

# Treatment of Multivessel Coronary Artery Disease: A Comparison of 3 Therapeutic Strategies

Hueb W, Lopez NH, Ramires JA, et al. Five-year follow-up of the medicine, angioplasty, or surgery study (MASS II): a randomized controlled clinical trial of 3 therapeutic strategies for multivessel coronary artery disease. *Circulation* 2007;115:1082–9.

## Study Overview

**Objective.** To compare the long-term outcomes of coronary artery bypass grafting (CABG), percutaneous coronary intervention (PCI), and medical therapy (MT) alone in the treatment of multivessel coronary artery disease (CAD) with stable angina and preserved ventricular function.

**Design.** Randomized controlled trial.

**Setting and participants.** Patients receiving care at the University of São Paulo (São Paulo, Brazil) with documented proximal CAD of > 70% and ischemia. Ischemia was determined by a stress test or standard angina assessment of the Canadian Cardiovascular Society (class II or III). Key exclusion criteria included refractory angina or acute myocardial infarction (MI) requiring emergency revascularization, left ventricular ejection fraction < 40%, a history of PCI or CABG, single-vessel disease, congenital heart disease, valvular heart disease, cardiomyopathy, left main coronary artery stenosis ≥ 50%, or a coexisting condition that was a contraindication to CABG or PCI.

**Main outcome measures.** The primary endpoint was a composite of 5-year mortality, q wave MI, or refractory angina requiring revascularization. Therapeutic PCI or CABG performed during an episode of unstable angina was considered a revascularization procedure.

**Main results.** A total of 611 patients with CAD were randomized to undergo CABG ( $n = 203$ ), PCI ( $n = 205$ ), or MT alone ( $n = 203$ ). After 5 years, the composite primary endpoint occurred in 21.2% of patients who underwent CABG, 32.7% treated with PCI, and 36% receiving MT alone ( $P = 0.0026$ ). There was no statistical difference in overall mortality between the groups. Additionally, 3.9% of CABG patients required repeat revascularization procedures compared with 11.2% and 9.4% of patients undergoing PCI or on MT alone, respectively ( $P = 0.021$ ). Nonfatal MI occurred in 15.3%, 11.2%, and 8.3% of patients in the MT, PCI, and CABG groups, respectively ( $P = 0.001$ ). Fewer patients were

angina-free in the MT group compared with both CABG and PCI groups (54.8% vs. 74.2% and 77.3%, respectively;  $P < 0.001$ ).

**Conclusion.** In patients with stable multivessel CAD, there were no significant differences in mortality at 5 years between the 3 treatment groups. CABG was superior to both PCI and MT in the number of required revascularization procedures and the incidence of nonfatal MIs.

## Commentary

In this study comparing 3 strategies (MT, PCI, and CABG) for treating stable multivessel CAD, the authors found no clinically significant differences among the strategies with regard to overall mortality and cardiac death. CABG was found to be superior to PCI and MT in preventing the primary composite endpoint of death, q wave MI, or refractory angina requiring revascularization at 5 years. The composite primary endpoint was mainly driven by the incidence of refractory angina requiring revascularization, which was greater in the PCI and MT groups compared with the CABG group. The PCI and MT treatment groups showed similar outcomes with respect to the primary endpoints, while CABG showed a significant cardioprotective effect when compared with the other treatment options.

The study had liberal inclusion criteria and enrolled 29% of eligible patients. The endpoints of the study were clinically relevant and important; however, this study has significant limitations. The trial was conducted at a single institution in Brazil, which limits the generalizability; however, the rates of restenosis and mortality are similar to those seen in larger trials [1]. Most patients in the PCI group received bare-metal stents rather than drug-eluting stents, which were being brought to the market around the time that the study was conducted. The use of drug-eluting stents has been shown to decrease revascularization rates compared with bare-metal stents and most likely would have made the PCI results more favorable. Another limitation was the lack of assessment of adequacy of MT at 5 years (ie, adherence to medications or clinical endpoints that would indicate optimal therapy).

### Applications for Clinical Practice

This study, along with the recently published COURAGE study [2], shows that MT is a viable strategy for management of stable multivessel CAD. There do not appear to be significant differences in 5-year mortality among the treatment strategies; therefore, the benefits of each strategy need to be carefully weighed against the possibility of adverse outcomes (eg, ongoing angina, revascularization procedures, death). Cost-effectiveness studies will be needed to understand the relative costs and benefits of these different treatment options, which in turn could have future policy

implications for the reimbursement of cardiac procedures.

—Review by Robert L. Huang, MD, MPH

### References

1. Serruys PW, Ong AT, van Herwerden LA, et al. Five-year outcomes after coronary stenting versus bypass surgery for the treatment of multivessel disease: the final analysis of the Arterial Revascularization Therapies Study (ARTS) randomized trial. *J Am Coll Cardiol* 2005;46:575–81.
2. Boden WE, O'Rourke R A, Teo KK, et al. Optimal medical therapy with or without PCI for stable coronary disease. *N Engl J Med* 2007;356:1503–16.

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