

Aortic Emergency: A Team Approach

One institution's experience in establishing a systematic, standardized, protocol-driven approach to management of ruptured abdominal aortic aneurysms.

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Since the first published report of ruptured endovascular aneurysm repair (rEVAR) by Yusuf and colleagues in 1994,¹ there has been much debate on optimal strategies for managing ruptured abdominal aortic aneurysms (rAAAs) and other aortic emergencies. There have been hundreds of publications that focus on a better definition of the new gold standard for managing rAAAs, ranging from single-center and multicenter experiences to large national databases, meta-analyses, prospective randomized trials, and even a comprehensive textbook, *Ruptured Abdominal Aortic Aneurysm—The Definitive Manual*.² The evidence indicates that EVAR of rAAA reduces patient morbidity and mortality when compared to open surgical repair.

Early in my experience, I realized that there were limitations in our ability to adopt endovascular technology for aortic emergencies, including experienced operators to perform rEVAR, dedicated operating room (OR) and ancillary staff equipped to perform emergent EVAR at all times, availability of off-the-shelf stent grafts, availability of emergent preoperative CTA that was necessary for stent graft sizing, and our inability to create a seamless transition of rAAA patients from the emergency room (ER) to the OR for rEVAR. The creation of a systematic, standardized, protocol-driven approach in managing all aortic emergencies was one of the most critical steps that changed the landscape in our institution. With a standardized approach in place, both large and small institutions across the world can participate in and accept the changing paradigm for managing rAAAs.

OUR INSTITUTION'S EXPERIENCE

Similar to several other early adopters of rEVAR, in 2001, we recognized that a systematic, standardized protocol was crucial in improving our outcomes, and we established a multidisciplinary approach for treating all patients with rAAAs. This included participation of

vascular surgeons, ER staff, anesthesiologists, OR staff, and radiology technicians; the availability of a variety of stent graft sizes and types; and having an OR that was adequately equipped to perform endovascular and open surgical procedures.³ We also established treatment algorithms for rAAAs and rehearsed modus operandi with all the ER physicians, anesthesiologists, and all designated OR staff, including radiology technologists who would participate in rEVAR. In doing so, we established their interest in understanding the implications of emergent diagnosis and treatment in this setting. Because a patient with an rAAA can present at any time, we rehearsed the procedure with staff who worked through the morning, evening, and night shifts. Each unit (or team member) within the system had distinct leadership roles that empowered them to stay engaged at a highest professional level. There were several critical steps:

1. Delays in rAAA diagnosis had long been the Achilles heel for poor patient outcomes, regardless of the type of repair. We recognized that a crucial element to early diagnosis included training the ER staff as well as emergency medical technicians who were the first responders and first touch point for diagnosing rAAAs. The educational process for emergency medical technicians focused not only on the didactics of rAAA diagnosis and treatment, but also allowed them to witness the rEVAR procedures and get feedback from patients. We found that this was a critical step in their understanding of their impact on the patient.
2. Nearly 30% to 50% of rAAA patients are initially misdiagnosed in the ER with more commonly seen pathologies, such as renal colic, diverticulitis, and mechanical back pain. ER staff education focused on rAAA awareness and the impact of early versus delayed diagnosis, as well as on simple bedside ultrasound evaluation that could easily detect the

presence of an AAA. Establishing a standardized approach in the ER allowed physicians to diagnose rAAAs and also triage patient care directly to imaging and the OR without necessarily waiting for a vascular surgeon to make the decision.

3. The OR staff, including the anesthesiologists, were trained to understand the rAAA treatment strategy, whether it was EVAR or open surgical repair. The patient and procedure throughput, including OR setup, fixed or mobile imaging setup, and availability of equipment, including wires, catheters, and stent grafts, were well rehearsed.
4. The physician operators were experienced and well rehearsed in a standardized operative approach to all rAAAs. Although rAAA shape and size may differ, the steps to hemorrhage control are essentially the same. Managing hemodynamically stable rAAA patients could be fairly straightforward, but the unstable patient requires an experienced operator, and this still remains one of the biggest challenges to the entire system. For this process to work, everyone has to have buy-in and either become comfortable in performing rEVAR or a backup surgeon/interventionist needs to be available for challenging cases.
5. The learning process for the rEVAR protocol in itself is not necessarily arduous for individuals; rather, the hospital/institution structure presents some barriers. Involvement of multidisciplinary teams requires routine meetings and sharing of ideas, and the staff turnover requires scheduled time for periodic educational meetings for staff leaders to revisit topics pertinent to rAAA protocols.

LESSONS LEARNED AND THE ROAD AHEAD

It would be fair to say that rEVAR has become the gold standard for rAAAs and is associated with significant reductions in patient morbidity and mortality when compared to open surgical repair of rAAAs. A decade ago, fewer than 10% of rAAA patients underwent rEVAR, and regionalization of care to “large-volume aortic centers” might have been more valuable. However, with increasing operator experience in managing aortic emergencies and evidence suggesting that surgeon case volume, not institution case volume, is the primary determinant of in-hospital AAA mortality, it is likely that the best care for rAAA patients will be offered at hospitals (large or small) that focus on skilled operators and developing a systematic, standardized, protocol-driven approach for managing rAAAs.

Personally, I have had experience in establishing a standardized, protocol-driven approach at both

large tertiary medical centers and smaller community hospitals. To establish the best aortic practice, the focus should be on providing the highest-quality care for patients. This requires a multidisciplinary team approach (inclusive of ER, OR, anesthesia, critical care, and advanced imaging), a systematic standardized protocol, and experienced surgeons and/or interventionists with advanced skill sets who are committed to achieving great outcomes. I have found the education process and the ability to establish a standardized multidisciplinary approach are similar regardless of the institution.

With this approach, over the past year, we started a complex aortic program at a community hospital and have performed nearly 100 endovascular abdominal and thoracic aortic procedures (90% elective and 10% emergent) that include complex arch and thoracoabdominal aortic dissections and rupture, with a 30-day mortality of 0%. The two essential elements for success include skilled operators and a well-rehearsed team.

SUMMARY

The majority of elective and emergent aortic procedures are already performed by endovascular means. With appropriate infrastructure and supervision that focuses on skilled operators and a standardized team approach, complex elective and emergent aortic intervention can be achieved with much success. ■

1. Yusuf SW, Whitaker SC, Chuter TA, et al. Emergency endovascular repair of leaking aortic aneurysm. *Lancet*. 1994;344:1645.

2. Starnes BW, Mehta M, Veith FJ, editors. *Ruptured Abdominal Aortic Aneurysm: The Definitive Manual*. New York: Springer; 2017.

3. Mehta M, Taggart J, Darling RC III, et al. Establishing a protocol for endovascular treatment of ruptured abdominal aortic aneurysms: outcomes of a prospective analysis. *J Vasc Surg*. 2006;44:1-8.

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