

WHAT TO DO WITH A POSITIVE STRESS TEST

The latest AHA/ACC algorithm provides a degree of discretion regarding noninvasive stress testing. The results of a cardiac stress test need to be considered carefully with regard to perioperative risk.

The two goals of stress testing are to:

- Further risk stratify patients prior to surgery.
- Identify patients in whom cardiology consultation, revascularization, or other means of potentially lowering cardiac risk, is warranted.

Does revascularization prior to surgery improve outcomes?

It remains uncertain which patients should receive revascularization versus optimum medical management prior to surgery. Each patient's case will need to be considered on an individual basis. The "CARP" trial has put into question whether revascularization prior to major elective vascular surgery affects morbidity and mortality.¹ This was a negative study in a select group of patients.

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| <i>Inclusion</i> | VA patients undergoing elective vascular surgery who underwent cardiac cath prompted by a cardiologist's recommendation, who had at least 70% stenosis in 1+ vessels. N=510 |
| <i>Exclusion</i> | Patient factors: urgent/emergency surgery, "severe coexisting illness", prior revascularization without recurrent ischemia. Cath: L main stenosis \geq 50%, EF <20%, severe AS. |
| <i>Intervention</i> | Revascularization (PCI or CABG) vs. none |
| <i>Results</i> | |

| | Revascularization | No revascularization |
|-----------|-------------------|----------------------|
| Mortality | 3.1% | 3.4% |
| MI | 11.6% | 14.3% |
| CVA | 0.4% | 0.8% |

(differences not significant)

Long term follow up: Median of 2.7 years, mortality 22% vs. 23%.

A smaller pilot study in 2007 also showed no benefit of revascularization in very high risk (43% with EF <35%; in the intervention group 67% with 3 vessel disease on cath) patients undergoing abdominal aortic aneurysm repair.⁵ Interestingly, although not statistically significant, at 12 months the medical management group appeared to "catch up" to the intervention group's rate of mortality and MI, suggesting that revascularization *after* vascular surgery may be of benefit.

Questions to ask yourself:

1. Why did I order the stress test in the first place? Now that I have the result, how will it change my management?
2. What is the extent of territory at risk?
3. Are there indications for revascularization (e.g. 3 vessel or left main disease as an indication for CABG) *regardless* of surgery?
4. How urgent is the surgery?
5. What comorbidities does the patient have?

The following are some examples of stress tests and potential management strategies:

1. A 55 year old woman with HTN and hyperlipidemia is diagnosed with colon cancer by screening colonoscopy. A stress perfusion scan is positive for mild inferior ischemia. She has no cardiac symptoms but her exercise tolerance is poor due to severe arthritis.

Comment: This patient is undergoing a necessary surgery for cancer, and her surgery should not be delayed for a stress test result that is, although positive, low risk. Optimum management includes aggressive control of her HTN and hyperlipidemia, and intra- and postoperative attention to pain control blood pressure control, and signs of ischemia. Smoking cessation should be

recommended. Beta blockade may be recommended based on her stress test, but cannot be recommended solely immediately preop (see "**Perioperative Beta Blockers**"). However, in practice, this patient may require an antihypertensive agent IV postop and a beta blocker would likely be used. Incidentally, this patient did not require a stress test because she does not have any clinical risk factors. (See "**Cardiovascular Risk Stratification**").

2. A 65 year old man, ex-smoker, with DM and < 4 MET exercise tolerance is diagnosed with a 5.6 cm AAA. ROS was positive for exertional dyspnea. A stress perfusion scan was consistent with multiple territories at risk, including a large anterior perfusion defect.

Comment: This patient is undergoing a major vascular surgery that is elective. He has a high risk stress test, and is likely symptomatic. Surgery should be postponed and cardiology consultation should be initiated. (Cath confirmed 3-vessel disease with a normal left main. He meets criteria for bypass surgery regardless of his intended operation, and elects to have this done prior to his AAA repair. However, given the CARP trial, revascularization may not necessarily alter the perioperative outcome of his AAA repair.)

3. A 60 year old woman with HTN, type 2 DM, hyperlipidemia, and COPD is to undergo partial lobectomy for non-small cell lung cancer. Her exercise tolerance is < 4 METs. Her stress test is positive for a large area of anterior ischemia in the LAD distribution.

Comment: This patient is undergoing thoracic surgery and has a significant risk of infarction that will likely be hemodynamically significant. Consultation with cardiology including possible cardiac catheterization would be prudent. Several options exist, including the following:

- Placement of a bare metal stent and postponing surgery for 1 month, if it is felt that this delay would not pose significant risk of spread of cancer.
- CABG, single vessel, with combined partial lobectomy.
- No intervention based on extrapolating the CARP trial results to non-vascular surgery. Optimize medical management; alert anesthesia.
- Defer surgical intervention completely.

4. The same patient as in #3 is to undergo elective TKA for DJD.

Comment: This patient is undergoing an elective surgery but has a high risk of cardiac complications. Surgery should be delayed and outpatient cardiology evaluation completed.

5. A 64 year old man develops postop atrial fibrillation after an elective AAA repair. Echo shows wall motion abnormalities. A stress test shows inferior lateral, distal inferior lateral and anterior lateral ischemia. He is now preoperative for RLE bypass surgery for severe peripheral vascular disease, with early rest pain.

Comment: This patient's heart disease is asymptomatic and he is undergoing urgent vascular surgery. After consultation with cardiology, he is medically managed.

What constitutes a “high risk” stress test?

AHA guidelines recommend coronary angiography for patients with the following high risk features on stress testing, even if asymptomatic (note that this does not address the issue of *preoperative* revascularization):²

| High risk noninvasive test results |
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| Resting LVEF <35% |
| High risk treadmill score of \leq -11 |
| Exercise LVEF <35% |
| “Stress-induced large perfusion defect (particularly if anterior)” |
| Large, fixed perfusion defect with LV dilatation or increased lung uptake |
| Stress-induced moderate-size perfusion defect with LV dilatation or increased lung uptake |
| Wall motion abnormality on stress echo > 2 segments at low dose of dobutamine or at a low HR |
| Stress echo with “extensive ischemia”. |

Perioperative management of the surgical patient with severe coronary heart disease:

- For the patient with severe coronary heart disease who nevertheless undergoes major noncardiac surgery, a team approach is recommended with the patient’s cardiologist, the surgical team, and the patient.
- Medical optimization may include beta blockade, early resumption or continuation of aspirin, statins, blood pressure control, pain management, cardiac anesthesia.
- Postoperative options may include telemetry, ECG in the PACU, serial cardiac enzymes (especially if the patient is not expected to be able to report symptoms reliably), and having the cardiology service aware of the patient. The AHA guidelines suggest that postoperative telemetry, ECG, and enzymes may be useful in “high risk” cases, although definitive data is lacking.^{3,4}

References:

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3. Drew BJ, Califf RM, Funk M, et al. Practice standards for electrocardiographic monitoring in hospital settings: an American Heart Association scientific statement from the Councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young; endorsed by the International Society of Computerized Electrocardiology and the American Association of Critical-Care Nurses. *Circulation.* 2004;110:2721-2746.
4. Fleisher LA, Beckman JA, Brown KA, et al. ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation.* 2007;116:e418-e500.
5. Poldermans D, Schouten O, Vidakovic R, et al. A clinical randomized trial to evaluate the safety of a noninvasive approach in high-risk patients undergoing major vascular surgery: the DECREASE-V Pilot Study. *J Am Coll Cardiol.* 2007;49:1763-1769.