Indications for Ascending Aortic Replacement
Size Alone Is Not Enough*

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Literature over the last 2 decades has progressively lowered the threshold for ascending aortic replacement at the time of aortic valve replacement. Current American College of Cardiology (ACC)/American Heart Association (AHA) guidelines recommend replacing the ascending aorta at the time of aortic valve replacement if the ascending aorta is more than 5.0 cm in any patient or if the ascending aorta is more than 4.5 cm in bicuspid patients (1). Yet, despite the simplicity of these guidelines, many factors play a role in determining the indications for ascending aortic replacement to prevent ascending aortic complications. In addition to increased absolute aortic diameter, observed to expected aortic diameter ratio (2), genetics (3), rate of aortic expansion (2,3), body size (1,3,4), smoking (5), and hypertension (5) have been demonstrated to be influential.

The bicuspid aortic valve is known to be a phenotype associated with many genotypes, some of which are considered to be “connective tissue” disorders (3,6). For a given ascending aortic diameter, the presence of a bicuspid aortic valve has been associated with increased risk of aortic complications relative to a tricuspid aortic valve (3). In other words, the presence of a tricuspid aortic valve would be expected to have less risk of aortic complications than a bicuspid valve of the same diameter.

The work by Gaudino et al. (7), in this issue of the Journal, is one of the few studies to examine the natural history of the ascending aorta in patients with tricuspid aortic valves. Only a few small reports have provided outcome data for patients with enlarged ascending aortas in the absence of either Marfan syndrome or bicuspid disease (8,9). Michel et al. (9) noted that in patients undergoing aortic valve replacement alone for degenerative aortic regurgitation with an ascending aorta of more than 4.0 cm, 25 of these patients subsequently required ascending aortic replacement.

Most studies have focused on the size threshold for complications for patients with Marfan syndrome, bicuspid patients (6,10), or mixed populations that include bicuspid valves (4,5,11). In fact, studies cited to justify the replacement of aortas larger than 5.0 cm all examined mixed populations that included bicuspid valves (1,3,5,12,13). Other studies of mixed bicuspid and tricuspid populations still found 6.0 cm to be the point at which risk of aortic complications increases dramatically in unoperated patients (3,13).

Gaudino et al. (7) provide convincing data that at least some patients with a tricuspid aortic valve and an ascending aortic diameter of 5.0 to 5.9 cm can have the ascending aorta left alone during aortic valve replacement, contrary to ACC/AHA guidelines (1). In 93 consecutive patients undergoing isolated replacement of a tricuspid aortic valve with a 5.0 to 5.9 cm ascending aorta left intact, no patient suffered an aortic complication or significant aortic enlargement over a mean follow-up of 14 years. The researchers concluded that the increase in operative risk related to ascending aortic replacement does not appear justified in patients with moderate post-stenotic dilation (<6.0 cm) of the ascending aorta in the absence of connective tissue disease.

The data of Gaudino et al. (7) do have limitations. The fact that only 93 patients came to surgery with aortas of 5.0 to 5.9 cm, whereas 381 patients came to surgery with aortas >5.9 cm suggests a referral bias in which patients with aortas of less than 6.0 cm were less likely to be referred for surgery. We do not know how many patients with aortas of 5.0 to 5.9 cm ruptured their aortas without referral to surgery in this referral network. Furthermore, we do not know if patients in the study by Gaudino et al. (7) might have been larger, if there might have been more men, or if the patients were less likely to have aortic regurgitation than other series, making aortic sizes respectively larger. Nonetheless, it is remarkable and important that none of the 93 patients who did have surgery for aortas 5.0 to 5.9 mm ever developed an aortic complication, and none ever needed aortic replacement.

One could also question the assumption of Gaudino et al. (7) that addition of ascending aortic grafting adds significant risk to an aortic valve replacement. The risk of aortic valve replacement alone may be 1% to 5%, whereas the risk of aortic valve replacement with ascending aortic grafting has similarly been reported at 2.5% to 5% (6). Thus, failing to graft the ascending aorta at the time of aortic valve replacement only makes sense if the risk of leaving the ascending aorta alone is less than approximately 3% (the difference between aortic valve replacement without vs. with aortic grafting). In the current study, the risk of leaving the ascending aorta alone was 0 of 93 (0%), which would have a 95% confidence interval of 0.0% to 3.5%. In short, this study, as large as it were, is marginally powered to demonstrate at a 95% confidence level that the risk of leaving the

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ascending aorta alone is <3%. The ability to achieve a 0 of 93 (0%) mortality by leaving the ascending aorta alone does, however, suggest that further study is warranted. Clearly these data will need to be confirmed by other investigators. Yet the article is important in adding new data from a reasonably sized series with excellent follow-up. Should the results of Gaudino et al. (7) be confirmed, then ACC/AHA guidelines should be made more specific regarding different patient groups (e.g., Marfan, bicuspid, tricuspid), as in Table 1 (2). Other disease etiologies (such as degenerative aortic regurgitation or chronic dissection) might require more or less aggressive approaches than the 3 etiologies in Table 1 (2,9).

Thus, evidence supports the contention of Gaudino et al. (7) that size alone is not enough to indicate replacement of the ascending aorta in many patients with aortas of less than 6.0 cm in diameter. Other factors such as disease etiology, genetics, rate of enlargement, body size, hypertension, quality of the aorta itself, and concurrent indication for cardiac surgery all must be considered. Guidelines are just guidelines. Guidelines need to be applied to individual patients by knowledgeable physicians.

**REFERENCES**


**Key Words:** aneurysm • aorta • surgery.