrasonographic examination is essential to make diagnosis; however, in all patients with a stable hemodynamic status a CT-scan is mandatory in order to better visualize the morphology of the abdominal aorta.

Preoperative clinical conditions are essential to predict the survival of the patient. During the years, several prognostic scoring systems for ruptured AAAs have been elaborated. These scores evaluate some parameters of the patient in the Emergency Department, such as diuresis, serum creatinine, blood pressure, metabolic acidosis, loss of consciousness. Historically, the Glasgow Aneurysm Score (GAS), the Hardman Index, and the Physiological and Operative Severity Score for enumeration of Mortality and Morbidity (POSSUM) scores (V-POSSUM and RAAA-POSSUM) have been recommended as predictors of outcomes after repair of ruptured AAAs. However, recent studies demonstrated that prospective validation of GAS, Hardman Index, V-POSSUM, and RAAA-POSSUM scores do not perform well as predictors for death after ruptured AAA, but only the Edinburgh Ruptured Aneurysm Score (ERAS) accurately stratifies preoperative risk [3,4].

Once the diagnosis has been made and the risk has been evaluated, the patient should be operated on: open or endovascular?

Open Repair

Open repair is performed under general anesthesia. Generally, it requires a standard median laparotomy. In case of contained rupture in the retroperitoneal space, it is possible to proceed with the preparation of the infrarenal aortic neck to perform an infrarenal aortic clamping, avoiding a prolonged time of ischemia to the renal and the remaining splanchnic vessels. Otherwise, in case of free rupture into the peritoneal cavity, it is necessary to proceed with a suprarenal aortic clamping at the level of the diaphragm. More rapid is the aortic clamping, more possibilities to save the patient ("Clamping saves life"). Distal clamping of the iliac vessels could be obtained with two Foley catheters. The reconstruction of the aorta is standard and it is preferable, whenever possible, a tube graft. At the end of the procedure, it is mandatory to evaluate the vitality of the bowel and, in particular, of the sigmoid colon. Several authors do not perform the immediate closure of the laparotomy, preferring a laparostomy (with or without Vacuum Assisted Closure, VAC), in order to reduce the frequency of intra-abdominal hypertension (IAH) and its catastrophic complication: the Abdominal Compartment Syndrome (ACS) [5].

Nevertheless the improvements in surgical and anesthesiological techniques, perioperative mortality of patients who underwent open repair remain high (between 30 and 50%) and it has not changed for two decades. Several complications can occur after a successful open repair: systemic complications (cardiac, respiratory, renal) till a Multiorgan Failure (MOF), and local complications (bowel ischemia, blood loss, peripheral embolization, ACS). In particular, about 40% of patients develop a sigmoid colon ischemia; therefore, several authors propose to routinely perform a postoperative colonoscopy in patients who have undergone open repair of their ruptured AAAs [6].

Endovascular Repair

In the last years, the growing interest in endovascular procedures has made possible to perform endovascular repair of ruptured AAAs.

The endovascular approach could be performed with local

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Received April 15, 2013; Accepted May 22, 2013; Published May 22, 2013

Citation: Troisi N (2013) Ruptured Abdominal Aortic Aneurysm: Open Or Endovascular Repair? Angiol 1: 103. doi: [10.4172/2329-9495.1000103](https://doi.org/10.4172/2329-9495.1000103)

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anaesthesia and totally percutaneously, without the surgical exposure of femoral arteries. The first step should be the positioning of an occlusive aortic balloon at the level of the diaphragm in order to reduce the blood loss. Then, the introduction and the deployment of the endograft could be performed more easily. Several authors propose the use of an aorto-uniliac graft with successive femoro-femoral crossover bypass grafting in order to reduce the procedural time. However, a bifurcated endograft is preferable when the patient is hemodynamically stable [7].

In the last decade, a lot of studies were published about the urgent endovascular treatment of ruptured AAAs. In a large meta-analysis mortality in people who underwent endovascular repair was lower than that in historical reports of unselected people undergoing open repair; the overall pooled mortality reported in 18 observational studies describing 436 people was 21% [8]. Furthermore, in a large collected world and single center experience, the overall 30-day mortality after endovascular repair was 21.2%; the authors indicate that endovascular repair has a lower procedural mortality at 30 days than open repair, even if adequate skills, facilities, and protocols are needed [9].

Endovascular repair reduces the number of perioperative complications; however, several authors reported that the rate of ACS is significantly high (about 15%) with a high risk of postoperative MOF [6]. Furthermore, the endovascular approach also seems to offer excellent mid-term survival and some authors recommend this treatment as the management of choice for ruptured AAAs in anatomically suitable patients where local facilities and expertise exist [10,11].

Open vs. Endovascular repair

In the last decade, several attempts to demonstrate the superiority of the endovascular treatment were made.

A metanalysis of 2008 suggests benefits to the selected group of patients undergoing minimally invasive procedure; there is a reduction in the high mortality, prolonged intensive care requirement and total hospital stay, which are historically associated with open repair [12].

A recent comparative study reports that endovascular treatment has a superior perioperative survival advantage and decreased morbidity vs open repair (mortality: 15.7% endovascular repair vs. 49% open repair); the authors recommend that endovascular treatment should be considered as the first-line treatment of ruptured AAAs and practiced as the standard of care [13].

An initial randomized controlled trial was suspended for the tough superiority of the endovascular repair respect to open repair. Recently, the results of a Dutch study were published (AJAX trial); this trial did not show a significant difference in combined death and severe complications between endovascular and open repair; and this could be attributable to optimization of logistics, preoperative CT imaging, and centralization of care in centers of expertise [14]. Nowadays, an European randomized trial is still ongoing (IMPROVE trial); its results will be published in the next years [15].

Conclusions

Mortality rates following repair of ruptured AAAs have remained depressingly high over the last number of decades despite advances in anaesthesia and perioperative care. In the last years a reduction in mortality coincided with the wider adoption of endovascular repair. A respectable author and surgeon as Frank Veith argues that we have enough information to widely adopt endovascular repair. Other authors feel that the applicability of endovascular repair requires

further evaluation with new randomized trials [16]. The debate is still open.

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