

## Angioplasty versus Surgery: Meta-analyses or Registries?

Pedro José Negreiros de Andrade

Universidade Federal do Ceará, Fortaleza, CE - Brazil

The choice between percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) should be based mainly on evidence-based medicine. The latter is based, concerning the choice between these procedures, on two types of publications: registries and randomized clinical trials. The information provided by these studies are complementary and help the cardiologist in making the decision individually. Nonetheless, some differences among them should be highlighted. Randomized studies, both individually and in meta-analyses<sup>1-3</sup>, showed no differences in outcomes between CABG and PCI, except for the items new revascularization and relief of angina. On the other hand, the registries<sup>4,5</sup>, except for a recent Asian study<sup>6</sup>, tend to demonstrate superiority of CABG in terms of mortality in subgroups of patients in which is recognized as capable of increasing survival.

Trying to explain these differences, it has been argued that the registries are more representative of the “real world”. This is because they allegedly involve more patients and a higher number of patients with triple-vessel disease, more patients with a proximal left anterior descending (LAD) artery lesion and more patients with left ventricular dysfunction, precisely those who would benefit from the surgery in terms of mortality. The lack of difference between surgery and angioplasty in randomized trials derive, according to advocates of the registries, from the fact that the patients are similar to those for whom the CABG was not superior over medical treatment. Therefore, it is based mainly on the registries that surgery tends to be the best option in situations such as triple-vessel disease, presence of poor ventricular function or two-vessel disease associated with LAD proximal obstruction<sup>7</sup>.

On the other hand, we need to emphasize that randomized studies, unlike registries, distribute all known and unknown prognostic factors, with an equal chance on groups, overwhelmingly decreasing the bias of the

samples. Therefore, meta-analyses of good quality clinical trials represent the best level of scientific evidence to guide decision making. Regarding the number of patients, recent meta-analyses<sup>2,3</sup> represent a number of patients close to some registries considered classical, such as the one from the Duke University<sup>4</sup>. The argument that randomized studies involved few patients with triple-vessel disease does not seem valid in the stent era, where those with triple-vessel disease plus those with left main lesion were in higher number than those with two-vessel disease. As for the undeniable fact that randomized trials have included few patients with compromised ventricular function, we may argue that 17% (percentage described in the collaborative study by Hlatky et al<sup>3</sup>) is not an insignificant number. Moreover, this percentage may be underestimated due to the non-inclusion of studies such as the AWESOME and CARDia<sup>8</sup>, which showed a larger number of patients with poor ventricular function. In addition, no randomized study suggested that patients with compromised ventricular function benefitted from the surgery compared to angioplasty. In BARI<sup>9</sup>, the only study to address this issue, nondiabetic patients who presented three-vessel lesions or two-vessel lesion with involvement of LAD, associated with poor ventricular function, did not have higher mortality with PCI. In AWESOME, where a number of patients had a decreased ejection fraction, mortality was slightly smaller with angioplasty. Finally, the collaborative study by Hlatky et al<sup>3</sup> did not show decreased ejection fraction, triple-vessel disease condition or obstruction of the proximal LAD may have contributed to the superiority of surgery over angioplasty in terms of mortality. Finally, there is one last argument: the selection of patients in randomized trials. The selection took place, however, both for patients undergoing angioplasty and for surgical patients, which may have improved the results of both. Moreover, the findings on equity of mortality results in randomized trials do not apply to all patient, but to those patients considered with anatomy suitable for both procedures.

Although published in the best medical journals, registries may have selection biases that even the best statistical techniques are unable to eliminate. Patients could be referred to surgery for seeming healthier (assuming a higher survival rate with CABR) due to total occlusion with collateral circulation or for having larger arteries that are more suitable for grafts: all these factors would favor the surgical results. On the other hand, patients could be referred to angioplasty for presenting a shorter life expectancy, due to severe comorbidities, impossibility of grafts, and doctors' or patients preference, despite inadequate anatomy: all these factors would jeopardize the results of angioplasty. Inquiries to the criteria of allocation and the outcomes of the SYNTAX<sup>10</sup> registry

### Keywords

Angioplasty, transluminal percutaneous coronary; coronary artery bypass graft; meta-analysis.

