

Primary Endovascular Treatment of Late-Onset Type 3 Endovascular Aortic Repair Rupture Using The Endurant II Stent Graft and Rapid Response Protocol

Endurant II Stent Grefti ve Hızlı Yanıt Protokolü Kullanılarak Geç Başlangıçlı Tip 3 Endovasküler Aort Onarım Rüptürünün Primer Endovasküler Tedavisi

CASE REPORT
OLGU SUNUMU

ABSTRACT

The objective of this article is to describe a patient with hemorrhagic shock due to type 3 post-endovascular aortic repair rupture successfully treated with the endurant II stent graft via a primary endovascular approach with a rapid response protocol. A 65-year-old male patient who underwent endovascular aortic repair 3 years ago was admitted to the emergency department with severe abdominal pain and hemorrhagic shock. The patient was rapidly taken to the angiography laboratory, and aortography demonstrated distal aortic graft rupture and extravasation of contrast media. The repair was performed successfully with 3 stent-grafts by paying attention to rupture localization and renal artery ostia. The hemodynamics of the patient improved very quickly, and the patient was discharged after 5 days. Emergency primary stent grafting using a rapid response protocol could be a crucial alternative to open surgery for late endoleaks, which are complicated with hemorrhagic shock.

Keywords: Abdominal aortic aneurysm, endovascular aneurysm repair, rapid response protocol, stent-graft, type 3 endoleak

ÖZET

Bu makalenin amacı, tip 3 postendovasküler aort tamiri rüptürünün, Endurant II stent greft kullanılarak primer endovasküler yaklaşımla ve hızlı yanıt protokolüyle tedavisini tarif etmektir. 3 yıl önce endovasküler aort tamiri yapılan, acil servise şiddetli karın ağrısı ve hemorajik şok ile başvuran 65 yaş erkek hasta hızlıca anjiyografi laboratuvarına transfer edildi. Aortografi doğrultusunda distal aort greft rüptürü ve kontrast madde ekstrevasasyonu izlendi. Tamir, 3 stent grefti yardımıyla, rüptür lokalizasyonu ve renal arter ostiumlarına dikkat edilerek başarıyla uygulandı. Hastanın hemodinamisi hızlıca düzeldi ve 5 gün sonra hasta taburcu edildi. Hızlı yanıt protokolü uygulanarak acil primer stent greft uygulaması, hemorajik şokla komplike olabilen geç kaçaklarda açık cerrahinin hayati bir alternatifi olabilmektedir.

Anahtar Kelimeler: Abdominal aort anevrizması, acil müdahale protokolü, endovasküler aort tamiri, stent greft, tip 3 endovasküler aort onarım rüptürü

Endovascular aortic repair (EVAR) is considered the mainstay of therapy for abdominal aortic aneurysms (AAA). It is shown to be associated with less perioperative risks compared to open aortic surgery¹; yet, it carries a life-threatening risk in both the perioperative and late periods, such as endoleaks, endotension, stent migration, limb occlusion, and stent rupture.² Rupture is a rare but serious complication after EVAR since rupture may result in hemorrhagic shock within minutes. Endovascular repair is associated with improved likelihood of survival in the early period. However, the risk of late complications, especially rupture, increases with endovascular repair, though long-term mortality is not significantly different between the 2 groups.^{1,3} In case of late aortic rupture after EVAR, open surgical aortic repair is more commonly opted for, especially if there is hemodynamic instability and hemorrhagic shock. Although there is not much evidence on which procedure is associated with reduced mortality for the

