Endovascular Repair of Ruptured Descending Thoracic Aneurysms

Recent literature supports a TEVAR-first approach for this rare, life-threatening condition.

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The rupture of a thoracic aortic aneurysm (TAA) is a relatively rare medical entity with an incidence of only five per 100,000.[1] A ruptured TAA is a life-threatening condition; most patients will die before even reaching the hospital, and the overall mortality rate is reported to be no less than 90%.[1]

Thoracic aneurysms in the descending aorta, which account for 30% of all thoracic aneurysms, are traditionally managed by open repair.[1] The open repair of a ruptured descending thoracic aortic aneurysm (rdTAA)—wherein a thoracotomy is followed by surgical resection and interposition of a Dacron graft—is associated with high mortality and morbidity rates.[2,3] Presently, however, thoracic aortic aneurysm repair (TEVAR) is shown to be an alternative for open repair of rdTAAs (Figures 1 and 2).[4,5] The potential benefits of endovascular repair are evident: mortality and morbidity rates associated with endovascular procedures are lower compared to those of open repair. Moreover, patients that are considered unfit for open repair can often be managed by endovascular therapies. The purpose of this article is to give an overview of the results of TEVAR for the treatment of rdTAAs and to compare these to the results of open repair.

WHAT DATA SUPPORT TEVAR FOR RDTAA?

An overview of the results of TEVAR for rdTAA repair was published in June 2010 in *Circulation*.[6] The results of 87 rdTAA patients, with a mean age of 70 years and a mean thoracic aneurysm diameter of 54 mm treated with TEVAR in seven vascular referral centers, were analyzed in this study.

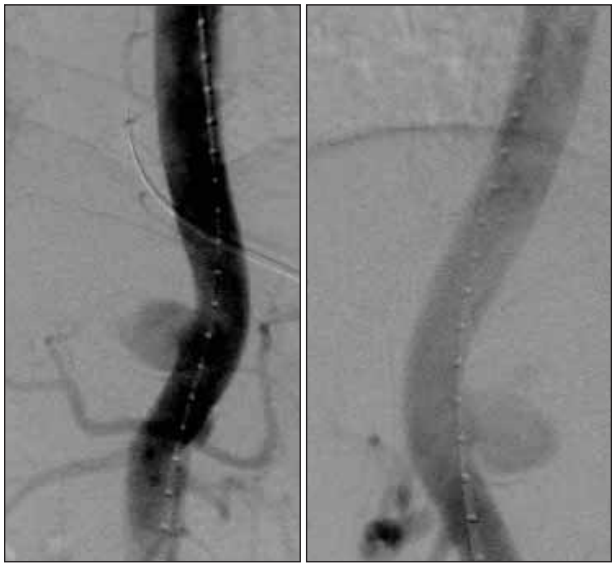

Figure 1. Two preoperative angiographic views of a ruptured descending aorta.

At presentation, 20% of the 87 rdTAA patients were in hypovolemic shock, 40% were hemodynamically unstable, 37% were diagnosed with a contained rupture, and a hemothorax was present in 42% of the patients. Endovascular access could be obtained through the femoral artery in 90% of the cases, and in the remaining 10% of the cases, an iliac conduit or the distal abdominal aorta was used for vascular access. The rdTAA was successfully excluded endovascularly in 95% of the cases, and the mean diameter of the stent grafts used was 38 mm, while a mean aortic length of 116 mm was covered. Coverage of the left subclavian

artery was required in 38% of patients, and stenting over the celiac artery occurred in 6% of the patients.

The 30-day mortality rate after TEVAR for rdTAAs in this group was 18% (n = 16), and multiorgan failure and cardiac failure were responsible for 50% of these deaths. A periprocedural stroke was seen in 8% (n = 7) of the patients, and the postoperative paraplegia rate was 8%. Endoleaks were noted in 18% (n = 16) of the cases, of which 10 were type I endoleaks, five type II endoleaks, and one type III endoleak.

The median follow-up of included patients that survived the first 30 days was 13 months (range, 1–72 months). Four additional patients died during follow-up due to TAA- or TEVAR-related complications. One patient died due to a poor general condition developed after TEVAR, a second patient died from sepsis due to a persistent aortoesophageal fistula, and two additional patients died from sepsis caused by an infected stent graft. Twelve other patients died during follow-up from causes unrelated to TEVAR or TAA. The estimated aneurysm-related mortality rate was 25% at 4 years. Thoracic reinterventions during follow-up were required in 11 patients, of which eight were needed to repair a type I endoleak, one to repair an aortoesophageal fistula, and two to solve further aneurysmal dilatation of the thoracic aorta without evidence of endoleak.

