ORIGINAL ARTICLE

Braz J Cardiovasc Surg 2005; 20(3): 317-322

Changes in profile of patients submitted to coronary bypass graft surgery

Modificações no perfil do paciente submetido à operação de revascularização do miocárdio

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RBCCV 44205-765

Abstract

Introduction: **The improvement in care and management of ischemic heart disease and the dissemination of percutaneous coronary intervention (PCI) changed the indications for coronary artery bypass grafting (CABG), regarding the procedure for multiarterial diseased patients with worse clinical conditions.**

Objective: **To compare CABG patients surgical and clinical profiles between two groups with a 10 year interval. Evaluate post-operative mortality and severity risk scores.**

Method: **Retrospective Cohort study, including 307 CABG patients operated in 1991/92 (n=153) and 2001/02 (n=154). Demographic characteristics, heart disease severity, comorbidities and pre-operative events were evaluated and compared between groups.**

Results: **Patients operated in 2001/02 were older, more severe (worse NYHA class, prevalence of heart failure, and multiarterial diseased) and with more comorbidities. Patients operated in 1991/92 had more urgent procedures. The observed surgical mortality rates were similar (3,3% and 1,9%, respectively).**

Conclusion: **Patients submitted to CABG currently are older and in worse clinical conditions than those operated 10 years ago, but hospital mortality wasn't altered significantly.**

Descriptors: **Myocardial revascularization. Risk assessment. Heart diseases, surgery.**

Resumo

Introdução: **Indicações da operação de revascularização miocárdica (RM) foram modificadas pela introdução de novas**

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Article received in March, 2005
Artigo accepted in August, 2005

drogas e da angioplastia coronária transluminal percutânea (ACTP), sendo o procedimento cada vez considerado em pacientes com doença multiarterial coronária e de condição clínica mais grave.

Objetivo: **Comparar perfil clínico e cirúrgico entre dois grupos de pacientes submetidos a RM com intervalo de 10 anos, bem como observar sua influência na mortalidade hospitalar.**

Método: **Estudo de coorte retrospectivo, envolvendo 307 pacientes submetidos a RM em 1991/92 (grupo INICIAL, n=153) ou 2001/02 (grupo ATUAL, n=154). Para cada grupo foram identificadas características demográficas, doenças cardíacas, co-morbidades e eventos operatórios, visando comparação e determinação dos fatores relacionados à mortalidade hospitalar aumentada.**

Resultados: **Grupo recente tinha idade mais avançada, condição cardíaca mais grave(classe funcional, prevalência de insuficiência cardíaca e número de vasos com lesão grave) e maior prevalência de co-morbidades. Pacientes iniciais mostraram maior prevalência na indicação cirúrgica de urgência. Não ocorreu diferença na mortalidade hospitalar (respectivamente 3,3% e 1,9% para grupos INICIAL e ATUAL).**

Conclusões: **Pacientes atualmente submetidos a RM são mais idosos e de condição clínica mais grave (cardíaca e sistêmica) que os operados há 10 anos, embora isto não tenha influenciado de modo significativo a mortalidade hospitalar, que é menor recentemente.**

Descritores: **Revascularização miocárdica. Medição de risco. Cardiopatias, cirurgia.**

INTRODUCTION

The treatment of ischemic cardiopathy has passed through significant changes, with implications in the natural history of the disease and in the indication of surgical intervention [1-5]. Some pharmacological or invasive therapeutic interventions, such as percutaneous transluminal angioplasty (PTCA), prove the necessity of coronary artery bypass grafting (CABG) or delay it, by allowing a more favorable clinical evolution [6-7]. However, when surgery is delayed, there is the probability of a future surgery when the patient is older, after the appearance or aggravation of comorbidities, when the coronary disease has evolved (frequently accentuated by the use of the catheter) and when the left ventricular function of the patient is worse (especially if ischemic events occur), conditions that increase surgical risk [1,2,6].

