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## CABG OR PCI? AN INTERVENTIONAL CARDIOLOGIST'S PERSPECTIVE

# To stent or to operate: Is this the question?

**I**S CORONARY ARTERY BYPASS GRAFTING (CABG) better than percutaneous coronary intervention (PCI) for patients with multivessel coronary artery disease?

In this issue of the *Cleveland Clinic Journal of Medicine*, Dr. Ivan Casserly<sup>1</sup> elegantly reviews a recent study by Dr. Edward Hannan et al,<sup>2</sup> who analyzed data on this topic from a large registry in New York State. At a median of 2 years, significantly fewer CABG patients had died compared with those who had had PCI. This was surprising, since previous studies found these treatments to be about the same with regard to mortality.

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While the authors of the New York study have invested great effort in convincing readers of the veracity of their findings, Dr. Casserly attempts to place them in their proper context. Neither, unfortunately, provides a mechanism for why the findings might or might not represent the “truth.”

### ■ THE CLEVELAND CLINIC EXPERIENCE

Before going on, it is interesting to note the findings of an analysis from the Cleveland Clinic of more than 6,000 patients who underwent revascularization between 1995 and 2000 and were followed for 5 years.<sup>3</sup>

As in the New York registry, CABG patients were more likely to have significant comorbidities such as diabetes and heart failure, while the PCI patients were slightly older and more likely to present with an acute coro-

nary syndrome. Left main trunk stenosis and chronic total occlusions were significantly more common in the CABG cohort.

The unadjusted mortality rate was 16% for PCI and 14% for CABG ( $P = .07$ ). However, after adjusting for all baseline characteristics and the propensity to be selected for one revascularization method or the other, PCI was associated with a higher mortality rate at 5 years (hazard ratio 2.3 [1.9–2.9],  $P < .001$ ), and this excess mortality was present in nearly all subgroups of patients—just as in the New York registry study.

### ■ WHY INCORPORATE THE NEW YORK FINDINGS IN OUR PRACTICE?

The mechanisms responsible for the apparent advantage of CABG over PCI can be grouped into anatomic and functional considerations.

By itself, CABG does not prevent myocardial infarctions, but a patent graft can ameliorate or eliminate the consequences of plaque rupture proximal to the anastomosis. The best evidence for this concept stems from the angiographic analysis of the patients enrolled in the Bypass Angioplasty Revascularization Study (BARI).<sup>4</sup> The authors found that diabetic patients who had a Q-wave myocardial infarction after randomization were more likely to survive if CABG rather than PCI had been performed.

Furthermore, as reported in registries and clinical trials,<sup>5</sup> PCI with stenting frequently compromises smaller branch arteries, such as septal perforators and diagonals. The territories affected may later become foci of arrhythmia, which can be fatal.

**CABG  
patients and  
PCI patients  
are two  
dissimilar  
cohorts**



## ■ WHY SHOULD WE NOT INCORPORATE THESE FINDINGS IN OUR PRACTICE?

The survival curves for the two treatment groups begin to separate very early after the procedures, despite an early survival advantage for PCI. In fact, by hospital discharge, PCI patients with either two-vessel or three-vessel disease had half the mortality rate of CABG patients with the same anatomy. Despite an excess of 400 in-hospital deaths in the CABG group, the curves diverge in favor of CABG within a few months. Unfortunately, information about the cause of death in these patients is not available.

Could restenosis be responsible for the increased mortality later in the first year after initial revascularization? It is quite unlikely. While stent thrombosis frequently causes infarction and potentially death, restenosis causes angina and results in repeat revascularization rather than death.

Moreover, there is no obvious and plausible explanation for this survival advantage. If CABG does not reduce the rates of sudden cardiac death and reinfarction, how would it improve survival in such a short time?

The answer, in part, is in the allocation of patients to each procedure. About 90% of patients with three-vessel coronary artery disease underwent CABG, whereas 75% of those with two-vessel disease and without involvement of the proximal left anterior descending artery underwent PCI. When a patient with three-vessel disease had PCI, he or she was more often in cardiogenic shock, or had a recent myocardial infarction, or had another important contraindication to surgery.

This type of selection bias cannot be properly adjusted for statistically and creates two rather incomparable cohorts.<sup>6</sup> Indeed, the

authors do not provide details of the statistical model for the propensity score and how it discriminated between the two groups.

Similarly, there is no information in the New York registry on the incidence of chronic total occlusions—a critical factor in the selection of the revascularization method and in the outcome of potentially incomplete revascularization.

If the current superiority of CABG is the result of prolonged patency of the arterial conduits, will drug-eluting stents not only reduce the need for repeat revascularizations but also improve long-term survival? Intriguing data from a French registry of 300 patients who underwent left main trunk coronary revascularization and were followed for 1.5 years suggest just that (Dr. Tullio Palmerini, Bologna, Italy, personal communication).

## ■ WHAT SHOULD A PRUDENT PHYSICIAN DO?

In summary, we are left with a large data set but no mechanistic explanation for the findings reported. What should a prudent physician conclude and how should decisions regarding the method of revascularization be reached?

I believe that one should evaluate the unadjusted survival rates from the available large registries and seek confirmation from randomized clinical studies with more inclusive enrollment criteria and longer follow-up. The former information incorporates and presents the whole process of decision-making and triage with innumerable unmeasured variables, while the latter provides the scientific proof (or lack thereof) for the equivalence of the two procedures.

In the interim, there is no substitute for sound clinical judgment.

**We are left with a large data set but no explanation for the findings**

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