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## CLINICAL UPDATE

# Bypass surgery or stenting for multivessel coronary artery disease?

**Serruys PW, Unger F, Sousa JE, Jatene A, Bonnier HJ, Schönberger JP, et al, for the Arterial Revascularization Therapies Study Group. Comparison of coronary-artery bypass surgery and stenting for the treatment of multivessel disease. *N Engl J Med* 2001;344:1117-24.**

***Background:*** Coronary artery stenting has been shown to reduce the need for repeat revascularization procedures in patients undergoing percutaneous transluminal coronary angioplasty (PTCA).[1] The widespread availability of this technology, which is less costly than bypass surgery, has necessitated a re-evaluation of the preferred approach to revascularization in patients with multivessel coronary artery disease.

***Question:*** Do coronary stent implantation (CSI) and coronary artery bypass grafting (CABG) lead to comparable clinical outcomes in patients with multivessel (excluding left main coronary artery) disease?

***Design:*** In a randomized controlled trial 1205 patients with multivessel coronary artery disease in 67 centres were randomly assigned to treatment with either CSI or CABG. To be eligible for the trial, patients had to have angina pectoris (stable or unstable) or silent ischemia and at least 2 lesions in different vascular territories that were deemed suitable for stent implantation. For each patient enrolled in the study, agreement was required between a cardiac surgeon and an interventional cardiologist that comparable revascularization could be achieved through either stenting or bypass surgery. Patients who had undergone previous PTCA or CABG and those who had left main coronary artery disease, a left ventricular ejection fraction of 30% or less, or overt congestive heart failure were excluded.

The study's primary end point was event-free survival after 1 year of follow-up. Events were defined as death, nonfatal myocardial infarction (MI), cerebrovascular event (stroke, transient ischemic attack or reversible ischemic neurologic defect) or repeat revascularization procedure. Secondary end points included angina status, antianginal medication use, quality of life, direct costs and combined rate of death, stroke or MI at 1 year. Comparative event rates in the 2 groups were expressed as relative risks (RRs) with 95% confidence intervals (CIs). Survival curves were compared using the log-rank test. All were intention-to-treat analyses.

***Results:*** The 2 groups were well matched in all baseline variables, including age (mean 61 years), sex, angina status, previous cardiac history, smoking status, prevalence of comorbid conditions (diabetes, hypertension, hypercholesterolemia, chronic obstructive pulmonary disease) and coronary artery anatomy. Ninety-six percent of patients in the surgical group and 99% in the stenting group received their assigned treatment. In the CSI group a mean of 2.6 (SD 1.0) lesions per patient had stents placed or were treated with balloon angioplasty alone, and in the CABG group a mean of 2.6 (standard deviation [SD] 1.0) anastomoses were performed per patient.

At 1-year follow-up, there was no significant difference between the CSI and CABG group rates of death (2.5% and 2.8% respectively [RR 0.89, 95% CI 0.45–1.77]), stroke (1.7% and 2.1% [RR 0.78, 95% CI 0.34–1.76]) or MI (6.2% and 4.8% [RR 1.29, 95% CI 0.80–2.06]). The need for repeat revascularization, however, arose far more often in the CSI group than in the CABG group (21.0% v. 3.8% [RR 5.52, 95% CI 3.59–8.49), yielding a 1-year event-free survival rate of 73.8% in the CSI group and 87.8% in the CABG group (RR of any event 2.14, 95% CI 1.66–2.75, $p < 0.001$).

In terms of quality of life, CABG patients had a higher incidence than CSI patients of freedom from both angina (89.5% v. 78.9%, $p < 0.001$) and antianginal medication (41.5% v. 21.1%, $p < 0.001$). Direct costs at 1 year were lower in the stenting group, yielding a net saving of US$2973 per patient.

***Commentary:*** Although stenting appears to be the less costly alternative, the savings associated with CSI reported in this study reflect only 1 year of follow-up. If the difference in the incidence of repeat revascularization procedures in the 2 groups were to persist beyond 1 year of follow-up, direct cost savings associated with CSI would diminish further. This study did not attempt to estimate indirect costs (e.g., time lost from work) or to relate cost to the effectiveness of the procedures.

Technology in this field is changing rapidly. Advances in both stenting (use of clopidogrel, platelet glycoprotein IIb/IIIa receptor blockade and heparin-coated stents) and CABG (minimally invasive techniques) since this study was conducted underline the need for continued re-evaluation of the relative merits of both approaches to multivessel disease.

***Practice implications:*** CSI and CABG offer comparable protection at 1 year against death, stroke and MI in appropriately selected patients with multivessel (excluding left main coronary artery) disease. Patients opting to undergo CSI, however, are over 5 times more likely than CABG patients to require a repeat revascularization procedure within 1 year. Surgery remains superior in providing symptom relief from angina. — *Donald Farquhar*

The Clinical Update section is edited by Dr. Donald Farquhar, head of the Division of Internal Medicine, Queen's University, Kingston, Ont. The updates are written by members of the division.

### Reference

1. Versaci F, Gaspardone A, Tomai F, Crea F, Chiariello L, Gioffre PA. A comparison of coronary-artery stenting with angioplasty for isolated stenosis of the proximal left anterior descending coronary artery. *N Engl J Med* 1997;336:817-22.