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Does This Study Make My Aorta Look Fat?

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A trip to the mall can rapidly become a nightmare with the question “does this [garment] make my [anatomical part] look fat?” An affirmative answer risks grueling days in the doghouse. A negative answer invites intense scrutiny for evidence of insincerity. Diplomacy dictates a measured approach of watchful waiting, preferably from a safe distance out of earshot.

However, this adverse event in a relationship pales into insignificance compared to a sudden rupture or dissection of the thoracic aorta. The incidence of acute aortic events is about 1% of the rate of myocardial infarction, but at least one-half of patients die suddenly - frequently before reaching a hospital¹. These figures are only rough estimates, because in the era of low autopsy rates, many cases of sudden death due to acute aortic events are probably attributed to acute coronary syndromes.

Among survivors to hospital, acute rupture in any location or dissection involving the ascending aorta (Stanford Type A) are almost universally fatal without surgical repair. Patients with acute dissection limited to the descending thoracic aorta (Stanford Type B) do better with medical therapy to control blood pressure, heart rate, and pain. Repair of Type B dissection is warranted for organ malperfusion, or for aneurysmal dilation of the aorta during follow-up¹.

Over the last two decades, observational studies show that the majority of acute thoracic aorta events relate to previously asymptomatic thoracic or thoracoabdominal aortic aneurysms². In asymptomatic patients, it is the size of the aortic aneurysm that is critical to determining the risk of a future acute aortic event. Current US and European guidelines for asymptomatic aneurysms of descending thoracic/ thoracoabdominal aorta define the criteria for surgical repair based on maximum aortic diameter. Patients without syndromic defects (e.g. Marfans syndrome), and an aortic diameter greater than 55 mm^{1, 3} or with an

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annualized growth rate of > 5 mm per year¹ should be offered thoracic endovascular aortic repair (TEVAR)^{1,3}. The US and European guidelines differ slightly on thresholds for patients who are only suitable for open surgical repair. US guidelines suggest open surgical repair for diameters greater than 55 mm, unless they have significant comorbidities, in which case a diameter greater than 60mm is recommended¹. The European guidelines suggest a threshold of greater than 60mm for open surgical repair regardless of comorbidities³.

For patients with diameters or growth rates less than these values, surveillance with imaging is recommended either annually (diameter 35–44 mm) or semi-annually (diameters 45–55 mm)¹. These guidelines are based on two pieces of evidence. First, the annual rate of death from acute aortic events in non-syndromic patients with diameters less than 55 mm is about 5%, and equals or is less than the peri-operative mortality associated with open surgical or TEVAR repair¹. Second, although there are no randomized trials of surveillance versus repair in small thoracic aneurysms, randomized trials of open and endovascular repair of asymptomatic *abdominal* aortic aneurysms in the 40–55 mm range show no benefit from repair compared to close surveillance⁴.

However, advances in anesthesiology, endovascular repair, open surgical repair, and imaging warrant a serious look at the validity of the current guidelines. The observational study by Sundt in this issue of *Circulation* is therefore appropriate and worthy of attention⁵. The authors identified patients with descending thoracic/ thoracoabdominal aortic aneurysms from a database in their specialty service at their institution. After excluding secondary causes of aneurysms (75% of patients), they evaluated the prognosis of small (40 – 55 mm) and large (> 55 mm) thoracic aneurysms, using case definitions of definite aortic events (confirmed rupture or dissection) or possible aortic events (definite events or unexplained or unwitnessed sudden death). Their analysis seeks to question whether aneurysms below the current threshold of repair should be repaired prophylactically.

Their study combines two groups. First, 103 patients who met the current guidelines for repair based on the size of their aneurysm, but either refused surgery or were declined surgery due to prohibitive surgical risk. These patients represent 15% of subjects with a surgical indication for repair (see Figure 1 in Sundt, et al). The second group was 154 patients without a surgical indication for repair and who had baseline diameters ≤ 55 mm or low growth rates. It is this latter group who provide insight into the question of whether we should lower the threshold for repair.

Sundt et al, show that in the subgroup of patients who met current recommendations for repair, outcomes were poor with 23% having a definite or possible aortic event and another 61% having elective repair of their aneurysm. Only 16% of this subgroup were free of these events over a median 14 months⁵. These results are consistent with older studies that led to the current guidelines.

However, in the 154 patients who did not meet current criteria for repair, they found 7 subjects (5%) who subsequently had a definite or possible aortic event. Four of these subjects had an event within 1 year of their initial assessment. The remaining 95% of

subjects either had elective repair for progressive dilation or were event free. This result seems to support the current guidelines which recommend against prophylactic repair in patients with aneurysms 40 – 55 mm in diameter¹. The guideline is based on the mortality equivalence of continued surveillance versus aneurysm repair from other studies (mortality of about 5%)¹, and is also consistent with the mortality for elective repair in Sundt, et al (4.6%)⁵.

Sundt et al, try to make a case for lowering the threshold for elective repair of thoracic aneurysms based on several of findings. First, they show that the rate of possible aortic events for subjects with maximum diameters between 50 to <60 mm was higher than aneurysms < 50 mm (see Figure 3). However, this groups patients with known elevated risk of an event (>55 mm) with some small aneurysms (50–55 mm) below the current threshold. Second, they show an elevated risk of possible events in patients with aneurysms 50 to < 55 mm (see Figure 4), and an increased risk above 52 mm using curves developed from statistical modeling (See Figure 5 and 6).

However, their data supplement (online) raises some doubts to these findings. Supplemental Figure 2 suggests that the risk of a definite aortic events is still very low in patients with aneurysms 50 to < 55 mm and equivalent to lower diameters where the risks of an event are about half the operative mortality from repair. Details on the possible events in their supplemental table shows that 5 of the 7 subjects with small aneurysms (< 55mm) had repeat imaging prior to their aortic event. In all 5 subjects, the second CT angiogram showed that the aorta had progressed to > 55 mm where surgery would be recommended. Furthermore, the subsequent events occurred between 2 and 139 months after the second imaging test – arguably an adequate window of time to organize elective repair.

So in summary, the data provided by Sundt, et al, support the current guidelines for large descending thoracic/thoracoabdominal aneurysms (> 55 mm), which should be repaired where possible due to the high risk of adverse aortic events. However, their data also support the current guidelines for small aneurysms (less than 55 mm) with watchful waiting and surveillance CT or MR angiography at appropriate intervals¹. Their data suggests that once the maximum diameter is over 55 mm, elective repair should be organized promptly as events can occur within several months.

Of course, a randomized controlled trial in small descending thoracic and thoracoabdominal aortic aneurysms would help resolve the question of whether lowering the threshold of aortic size for elective repair leads to less mortality and morbidity from this catastrophic disease. The feasibility of a trial is open to debate. In the meantime, asymptomatic descending thoracic/thoracoabdominal aortic aneurysms with a maximum diameter less than 55 mm are not “too fat”. They do require close surveillance with watchful waiting to see if they progress beyond this threshold where TEVAR or open surgical repair more likely lead to net benefits.

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