

## Endovascular repair of ruptured aortic aneurysms: do not let the patient die while you are planning

*Correção endovascular de aneurisma roto de aorta: não deixe o paciente morrer enquanto você planeja o que fazer*

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Patients with ruptured abdominal aortic aneurysms (AAA) admitted in emergency services are always those with sealed rupture. When an aneurysm ruptures and does not seal, the patient dies before getting to a hospital.

In recent decades, based on the above statement, ruptured aneurysms have been treated as an emergency because it is thought that the sealing of the rupture is fragile, and a second episode of massive bleeding will occur at any moment. The time delay between sealing and the definitive rupture has not been well studied; therefore, the latter event is considered to be imminent in every case.

Before endovascular grafting for aneurysms was possible, surgeons got used to fearing intra-hospital rupture of aneurysms, which is not rare.<sup>1</sup> The standard procedure used to be as follows: patients with the classical syndrome – hypovolemia + abdominal pulsatile mass – shall be taken to the operating room at once. If abdominal palpation was difficult, an ultrasound performed at the patient's bed could confirm diagnosis. Mobilization of the patient for computed tomography (CT) scan or nuclear magnetic resonance (NMR) could precipitate rupture and death; thus, mobilization was generally thought to be a dangerous action.

Specialists used to recommend the avoidance of unnecessary diagnosis with much emphasis. The statement “no diagnostic test is so important as to justify delay in this operation” is attributed to Dr. Crawford

(apud Bonamigo & Fonseca Filho).<sup>2</sup> Bonamigo & Fonseca Filho wrote “CT scan would only be indicated in cases of hemodynamic stability and consistent diagnostic doubt, which is rare.”<sup>2</sup> Glowiczky postulated: “The diagnosis of ruptured aortic aneurysm should be based on the clinical presentation. Diagnostic tests should be kept to a minimum. Injudicious delay incurred by performing unnecessary tests in hypotensive patients before taking them to the operating room is dangerous and further increases the already excessive mortality.”<sup>3</sup>

Immediately after endovascular aneurysm repair (EVAR) was introduced into medical practice, the idea of using this promising technique in ruptured aneurysms came to the mind of every vascular surgeon. By not having to open the abdomen, hemorrhage would be avoided. It sounded like the perfect solution. But there is no free lunch. Endovascular treatment requires an extensive anatomical evaluation, creating a dilemma: to delay the operation and increase patient mobilization (for an endovascular treatment), or to rush to the operating room for an open procedure to prevent in-hospital rupture and death.

A few studies have been conducted to challenge the classical rush-to-operate management, trying to prove that patients with ruptured aneurysms can wait longer than usually assumed. Lloyd et al. observed 56 patients admitted to their hospital and not undergoing surgery, reporting that 12.5% of them died in less than 2 hours, while 87.5% died after a longer period of time.<sup>4</sup> They

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concluded that “most patients with a ruptured AAA who reach the hospital alive are sufficiently stable to undergo CT and consideration of EVAR.” One can still be concerned about those who are not sufficiently stable, and “most patients” may not be good enough in a quest for excellence. Boyle et al. reviewed the time delay between admission and operation in a series of 79 consecutive patients with ruptured aneurysm.<sup>5</sup> Results showed a very wide range of time (16 to 1,450 min), and they found no correlation between length of delay and mortality. However, four patients in their series died between admission and surgery.

We have not found enough evidence so far that delaying surgery does not affect mortality in cases of ruptured aneurysms. To prove that, against common sense and physiopathological understanding of the condition, would require much more convincing studies. Besides, it seems that all of the discussion is being focused on time, while patient mobilization is also a risk.

Small unpublished series of successful treatment of ruptured aneurysms with EVAR have been reported at Brazilian medical meetings. Usually they have been collections of cases for which the vascular surgeon, called to the hospital, finds a patient already studied, by the on-duty general practitioner, with contrast CT scan to confirm diagnosis. This situation makes the decision much easier, but obviously represents a wrong initial approach. Good results are biased by the fact that those specific patients are survivors of inadequate management.

A few series of EVAR for ruptured aneurysms have appeared in the literature, mostly including selected cases (the more stable ones) and not compared with standard treatment.<sup>6-10</sup> An interesting paper was published by Hinchliffe et al., who compared results of EVAR and open repair in 32 patients randomly allocated to each type of treatment.<sup>11</sup> Mortality was the same in both groups (53%), and 4/32 patients died before receiving surgical treatment. The study, which did not include all patients admitted with ruptured aneurysm (only the more stable ones), was suspended.

Despite all the efforts of those who argue for EVAR in ruptured aortic aneurysms, most surgeons still seem to fear the danger involved in the management change.

In 2006, Greco et al. examined the discharge data sets from 2000 through 2003 in four highly populated states of the USA, representing almost 1/3 of the national population.<sup>9</sup> EVAR was chosen in only 6.2% of the cases, the remaining being treated with open repair. The percentage of EVAR procedures in elective repair during this period was not mentioned, but one can assume it was several times higher. Surgeons do not seem confident enough to introduce the new technique into the standard practice for emergency cases.

Is there a place for EVAR in the treatment of ruptured AAA? Yes, as the technique becomes increasingly widespread, we should find the way to take advantage of minimal invasion without paying the price of treatment delay and excessive patient mobilization. A suggestion of guidelines to achieve the best of both worlds includes the following:

- A patient with a clinical diagnosis of ruptured AAA shall be taken to the operating room at once. Eligibility for EVAR has to be decided in that environment, where emergency laparotomy can be performed immediately in case of sudden hemodynamic instability. In non-obese patients, portable ultrasound systems may provide enough information about the suitability of the proximal neck and iliac arteries, while the anesthetic team prepares the patient for surgical treatment. Another option is to pass a guide wire and a diagnostic catheter through a femoral or brachial route and perform an angiographic study of the neck and iliac arteries, as proposed by Veith et al.<sup>12</sup> In case of rapid deterioration of hemodynamic conditions, an occlusion balloon can be passed through the guide wire, allowing enough bleeding control to promptly proceed to laparotomy. It is true that angiography may provide wrong information in the few cases with mural thrombus in the neck, but combination with ultrasound would probably provide a trustable assessment.
- The staff in charge of the emergency service must be trained in both techniques, EVAR and open. If a skilled surgeon is ready for an open repair, there is no excuse for delaying treatment of a ruptured aneurysm because an endovascular surgeon has to be called.

- The hospital must keep an inventory of endografts sufficient to treat all cases. Ruptured aneurysms are usually corrected with aorto-uni-iliac devices; thus, a set of at least three diameters, plus extensions of various sizes and occlusion plugs must be available around the clock. To delay treatment until the local representative shows up with the devices is certainly malpractice.
- If the patient is admitted in a state of anuria or severe oliguria, not reverted during initial careful volume expansion, EVAR should probably not be considered. Contrast injection may be highly deleterious in this condition.<sup>11</sup>
- If endovascular treatment requires occlusion of both internal iliac arteries, it may be a bad option. This approach has been shown to cause sacral and bowel ischemia in a variable number of patients undergoing elective repair, and its effect will certainly be more deleterious in patients undergoing surgery under poor hemodynamic conditions.

In conclusion, it is our opinion that EVAR will replace open repair in the treatment of ruptured aortic aneurysms in the near future, with a strong favorable impact on mortality. But before this modern approach becomes accepted as state-of-the-art, surgeons and hospitals have a long way to go – not to mention third-party payers.

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