Logically, aggravation of ischemic disease in surgical patients must increase the morbidity and mortality of CABG. However, the evolution of the preoperative management, through the identification of operative risk factors and the development of measures capable of neutralizing their deleterious influence, and the progress in the postoperative management are reflected in a current reduction in the surgical morbidity and mortality, an effect that has been observed over the last 20 years [1,2,4,8].

The objective of this study is to evaluate the profiles of patients submitted to CABG currently and ten years ago, trying to identify changes that can have influenced the surgical risk.

METHOD

Patients

A retrospective cohort involving 307 patients submitted to CABG, isolated or together with left ventricular aneurysmectomy or endarterectomy of the carotid arteries, in the Institute of Cardiology in Rio Grande do Sul/ University Foundation of Cardiology was studied. The patients were allocated to two groups: Ten-year: 153 patients operated on between October 1991 and April 1992; Current: 154 consecutive patients who performed the same procedure between October 2001 and April 2002. Patients who performed CABG associated with valve replacement or valvuloplasties were excluded.

Risk factors of hospital mortality

Characteristics of patients recognized as possible factors capable of increasing the hospital risk [9-15], were classified as: Demographic characteristics: factors related to patients but independent of disease, such as age, gender, race, weight (obese), hematocrit and creatinine levels. Heart disease: determined by factors that identify the extent and repercussions of coronary disease or that can directly influence the performance of the heart, such as clinical symptoms (anginal state and functional class - New York Heart Association), left ventricular function, systemic arterial hypertension (SAH), dyslipidemia, cardiac insufficiency (CI), distribution of coronary lesions, previous events such as acute myocardial infarction (AMI) or percutaneous transluminal angioplasty (PTCA) with or without the implant of a stent.

Comorbidities: preexistent diseases that are not directly related with the heart disease, such as smoking, diabetes mellitus (DM), peripheral vascular disease (PVD), cerebral vascular disease (CVD), renal insufficiency (RI), chronic obstructive pulmonary disease (COPD). Operative variables: surgical characteristics such as indication criteria (elective or urgency emergency), previous CABG (reoperation), cardiopulmonary bypass (CPB) time, aortic clamping time,

number of grafts utilized, use of the internal thoracic artery. The use of intra-aortic balloon (IAB) or nitroglycerin (NTG) in the preoperative period was also evaluated.

Outcomes

The demographic and operative characteristics, as well as the characteristics that defined the severity of the heart disease and the comorbidities were expressed in terms of absence or presence (dichotomous variables) or intensity (continuous variables) in both the Ten-year and Current Groups. With this, the study aimed at characterizing the two populations and attempted to identify significant differences in the distribution of variables between the studied groups, to assess possible changes in the clinical profile of the two populations who underwent CABG over a 10-year interval.

Surgical mortality was the outcome utilized to define the quality of the result of CABG, with the rate observed in each group compared with the expected rate.

Ethical considerations

The study was registered in the Research Unit of the Cardiology Institute of RGS/ Fundação Universitária de Cardiologia and it was approved by the Ethics Research Committee of the Institution. As it was a retrospective study with investigations of patient records, no risk or harm to the patients was predicted; secrecy of the medical information was observed throughout.

Data collection and statistical analysis

Information about patients was collected from the patient records and registered in tables for statistical analysis using the SPSS computer program. Numerical data are expressed as means and standard deviations. The comparative tests used the Student t-test and the chi-square and variance analysis tests. A critical α level of 5% was considered significant, giving a P-value < 0.05, although lower values for p are reported.

RESULTS

Profile of the groups

a) Demographic characteristics (Table 1)

Comparing the demographic characteristics the members of the Current Group were older than those of the Ten-year Group (62.71 years versus 58.86 years, respectively – p-value = 0.01) and had a lower prevalence of obesity (9.7%, versus 20.9% p-value = 0.05). In the preoperative evaluation of the laboratory results, patients of the Current Group when compared to the Ten-year Group had lower hematocrit levels (38.05% versus 40.61%, respectively - p-value = 0.01) and higher creatinine levels (1.14 mg/dL versus 1.01 mg/dL, respectively – p-value < 0.05).

