

When is percutaneous coronary intervention a better choice than coronary artery by-pass grafting?

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Percutaneous coronary intervention (PCI) has overtaken coronary artery by-pass grafting (CABG) as the commonest modality of revascularization. There have been several randomized controlled trials (RCTs) and registries comparing the outcomes of both strategies. Nevertheless, it is still unclear whether one is superior. The recent meta-analysis by Bravata et al. [1] evaluating 23 RCTs (a total of 9963 patients) found that there was no difference in mortality up to 10 years. However CABG patients had better angina relief, a lower need for repeat revascularization but an increased risk of stroke. There are several caveats. Firstly, the heterogeneity of the RCTs: this meta-analysis included 9 trials of patients with single-vessel disease and 9 where balloon angioplasty was the only percutaneous treatment. None of the RCTs included patients treated with drug-eluting stents (DES). The inherent selective nature of RCTs also limits their applicability to contemporary PCI where 50% or more of cases are considered "off-label" uses and would have been excluded from RCTs [2,3]. Appropriately therefore, the authors also examined large registries (>1000 patients) of patients undergoing either PCI or CABG, some but not all of which showed improved survival after CABG. As the authors point out, these registries suffer from selection bias, which may not be adjustable even after using complex statistics.

Is there any assistance from official guidelines? The most recent guidelines from the European Society of Cardiology [4] suggest a Class IA recommendation (evidence or general agreement that the treatment is useful, data derived from multiple RCTs or meta-analyses) for PCI in stable coronary artery disease if there is objective evidence for significant ischaemia or for the treatment of de novo lesions in native vessels or venous bypass grafts. More complex patients have less firm recommendations: patients at high surgical risk (including left ventricular ejection fraction <35%) have a Class IIa/B recommendation (weight of evidence is in favour, data from a single

RCTs or large non-randomised studies) and chronic total occlusions are given a Class IIa/C recommendation (weight of evidence is in favour, evidence from consensus of experts or small studies). However, patients with multivessel disease, diabetes or unprotected left main disease are given Class IIb/C recommendations (usefulness/efficacy less well established, evidence from consensus of experts or small studies). The meta-analysis by Bravata et al. [1] found a non-significant trend towards improved survival with CABG in patients with both single and multi-vessel disease and diabetes. Unprotected left main disease was not analysed as a subgroup in this meta-analysis since these patients were excluded from all the RCTs.

Ultimately the choice of PCI or CABG depends on a variety of factors, including operator and institution volume and experience (it is clear that high volume operators and institutions have lower complication rates), availability, waiting times and procedural costs. The latter is an important consideration, especially in countries with limited resources where the cost of a complex PCI with multiple DES may be more expensive than the surgical alternative. The increasing number of new companies and new DES under investigation should be beneficial as market forces drive down the prices for DES. Patient-specific characteristics clearly need to be taken into account, since the inability of PCI for perform complete revascularisation in all cases is a major limitation, although continuing advances in the treatment of chronic occlusions may increase the applicability of PCI. Evaluation of the SYNTAX score [5], which focuses on not only the number of significant lesions and their location but also the complexity of each lesion independently, as a tool to quantify the complexity of coronary artery disease may provide some answers as to which anatomic features are best treated with CABG. Finally patient preference also needs to be considered.

Unfortunately, there is little evidence to believe that a specific revascularization strategy would confer better survival in the general population. Ongoing RCTs, such as FREEDOM, SYNTAX, CARDIA and VA-CARDS, evaluating the use of DES in less selective patients are eagerly awaited and should shed light as to which patient subgroups are better suited to PCI or CABG. Until the results of these trials are published, the choice for each strategy should be based on the patients' individual risk and anatomy.

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From the Editor

Synopsis: Bravata DM, Gienger AL, McDonald KM, et al. Systematic review: the comparative effectiveness of percutaneous coronary interventions and coronary artery bypass graft surgery. *Ann Intern Med.* 2007; 147: 703-716.

In this systematic review of 23 randomized controlled trials the authors assessed the effectiveness of percutaneous coronary intervention (PCI) and coronary artery bypass graft surgery (CABG) in patients with coronary heart disease, who have clinical indications and in whom both procedures are feasible. After 5 years of follow-up of 9963 patients, in CABG group, as compared with PCI group, the overall survival was similar (90.7% vs. 89.7%), angina relief was more common (84% vs. 79%), repeated coronary revascularization was less frequent (10% vs. 40–46%) and the risk of periprocedural myocardial infarction was similar, but the rate of periprocedural stroke was higher (1.2% vs. 0.6%; pooled ARR for PCI vs. CABG 0.6%, 95% CI 0.2–1).

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