**Mailing address: Pedro José Negreiros de Andrade •**

Francisco Holanda, 992/1101 - Dionísio Torres - 60130-040 - Fortaleza, CE - Brazil

E-mail: pedroneg@cardiol.br, pedroneg@gmail.com

Manuscript received May 01, 2010; revised manuscript received July 14, 2010; accepted August 13, 2010.

suggests that some selection biases mentioned above (severe comorbidity as indication for PCI, total occlusion as indication for CABG, graft failure as an indication for PCI) may have contributed to the superiority of the surgery in this registry as well as in other observational studies.

Because of that, we think that, in choosing between PCI and CABG, we must consider primarily what meta-analyses of randomized trials say (pointing out to equality of results) rather than observational studies (pointing out to the superiority of surgery), as long as patient's anatomy is suitable for both procedures.

## References

1. Daemen J, Boersma E, Flather M, Booth J, Stables R, Rodriguez A, et al. Long-term safety and efficacy of percutaneous coronary intervention with stenting and coronary artery bypass surgery for multivessel coronary artery disease: a meta-analysis with 5-year patient-level data from the ARTS, ERACI-II, MASS-II, and SoS trials. *Circulation*. 2008; 118 (11): 1146-54.
2. Bravata DM, Gienger AL, McDonald KM, Sundaram V, Perez MV, Varghese R, et al. Systematic review: the comparative effectiveness of percutaneous coronary intervention and coronary artery bypass surgery. *Ann Intern Med*. 2007; 147 (10): 703-16.
3. Hlatky MA, Boothroyd DB, Bravata DM, Boersma E, Booth J, Brooks MM, et al. Coronary artery bypass surgery compared with percutaneous coronary interventions for multivessel diseases: a collaborative analysis of individual patient data from ten randomized trials. *Lancet*. 2009; 373 (9670): 1190-7.
4. Jones RH, Kesler K, Phillips HR 3rd, Mark DB, Smith PK, Nelson CL, et al. Long-term survival benefits of coronary artery bypass grafting and percutaneous transluminal angioplasty in patients with coronary artery disease. *J Thorac Cardiovasc Surg*. 1996; 111 (5): 1013-25.
5. Hannan EI, Racz MJ, Walford G, Jones RH, Ryan TJ, Bennett E, et al. Long term outcomes of coronary artery bypass grafting versus stent implantation. *N Engl J Med*. 2005; 352 (21): 2174-83.
6. Kimura T, Morimoto M, Furukawa Y, Nakagawa Y, Shizuta S, Ehara N, et al. Long term outcomes of coronary-artery bypass graft surgery versus percutaneous coronary intervention for multivessel disease in the bare-metal stent era. *Circulation*. 2008; 118 (14 Suppl): 199-209.
7. Morrow DA, Gersh BJ. Chronic coronary artery disease. In: Mann DL, Bonow RO, Mann DL, Zipes DP (eds). *Braunwald's heart disease*. Philadelphia: Saunders Elsevier; 2008. p. 1353-405.
8. Kapur A, Hall RJ, Macik I, Qupesh AC, Butts J, Beider B, et al. Randomized comparison of percutaneous coronary intervention with coronary artery bypass grafting in diabetic patients: a one year results of the CARDia (coronary artery revascularization in diabetics) trial. *J Am Coll Cardiol*. 2010; 55 (5): 432-40.
9. Berger PB, Velianou JL, Vlachos HA, Felt F, Jacobs AK, Faxon DP, et al. Survival following coronary angioplasty versus coronary artery bypass surgery in anatomic subsets in which coronary artery bypass surgery improves survival compared with medical therapy. Results from the BARI Investigations. *J Am Coll Cardiol*. 2001; 38 (5): 1440-9.
10. Serruys PW, Morice MC, Kappetei AP, Colombo A, Holmes DR, Mack MJ, et al. Percutaneous coronary intervention versus coronary-artery bypass grafting for severe coronary artery-disease. *N Engl J Med*. 2009; 360 (10): 961-72.

## Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

## Sources of Funding

There were no external funding sources for this study.

## Study Association

This study is not associated with any post-graduation program.