Editorial

Should Percutaneous Coronary Intervention and Coronary Artery Bypass Graft Surgery be Considered Effective Methods to Control Myocardial Ischemia in Stable Angina?

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In the last fifteen years several randomized studies were published comparing percutaneous coronary intervention (PCI) and coronary artery bypass graft surgery (CABG) in patients with stable angina and multivessel coronary artery disease[1-3].

Few studies, however, have focused their designs on the presence of angina (BARI[3], MASS II)[4] or on the quantitative evaluation of myocardial ischemia as obtained at ergometric stress test or at myocardial perfusion scintillography[1,4].

Studies that compared CABG and PCI showed that mortality and q-wave myocardial infarction rates were similar either at short term (one year) or at long term (five years) follow-up for both groups. The freedom of angina advantage at one year within the CABG group was lost in the fifth year after randomization[5-7].

Alazráki et al[8] also showed the same results using Single Photon Emission Computed Tomography (SPECT) evaluation with Thalium 201 at three years of follow-up. There was no evidence of predominant myocardial ischemia in either of the two groups.

These studies correspond to a time when groups selected for randomization consisted of patients with multivessel coronary artery disease, mostly with two-vessel disease; the stents were allowed only under extraordinary conditions (bailout) and complete revascularization was achieved mainly on surgical patients. Still, at long term follow-ups, surgery did not show to be superior to PCI on death or q-wave myocardial infarction analysis.

In addition, patients randomized to PCI presented similar results to those observed in the CABG group in terms of induced myocardial ischemia either on ergometric stress test evaluation or on scintillography, or even in relation to severity of angina. This was due to an elevated necessity of a new revascularization procedure in the PCI group[1-4,9].

Moreira et al[10] designed a randomized, prospective, unicenter cohort study that compares two different revascularization strategies of the ischemic myocardium. The first group had CABG surgery in which the use of arterial grafts were encouraged. In the second group, PCI was achieved with no limits to the use of different tools to accomplish an unobstructed coronary artery, ranging from balloon-catheter and atheroablasive devices to laser and non-pharmacological stents. Their goal is to quantify and qualify myocardial ischemia at two distinct moments: M1, pre-intervention and M2, at six month follow-up. Angina evaluation, ergometric stress test and SPECT-sestamibi variables were used for that.

The analysis was based on those patients successfully treated in each group by excluding acute complications and the necessity of a new revascularization procedure at the CABG and PCI groups.

The angiographic variables differ between the two groups: there is a predominance in patients with triple-vessel disease and complete anatomic revascularization in the CABG group compared to the PCI group. However, the presence of angina and quantitative ischemic variables at ergometric stress test and scintillography are equivalent.

Moreira et al[10] conducted a well-designed and rare randomized and prospective study, predominantly in patients with multivessel coronary artery disease wth normal left ventricular function and equivalent ischemic situations.

These data allowed the conclusion that the two types of myocardial revascularization treatments, at the symptomatic evaluation (angina) as well as at the quantitative ischemia evaluation through ergometric stress test and perfusion scintillography (ischemic load) comparing M1 and M2, resulted in a significant decrease of the myocardial ischemia with no difference between the two types of treatment sixth months after the procedure (M2).

The limitations and critics to the work of Moreira et al[10] refer to the groups of patients with a predominance of triple-vessel coronary artery diseae in the surgical group, and two-vessel disease in the PCI group.

The exclusion of acute complications in both groups and the elevated percent levels of new revascularizations in the PCI group up to six months after the procedure possibly made the two groups exhibit the same degree of ischemic equivalency at M1 and M2.

Thus, the authors could have demonstrated different results from those obtained regarding myocardial ischemia at ergometric stress test and at the scintillography (ischemic load) as well as concerning angina at M2, if those variables were not eliminated. Another point to be discussed and remembered refers to the lack of analysis of the coronary blood low through the graft (or coronary artery) that reaches the viable myocardium. Frequent examples are found such as graft occlusion or an artery treated by PCI, that tests with normal responses, as well as non-revascularized vessels of little anatomic importance, resulting in a ischemic response.