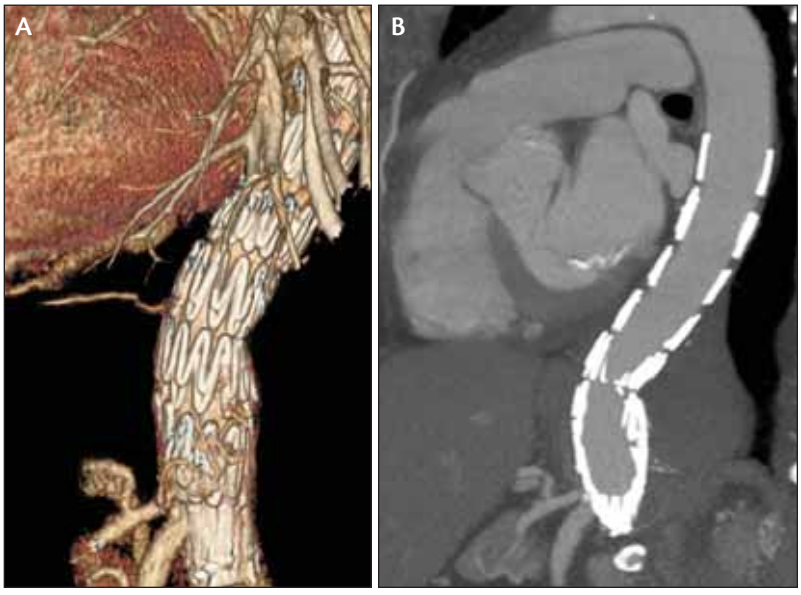

Figure 2. Postoperative images of the same patient in Figure 1. Three-dimensional reconstruction of the aorta (A). Sagittal view of the aorta (B). It can be clearly seen that the celiac trunk and superior mesenteric artery are still open.

The results of this patient group have been retrospectively compared to the results of rdTAA patients treated with open repair.[7] A total of 161 patients with rdTAAs were included for this study, of which 92 were treated with TEVAR and 69 with open repair. A composite endpoint of death, stroke, or permanent paraplegia was used for this study. This endpoint occurred in 36% of the patients of the open repair group, whereas this endpoint occurred significantly less in the TEVAR group (22% of patients). The 30-day mortality rate was 25% after open repair and 17% after TEVAR, but this difference was not statistically significant. The aneurysm-related survival rate of patients treated with open repair was 64% at 4 years compared with 75% for patients treated with TEVAR. The investigators concluded after this analysis that the endovascular repair of rdTAAs was associated with a lower risk of a composite of death, stroke, and paraplegia when compared to traditional open repair.[7]

The same investigators also published a meta-analysis of the literature evaluating the outcomes of TEVAR and open repair for rdTAA patients.[8] In their analysis of 224 rdTAA patients, of whom 143 (64%) were treated endovascularly, the 30-day mortality rate after TEVAR was significantly lower than after open repair (19% vs 33%). Although the paraplegia, myocardial infarction, and stroke rates were lower after TEVAR than after open repair, these differences failed to reach statistical significance. During follow-up after TEVAR, five patients died from aneurysm-related causes. The investigators concluded that the endovascular repair of rdTAA was associated with a significantly lower 30-day mortality rate compared with open repair. TEVAR was, however, associated with a considerable number of aneurysm-related deaths during follow-up.

Taking the results of these studies into account, it seems that endovascular repair of an rdTAA is associated with a significantly lower 30-day mortality rate when compared with conventional open repair.[7,8] Patients treated by open rdTAA repair also appear to suffer more frequently from paraplegia, myocardial infarction, and stroke, although this difference is not statistically significant. TEVAR, on the other hand, is associated with a considerable number of reinterventions and aneurysm-related deaths during follow-up. Continued surveillance after TEVAR in rdTAA patients and further optimization of stent grafts and the TEVAR technique is therefore required.

> " . . . TEVAR appears to be the preferred treatment method for anatomically suitable patients with an rdTAA at least in the short term."

CONCLUSION

TEVAR appears to be the preferred treatment method for anatomically suitable patients with an rdTAA at least in the short term. It is unlikely that a randomized controlled trial of TEVAR versus open repair for rdTAAs will be undertaken. Therefore, the best evidence available is likely to remain large case series such as those alluded to in this article. Practice patterns have already changed significantly across the country with a favored endovascular approach to this difficult problem, and the data are now catching up to support an endovascular-first approach. ■

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