

# Q: Does a systolic murmur heard in the aortic area need to be further evaluated prior to elective surgery?

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**A:** The decision to further evaluate a systolic murmur heard in the aortic area by transthoracic echocardiography prior to surgery should depend on the available clinical information and the cardiovascular risk associated with the surgical procedure. An isolated systolic murmur in the aortic area can be due to either aortic stenosis or aortic sclerosis, or it can be functional.

## Aortic stenosis needs to be identified prior to elective noncardiac surgery

Aortic stenosis (AS) occurs in about 2% of adults 65 years of age or older.<sup>1</sup> Severe AS poses a high risk for complications in patients undergoing noncardiac surgery, with an approximate mortality rate of 10%.<sup>2</sup> Patients with severe AS have symptoms of angina, heart failure, and effort syncope. Physical examination findings that are helpful in establishing the presence of significant AS include delayed carotid upstroke, mid-to-late peaking of murmur intensity, and decreased intensity of the second heart sound. Absence of radiation of the systolic murmur to the right carotid artery rules out significant AS.<sup>3</sup> The **Table** (see next page) presents the various likelihood ratios for these findings.<sup>3</sup>

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It is important to identify patients with AS, since risk reduction strategies can be instituted perioperatively.

## What other conditions are responsible for similar systolic murmurs?

**Aortic sclerosis** produces a systolic ejection murmur in the aortic area. It is more common than AS, occurring in 26% of adults older than age 65.<sup>1</sup> In contrast to AS, in aortic sclerosis there is no fixed aortic outflow tract obstruction, so the second heart sound and the carotid pulses are preserved. Patients with aortic sclerosis can undergo surgery safely without complications.

**Functional murmurs** caused by anemia, hyperthyroidism, or fever result from augmentation of blood flow through a structurally normal aortic valve.

## The decision to obtain a TTE should be individualized

If AS is suspected in a *symptomatic* patient, a transthoracic echocardiogram (TTE) is warranted, regardless of the risk of the surgical procedure. At this point, the focus is primarily on treating the aortic valve disorder, and the surgery has to be delayed.

If AS is suspected in an *asymptomatic* patient undergoing a *low-risk* surgical procedure under local anesthesia, it is reasonable to proceed with surgery without a preoperative TTE. In a retrospective analysis of 48 patients with known severe AS who were

**TABLE**  
Accuracy of the physical examination for detecting aortic stenosis

Finding	Reference standard (no. of patients)	Positive likelihood ratio* (95% CI)	Negative likelihood ratio† (95% CI)	Quality grade
Slow rate of rise of carotid pulse				
Study 1	Cardiac catheterization (781)	130 (33–560)	0.62 (0.51–0.75)	A
Study 2	Cardiac catheterization (231)	2.8 (2.1–3.7)	0.18 (0.11–0.30)	C‡
Study 3	Cardiac catheterization (106)	6.4 (0.8–45)	0.73 (0.59–0.90)	C
Timing of peak murmur intensity				
Late peaking	Cardiac catheterization (781)	101 (25–410)	0.31 (0.22–0.44)	A
Mid peaking	Cardiac catheterization (106)	8.0 (2.7–23.0)	0.13 (0.07–0.24)	C
Decreased intensity or absent second heart sound				
Study 1	Cardiac catheterization (781)	50 (24–100)	0.45 (0.34–0.58)	A
Study 2	Cardiac catheterization (231)	3.1 (2.1–4.3)	0.36 (0.26–0.49)	C‡
Apical carotid delay	Cardiac catheterization (44)	∞ (2.4–∞)	0.05 (0.01–0.31)	C
Brachioradial delay	Echocardiogram (58)	6.8 (3.2–14.0)	0.0 (0.0–0.3)	C
Fourth heart sound	Cardiac catheterization (781)	2.5 (2.1–3.0)	0.26 (0.14–0.49)	A
Presence of any murmur	Cardiac catheterization (781)	2.4 (2.2–2.7)	0.0 (0.0–0.13)	A
Reduced carotid volume				
Study 1	Cardiac catheterization (231)	2.3 (1.7–3.0)	0.31 (0.21–0.46)	C‡
Study 2	Cardiac catheterization (106)	2.2 (1.2–4.2)	0.39 (0.22–0.69)	C
Radiation to right carotid				
Study 1	Cardiac catheterization (781)	1.4 (1.3–1.5)	0.10 (0.13–0.40)	A
Study 2	Cardiac catheterization (231)	1.5 (1.3–1.7)	0.05 (0.01–0.20)	C‡
With Valsalva maneuver intensity is decreased	Cardiac catheterization (50)	1.2 (0.8–1.6)	0.0 (0.0–1.6)	C

\* The applicable likelihood ratio when the finding is present. CI indicates confidence interval.

† The applicable likelihood ratio when the finding is absent.

‡ Grade A study except cardiac catheterization interpreted with knowledge of clinical findings.

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inoperable candidates for aortic valve replacement, 25 underwent noncardiac surgery under local anesthesia with intravenous sedation, and none had complications.<sup>4</sup> In another study of 55 patients with severe AS, no complications occurred in patients undergoing local anesthesia.<sup>5</sup> In general, patients with AS undergoing surgery with local anesthesia and sedation have a benign perioperative outcome.<sup>6</sup>

If AS is suspected in an *asymptomatic* patient undergoing noncardiac surgery that involves general or regional anesthesia, a TTE is warranted. The TTE usually provides data about the severity of AS and the presence of left ventricular dysfunction and left ventricular hypertrophy. In a retrospective cohort of 92 patients, Kertai et al<sup>7</sup> found that perioperative death or nonfatal myocardial infarction occurred in 31% of patients with severe AS (aortic valve area < 0.7 cm<sup>2</sup> or a mean transvalvular gradient ≥ 50 mm Hg) and in 11% of patients with moderate AS (valve area of 0.7 to 1 cm<sup>2</sup> or a mean gradient of 25 to 49 mm Hg). The key point is to quan-

tify the severity of AS, since postoperative complications occur even in patients with moderate AS.

## Conclusions

Systolic murmurs that are heard in the aortic area are not specific for AS. Aortic sclerosis can mimic the murmur of AS, as can other functional murmurs. A thorough and careful history and physical examination are essential in the preoperative evaluation. In the absence of clinical signs and symptoms of AS, surgery can proceed without need for a TTE. For symptomatic patients, a TTE is warranted and surgery must be postponed. If clinical suspicion suggests AS in an asymptomatic patient, the course depends on the type of surgery and anesthesia: if the patient is scheduled for minor surgery under local anesthesia with intravenous sedation, the surgery can proceed without further evaluation; if the surgery requires general or spinal anesthesia, a TTE is warranted to confirm the diagnosis and assess the severity of disease.

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