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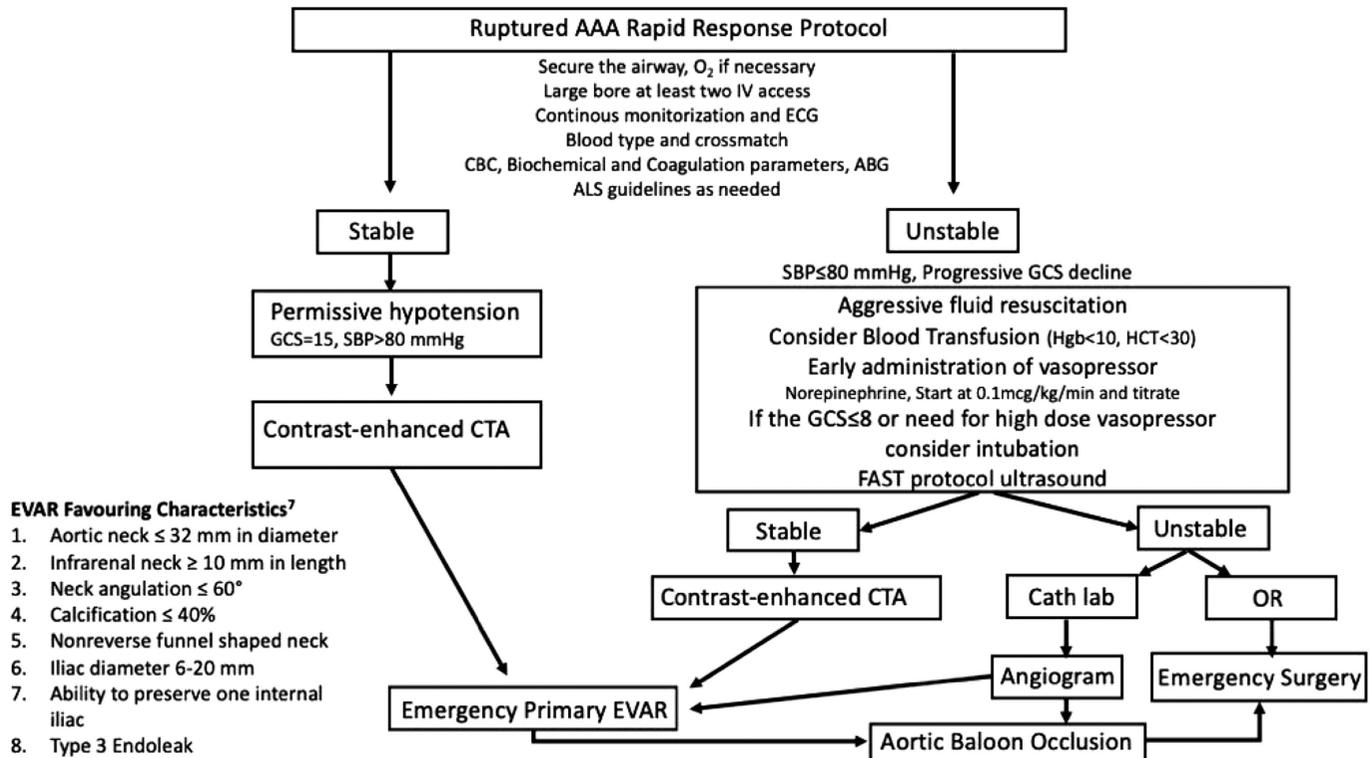


Figure 1. Rapid response protocol for the ruptured abdominal aortic aneurysm. AAA, abdominal aortic aneurysm; ABG, arterial blood gas; ALS, advanced life support; CBC, complete blood count; CTA, computed tomography angiography; EVAR, endovascular aneurysm repair; FAST, focused assessment with sonography for trauma; O₂, oxygen; OR, operating room; IV, intravenous; ECG, electrocardiogram; GCS, Glasgow Coma Scale; HCT, hematocrit; Hgb, hemoglobin; SBP, systolic blood pressure.

repair of late aortic rupture after EVAR, Mehta et al⁴ reported similar mortality rates for EVAR and open repair. Moreover, this article presents a case with hemorrhagic shock because of the rupture after EVAR was repaired with the rapid response primary endovascular technique.

Case Report

A 65-year-old male patient who underwent EVAR 3 years ago was admitted to the emergency department with abdominal pain and hemorrhagic shock. Femoral artery pulses of the patient were not present on palpation; thus, aortic rupture was suspected. The patient was orotracheally intubated due to the regression of the Glasgow Coma Scale score and started on vasopressor support (norepinephrine was titrated 0.5 µg/kg/min) and aggressive fluid, erythrocyte suspension, and fresh frozen plasma resuscitation. Subsequently, a contrast-enhanced computed tomography angiography (CTA) was performed, and it showed secondary EVAR endoleak, confirming the initial diagnosis. The cardiology and cardiovascular surgical emergency council evaluated the surgical risk of the patient as being high due to obesity, severe obstructive sleep apnea, and dual antiplatelet use due to a transient ischemic attack 4 months ago. Thus, the

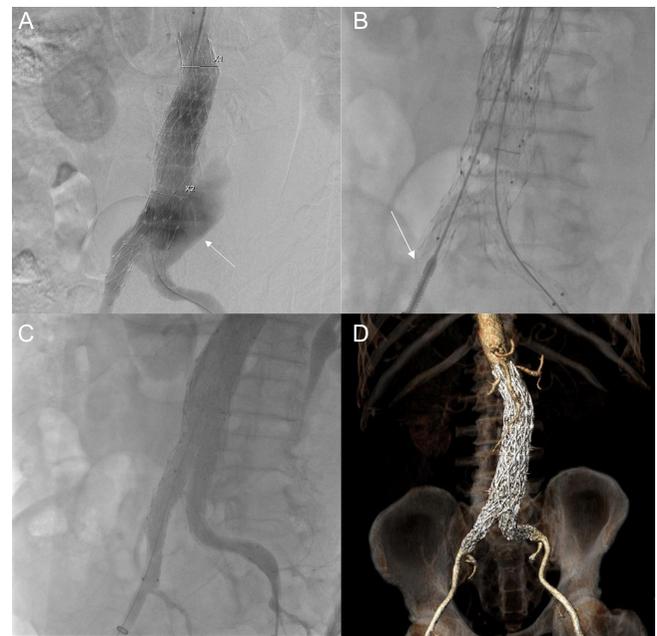


Figure 2. A-D. EVAR procedure angiograms. (A) Aortography of abdominal aorta (arrow: distal abdominal aorta/post-EVAR rupture and extravasation) (B) aortography of distal abdominal aorta and bifurcation (arrow: stent insertion via right femoral artery); (C) control aortography showing no extravasation; (D) control aortography 3D reconstruction with computed tomography angiography showing no extravasation.

