



**BRIEF
ANSWERS
TO SPECIFIC
CLINICAL
QUESTIONS**

Q: Should patients with documented or probable coronary artery disease routinely be placed on beta-blockers before noncardiac surgery?

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STUDIES OF BETA-BLOCKERS IN NONCARDIAC SURGERY

Direct evidence in favor of perioperative beta-blocker use comes from clinical intervention studies. Three of the most important are discussed below:

In a study at the San Francisco Veterans Affairs Medical Center,⁵ 200 patients were randomized to receive either atenolol or placebo, starting before surgery and continuing until discharge. The atenolol group had significantly fewer deaths from cardiac causes both during the first 6 to 8 months and at 2 years of follow-up, and atenolol caused no significant adverse effects that could be detected. This study led to a recommendation that beta-blockers be given perioperatively to patients at high risk, which was included in a 1997 clinical guideline for preoperative assessment and management of patients at risk for coronary artery disease.⁶ Patients undergoing vascular surgery were considered at especially high risk of cardiac complications because many have asymptomatic coronary disease.

In another study,⁷ patients older than 65 years were randomly assigned to three protocols: one with no atenolol, one with atenolol before and after surgery, and one with atenolol during surgery only. Neither atenolol regimen significantly altered the hormonal stress response, but both improved hemodynamic stability during emergence from anesthesia, keeping the systolic blood pressure between 90 and 180 mm Hg and the heart rate between 40 and 100 beats/minute. In addition, the patients given atenolol required less postoperative analgesia.

A study of bisoprolol in patients at high risk who were undergoing vascular surgery also had favorable results.⁸ In this study, 112 patients with abnormal dobutamine echocar-

A: YES. Current evidence suggests that patients with either documented coronary disease or significant cardiac risk factors should routinely be started on beta-blockers before noncardiac surgery. Three lines of evidence support this recommendation: the frequency and severity of complications, the mechanism of action of beta-blockers, and data from randomized clinical trials.

SURGICAL COMPLICATIONS ARE FREQUENT AND SEVERE

Complications associated with noncardiac surgery are frequent, and many of these complications are cardiac. In a large Veterans Administration study,¹ the 30-day mortality rate was 3.1%, the cardiac complication rate was 4.5%, and the myocardial infarction rate was 0.7%.¹

BETA-BLOCKERS REDUCE MYOCARDIAL OXYGEN DEMAND

Perioperative myocardial ischemia is thought to be caused by high levels of circulating catecholamines, an increased heart rate, and consequent increased oxygen demand. Beta-blockers reduce myocardial oxygen demand and so in theory should reduce the risk of myocardial ischemia and infarction.

In addition, beta-blockers are known to be beneficial in stable angina,² heart failure,³ and after an acute myocardial infarction.⁴ These observations provide further reason to think that beta-blockers may help decrease risk during the stress of surgery.

**Preoperative
atenolol
reduced
postoperative
cardiac
mortality**



diagrams were randomized to receive standard care or bisoprolol starting at least 1 week before surgery and continuing for 30 days afterward. Patients who received bisoprolol had a 3.4% mortality rate, compared with 17% among those receiving standard care. Another 17% of the standard care group had nonfatal myocardial infarctions, whereas none of the bisoprolol group did. No serious side effects occurred in the bisoprolol group.

■ ARGUMENTS AGAINST ROUTINE BETA-BLOCKER USE

Some argue that more research is needed before the results of these studies can be applied to all patients. Furthermore, critics point to possible complications from the use of beta-blockers, including bronchospasm, myocardial depression, bradycardia, and conduction system abnormalities. However, as noted, studies to date have not found these complications to be a problem, provided that standard precautions are followed, such as withholding the beta-blocker if the heart rate is less than 55 or if the systolic blood pressure is less than 100 mm Hg.

■ WHICH PATIENTS WILL BENEFIT?

The patients who would appear to benefit the most from perioperative use of beta-blockers are those undergoing vascular surgery, who have a high likelihood of asymptomatic cardiac disease and a high risk of cardiac morbidity and mortality.

The potential benefits of beta-blockers probably also outweigh the risks for patients scheduled for nonvascular surgery who have a history of coronary disease or significant risk factors for coronary disease.

The benefit may be substantially less or negligible in patients undergoing minor procedures such as ophthalmologic surgery, especially procedures that do not require general anesthesia.

The optimum timing and duration of therapy remains to be determined. However, on the basis of available evidence, we conclude that beta-blockers should be started preoperatively and continued until discharge if no complications develop.

Atenolol is preferred because it was studied in the trials discussed earlier. If the heart rate is greater than 65 and the systolic blood pressure is greater than 100 mm Hg, give 100 mg daily. If the heart rate is 55 to 65 and the systolic blood pressure is greater than 100 mm Hg, give 50 mg. If the heart rate is less than 55 or the systolic blood pressure is less than 100, do not give atenolol.

■ REFERENCES

1. Khuri S, Daley J, Henderson W, et al. The National Veterans Administration Surgical Risk Study: risk adjustment for the comparative assessment of the quality of surgical care. *J Am Coll Surg* 1995; 180:519-531.
2. Heidenreich P, McDonald K, Hastie T, et al. Meta-analysis of trials comparing beta-blockers, calcium antagonists and nitrates for stable angina. *JAMA* 1999; 281:1927-1936.
3. Abraham W. Beta-blockers: the new standard of therapy for mild heart failure. *Arch Intern Med* 2000; 160:1237-1247.
4. Mehta R, Eagle K. Secondary prevention in acute myocardial infarction. *Br Med J* 1998; 316:838-842.
5. Mangano D, Layug E, Wallace A, Tateo I. Effect of atenolol on mortality and cardiovascular morbidity after noncardiac surgery. *N Engl J Med* 1996; 335:1713-1720.
6. Palda V, Detsky A. Clinical guideline, part II. Perioperative assessment and management of risk from coronary artery disease. *Ann Intern Med* 1997; 127:313-328.
7. Zaugg M, Tagliente T, Lucchinetti M, et al. Beneficial effects from beta-adrenergic blockade in elderly patients undergoing noncardiac surgery. *Anesthesiology* 1999; 91:1674-1686.
8. Poldermans D, Boersma E, Bax J, et al. The effect of bisoprolol on perioperative mortality and myocardial infarction in high-risk patients undergoing vascular surgery. *N Engl J Med* 1999; 341:1789-1794.

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CME ANSWERS

Answers to the credit test on page 367 of this issue

1 D 2 C 3 E 4 D 5 D 6 B 7 C 8 A 9 C 10 D 11 C 12 A

Vascular-surgery patients may benefit the most from beta-blockers