Editorial

On-Pump *versus* Off-Pump Coronary Artery Bypass Surgery. The Impact on Costs of Health Care Systems

Walter J. Gomes [1] *and Domingo M. Braile* [2,3]

Escola Paulista de Medicina da Universidade Federal de São Paulo, Faculdade de Medicina de São José do Rio Preto (Famerp), Universidade de Campinas (Unicamp), São Paulo, SP; São José do Rio Preto, SP; Campinas

Currently, the increase in health care costs is undeniable, and that is a reason for concern to all third-part payers in the world. Since health care budgets in most countries are considerably limited, cost-benefit and cost-effectiveness analyses of several medical interventions are essential, not only for physicians, but also for public and private health care systems, inasmuch as they are equally relevant for both.

Therefore, new procedures which provide quality, efficiency and clinical results similar or superior to those provided by ordinary therapies, with better cost-benefit and cost-effectiveness ratios, are needed and beneficial.

Consonant with this reality, the study by Girardi et al.[1], published in this issue, which analyzes comparatively the cost of on-pump and off-pump coronary bypass surgery, is extremely relevant and pertinent. Although this issue has already been analyzed by international studies, there were no specific data concerning the Brazilian reality; therefore, this study is particularly important to clarify the issue of comparative costs of on-pump and off-pump revascularization techniques in our country.

Off-pump coronary artery bypass surgery (OPCAB) is gaining great acceptance and has become a widely used procedure in the treatment of coronary artery disease, as an effort to reduce the morbity attributed to and related to cardiopulmonary bypass (CPB)[2]. This trend has been guided by scientific evidences, randomized controlled studies, systematic reviews, meta-analyses and retrospective registries of large data bases, which have shown that off-pump surgery is associated with an incidence of perioperative complications lower than that of conventional myocardial revascularization surgery.

Since the early 90s, there has been a gradual change in the demographic and risk profiles of patients referred for myocardial revascularization surgery, mostly related to old age and the presence of more serious comorbities which increase the incidence of complications that may lead to a greater operative mortality. It was demonstrated that off-pump surgery reduces the systemic inflammatory response and the neurological alterations associated with the use of on-pump surgery which contribute to the incidence of perioperative complications.

Up to now, 41 randomized controlled trials involving 3,996 patients were published, and four recent meta-analyses compared the results of on-pump versus off-pump coronary artery bypass surgery.

The results of the meta-analyses demonstrated that off-pump surgery, in comparison to traditional technique, was associated with a reduction in the incidence of cerebrovascular accidents (CVA), respiratory infections, atrial fibrilation, blood transfusions and the use of inotropic agents, as well as a reduction in the duration of mechanical ventilation and hospitalization, and lower direct costs. Two meta-analyses demonstrated a reduction in mortality at 30 days, in off-pump surgery technique, but also there were less grafts, and more late reinterventions were required[3-6]. The difference between off-pump surgery and traditional technique in the number of grafts and late patency rates, which had been observed in previous studies, was not confirmed by subsequent studies, since no statistically significant difference was demonstrated[7].

In a recent study using data collected from the New York State registry, comparing 13,889 patients who underwent off-pump surgery with 35,941 patients who underwent on-pump surgery, it was demonstrated, after adjustment for patient risk factors, that the patients who underwent off-pump surgery had a significantly lower mortality rate at 30 days and a lower incidence of CVA and respiratory failure. No difference existed in 3-year mortality, but the patients in the off-pump surgery group had higher rates of subsequent revascularization[8].

Reduction in morbity and mortality in off-pump surgery was more evident in the subgroups of patients with higher operative risk factors, such as older age (age > 75 years), renal dysfunction, recent myocardial infarction, previous CVA, left ventricular dysfunction, chronic obstructive pulmonary disease and reoperations[7].

Kastanioti[9], in a comparative analysis of both techniques, demonstrated that off-pump surgery had lower mean in-hospital cost than on-pump surgery (off-pump €6.515±926 versus on-pump €9.872±1.299, $p<0.0001$). At 1-year follow-up, all mortality parameters, quality of life indices, return to work rates and treatment satisfaction indices were similar in both groups[9]. Other international studies also demonstrated a reduction in cost for off-pump technique in comparison to traditional technique, with a variation of 15-35%, according to the methods used for compiling data and assessing costs[9].

Key Words

Myocardial revascularization; extracorporeal circulation; health care costs.

Mailing Address: Walter J. Gomes •
Rua Borges Lagoa, 1080, cj. 608 –Vila Clementino - 04038-002 – São Paulo, SP - Brazil
E-mail: wjgomes.dcir@epm.br
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If a limited health care budget is a matter of concern everywhere, in Brazil the situation is even more serious. The Brazilian government allocates to public health care systems US$ 157 per inhabitant per year, which added to private system expenses amounts to US$ 290 per inhabitant per year, i.e., 7.6% of the GDP. This is in sharp contrast to health care expenditures observed in other countries. The United States expends US$ 2,725 per inhabitant per year (only with Medcare), amounting to US$ 6,096 per inhabitant per year, i.e., 15.2% of the GDP. Canada expends US$ 2,823, i.e., 9.9% of the GDP; Germany expends US$ 3,521; Portugal expends US$ 1,850. Brazilian expenditures are even lower than those of some other countries, such as Argentina (US$ 380) 8.9 % of the GDP, Chile (US$ 720) and Costa Rica (US$ 378)[10]. Currently, myocardial revascularization surgery represents approximately 50% of all heart surgeries performed in the country.

However, off-pump surgery is still a procedure that corresponds to less than 30% of all myocardial revascularization surgeries performed in the country, and the outcomes depend largely on the experience of the surgeon and the surgical team. Technical advances in the area, such as the introduction of better stabilization devices and heart positioners, and the optimization of anesthetical management and intraoperative control, allowed for a greater acceptance of the method, albeit slowly.

In this context, the study by Girardi et al.[1], with a subgroup of patients at lower risk, confirmed the clinical benefits observed in previous trials, such as a shorter duration of orotracheal intubation and stay in the intensive care unit, and a reduction in the incidence of blood transfusions and perioperative myocardial infarction. It is important to emphasize that in this study, the number of coronary grafts per patient was significantly lower in the off-pump surgery group, mainly because there were fewer bypasses in the posterior-lateral wall, which is supplied by the circumflex coronary artery. The hemodynamical alterations caused by the retraction of the heart to expose the posterior-lateral wall render the anastomosis technically more difficult in the region of this artery, in the off-pump surgery. However, the percentage of left internal thoracic artery grafts used to revascularize the anterior descending coronary artery was similar in both groups (92.3% on-pump versus 94.5% off-pump). It is worthy of notice that previous studies showed that the mean cost of myocardial revascularization surgery is directly proportional to the number of bypass grafts performed[11].

In this study, it was demonstrated that the patients who underwent off-pump surgery represented significantly lower costs than the patients who underwent on-pump surgery, as a reflection of the reduction in operative complications and stay in the intensive care unit. This cost reduction would allow for a 25% increase in the capacity to undertake myocardial revascularization surgeries, in our country. However, it should be taken into account that off-pump myocardial revascularization, due to technical limitations,are not, as yet, applicable to 100% of the procedures, and the on-pump surgery technique still represents an excellent therapeutical option for the treatment and benefit of patients with coronary artery disease.

Therefore, the contribution of these data is relevant for health care systems, emphasizing the prolonged effectiveness of off-pump myocardial revascularization and its lower comparative cost, with a resulting increase in the availability of the surgery for a larger number of patients. Both private and public health care systems may benefit from the reduction in costs, with no decrease in effectiveness.

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