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Another noteworthy point is that there are open arteries after PCI, with angiographically slight residual lesions, which show myocardial ischemia when the functional test is applied. These considerations must be made by the non-interventionist cardiologist during the analysis of such results.

The studies that compare the use of bare metal stents and following, the pharmacological ones, in comparative groups of CABG and PCI, are unaware of the relevance of the evolution of the clinical treatment, setting it apart from any kind of comparison. Twenty years ago, the initial studies that compared the clinical and surgical treatments (CASS and VA[11,12]) did not show the superiority of one treatment over the other, in patients with multivessel coronary artery disease (CAD) with normal ventricular function, when the primary objectives were death or nonfatal acute myocardial infarction (AMI).

Recent studies have used coated stents in patients with three-vessel CAD, comparing the surgical procedure with angioplasty regarding major cardiac events, in a period of 12 months, including death, nonfatal AMI, stroke, and the need for a new revascularization. Among these studies, the ARTS II[13], which was recently presented at the ACC Meeting 2005, is noteworthy. They have shown data on major events obtained at the CABG group of the ARTS[14] study and compared with those obtained for the same events in the PCI-coated stent group of ARTS II. Its results showed a significant decrease of a new revascularization procedure in the PCI-coated stent group – 7.4% vs 3.7% in the CABG group. This trend did not reach significant difference. There was no significant difference as well for death or nonfatal AMI events.

Van Domburg et al[15] on an eight-year follow-up analysis, comparing groups of PCI-stent with CABG in the period of 1997 to 1999 in a single center, after adjustments, showed a longer survival in the CABG group – 78% vs 64% in PCI-stent group, $p<0.0001$.

Hannan et al[16] reported the comparative results in patients with multivessel ischemic disease, with 37,212 of them having been submitted to CABG and 22,102 to PCI with stents. The data gathering period in the New York registry was from 01/01/1997 to 12/31/2000. The median follow-up of both groups was 706 days. After adjustments, the mortality rate in the group submitted to surgery was lower than that of the PCI in the subgroups with triple-vessel disease with proximal involvement of the left anterior descending artery (LAD) 10,7 vs 15,6% HR: 0,64 (CI: 0.56 to 0.74) and with two-vessel disease with no proximal LAD involvement 6,7% vs 8,6% HR: 0,76 (CI: 0.60 to 0.96). Regarding the need for a new revascularization, the stent group needed it in 35.1%, whereas the CABG group needed it in 4.9% of the cases within the same period.

Moreira et al[10] call the attention to the ischemic load that is often not analyzed at the short and long-term follow-up of patients. We recently showed our results in this Journal when we analyzed ischemic load and angina at 5 years of follow-up, comparing PCI and CABG in patients with stable angina with a predominance of triple-vessel disease in both groups. Seventy percent of the patients from the PCI group had non-pharmacological stent implanted. At the end of 5 years of follow-up, angina as well as positive stress test decreased significantly in both groups. However, in order to obtain such results, the PCI group had to be submitted to an elevated number of new procedures, 24.75% vs 2.85% in the CABG group[17].

Finally, there is a great expectation regarding the results of two studies: the first, *Clinical Outcomes Utilizing Revascularization and Aggressive druG Evaluation* (COURAGE)[18] compares, in symptomatic multivessel ischemic disease, the clinical treatment with angioplasty and the clinical treatment with surgery. In this study, aggressive use of drugs to control atherosclerosis and diabetes mellitus is advocated for all groups. The objective is to analyze, at long-term, (4 to 7 years) clinical events such as death, acute myocardial infarction, and troponin-positive acute ischemic syndrome.

The second is the study by Hueb et al., MASS II[4], which compares clinical treatment, PCI, and the surgery in patients with stable angina. Final results of a 5-year follow-up are about to be published and will serve as a guide for the strategy that should be used in patients with triple-vessel coronary artery disease. This study will also define the analysis of the primary objectives (death, q-wave myocardial infarction, need for a new revascularization) and the secondary ones (often forgotten ischemic load, and angina).

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