ABBREVIATIONS

AAA	Abdominal aortic repair
CT	Computed tomography
EVAR	Endovascular aortic repair

decision of rapid response primary endovascular repair was made according to the rapid response protocol (Figure 1). The size and model information of the existing stent was not available in the patient's previous records. The patient was urgently taken to the angiography laboratory. Both femoral arterial sheaths were placed. Aortography demonstrated distal aortic graft rupture and extravasation of contrast media into the abdomen (Figure 2A). First, a 36 × 36 × 49 mm (Endurant II, Medtronic, Minneapolis, Minn, USA) stent graft was implanted to the left graft limb, but the extravasation persisted. A bifurcated system was opted for because of the persistence of bleeding. The 25 × 16 × 145 mm main body was inserted first via the right femoral artery (Figure 2B). The main body of the device was positioned and implanted immediately below the renal arteries. Then, the left limb was catheterized and a 16 × 24 × 124 mm stent graft was implanted. Control aortography was done, and it showed no extravasation of contrast media (Figure 2C).

After the stabilization was maintained at the coronary intensive care unit, a control abdomen CT was performed. A retroperitoneal hematoma was detected at the distal part of the abdominal aorta. Foley catheter-assisted abdominal pressure measurement was conducted on the advice of the general surgery consultant, and the intra-abdominal pressure was 22 mmHg. Since there was urine output, no new organ failure, and the rupture was repaired with percutaneous intervention, an abdomen CT-guided percutaneous drainage catheter was placed by interventional radiology. In the hospital follow-up, the hemodynamic situation of the patient improved very quickly, and the patient was discharged after 5 days. CTA demonstrated full recovery of abdominal aorta (Figure 2D). At 1-year follow-up, control CTA showed an intact lumen and no complaints were recorded.

Discussion

Despite being the most accepted and used treatment modality, EVAR still carries complications such as limb occlusion, endoleaks, and most importantly, rupture. The endoleaks can be classified variously. The most common one is based on chronological data. If the leak appears in the first 30 days, it can be named as "primary endoleak"; however, it can be classified as "secondary endoleak" after 30 days. A classification system based on the anatomical location of the rupture was suggested by White et al.⁵ According to this system,⁵ type 3 is defined as the structural failure of the graft. It can occur due to the stent's fabric tears, strut fracture, or any component's failure. Due to the direct connection between the aortic lumen and the aneurysm chamber, high-pressurized blood flow can lead to rupturing the aneurysm wall and could result in a fatal shock.⁶ In this case, the left graft limb was initially stented due to the suspicious rupture nidus. Among the possible reasons for the persistent leak could be incomplete stent coverage of the lesion, suture breakage, fabric tear, and insufficient implantation technique.

The rapid response protocol is adopted in collaboration with a multidisciplinary approach. Emergency and anesthesiology physicians should be part of the procedure. The aim of the protocol is correct diagnosis and fast treatment due to the AAA rupture. The algorithm is mainly based on Moore et al's⁷ work, which has been enhanced according to our institution's need. According to their risk-stratified analysis,⁷ and a meta-analysis,⁶ EVAR could

be a crucial solution in terms of AAA ruptures when compared with open surgery, through the minimal-invasive interventional era. If the lesion has favorable characteristics (Figure 1) for percutaneous intervention, EVAR should be the choice of the treatment and the rapid response algorithm could be the solution.

The overall complication rate requiring intervention after a successfully completed EVAR is reported to be 15%.¹ Endoleak or rupture is a medical condition associated with high mortality unless immediate treatment is delivered. As the number of patients treated with EVAR increases cumulatively, follow-up of those patients and treatment of post-interventional complications will gain popularity. Currently, most of the post-EVAR rupture patients undergo open surgical repair. On the other hand, there is no sufficient data about the percutaneous management of late-onset endoleaks. This report, along with few others,^{8,9} demonstrates the efficacy of percutaneous treatment of post-EVAR aneurysm ruptures, even in case of hemorrhagic shock using EVAR. For the high-risk patients, who are not likely to benefit from an open surgery repair of post-EVAR rupture, endovascular repair can be considered as an alternative method.

Furthermore, our report differs from others in that it includes retroperitoneal hemorrhage management and an enhanced rapid response protocol. This report provides an excellent illustration regarding the importance of an interdisciplinary approach. Therefore, our approach could pave the way for conducting further studies comparing the efficiencies of open surgery and EVAR for post-EVAR rupture management in the future.

Conclusion

Emergency primary stent grafting using a rapid response protocol could be a life-saving alternative to open surgery for late endoleaks, which are complicated with hemorrhagic shock.

Informed Consent: Written informed consent was obtained from the patient who agreed to take part in the study.

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Figure 1 is adapted from Moore et al⁷ after receiving permission from the authors.

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