Table 1. Demographic characteristics of patients considered in the study

Characteristics	Ten-year Group	Current Group	p-value
Sample (n)	153	154	–
Mean age (years)	58.86 ± 8.87	62.71 ± 9,36	0.001
Gender			0.126. ns
Male	119 (77.8%)	110 (71.4%)	
Female	34 (22.2%)	44 (28.6%)	
Race			0.501.ns
Caucasian	148 (96.7%)	152 (98.7%)	
Negro	3 (2%)	1 (0.6%)	
Half-caste	2 (1.3%)	1 (0.6%)	
Obesity	32 (20.9%)	15 (9.7%)	0.005
Laboratory Evaluation			
Hematocrit (%)	40.61 ± 3.82	38.05 ± 3.98	
Creatinine (mg/dL)	1.01 ± 0.25	1.14 ± 0.46	

ns: non-significant for p-value < 0.05

b) Heart disease (Table 2)

In relation to the symptomatology, the patients in the Current Group had a higher prevalence of unstable angina than those in the Ten-year Group (88.7% versus 66.2%, respectively) and a lower rate of stable angina (7.2% versus 24.7%) giving a significant difference (p-value = 0.001). Patients of the Current Group had more severe heart conditions, with a predominance of functional classes II and III (NYHA) than patients in the Ten-year Group (15.6% versus 3.3% respectively for class II and 13% versus 2% for class III, p-value = 0.01). The greater incidences of CI, SAH and dyslipidemia were in the Current group.

In respect to previous adverse events, we found a significant difference only in relation to the use of coronary stents implanted by PTCA, which was more common in the Current Group.

There was a statistical difference between the groups in respect to the number of vessels with severe lesions (> 70%) with preponderance in the Current Group when compared to the Ten-year Group (2.76 vessels versus 2.42 vessels, p-value = 0.01) as seen by coronary cineangiography. The ejection fraction of the patients in the Current Group was higher when compared to the Ten-year Group (68.3% versus 60.4%, p-value = 0.01), but ejection fractions under 30% also prevailed in the Current Group (1.9%) compared to the Ten-year Group (1.3%).

Table 2. Heart disease characteristics of the patients considered in the study

Characteristics	Ten-year Group	Current Group	p-value
Sample (n)	153	154	––
symptoms			0.001
Asymptomatic	5 (3.3%)	2 (1.3%)	
stable Angina	11 (7.2%)	38 (24.7%)	
unstable Angina	128 (83.7%)	102 (66.2%)	
Acute myocardial infarction	7 (4.6%)	6 (3.9%)	
others	2 (1.3%)	6 (3.9%)	
NYHA			0.001
Class I	140 (91.5%)	104 (67.5%)	
Class II	5 (3.3%)	24 (15.6%)	
Class III	3 (2%)	20 (13%)	
Class IV	5 (3.3%)	6 (3.9%)	
Ejection fraction < 30%	2 (1.3%)	3 (1.9%)	0.503.ns
Cardiac insufficiency	12 (7.8%)	42 (27.3%)	0.001
Arterial hypertension	81 (52.9%)	103 (66.9%)	0.009
Dyslipidemia	22 (14.4%)	44 (28.6%)	0.002
Previous events			
Coronary angioplasty	10 (6.5%)	17 (11%)	0.117.ns
Stent implantation	0	9 (5.8%)	0.002
Acute myocardial infarction	75 (49%)	87 (56.5%)	0.116.ns
stroke	2 (1.3%)	8 (5.2%)	0.053.ns

ns: non-significant for p-value < 0.05

Table 3. Co-morbidities in patients

Characteristics	Ten-year Group	Current Group	p-value
Sample (n)	153	154	_
Smoker	94 (61.4%)	97 (63%)	0.436.ns
Diabetes Mellitus	33 (21.6%)	56 (36.4%)	0.003
PVD	8 (5.2%)	25 (16.2%)	0.001
CVD	7 (4.6%)	16 (10.4%)	0.042
Renal Insufficiency	0	13 (8.4%)	0.001
COPD	18 (11.8%)	10 (6.5%)	0.079

PVD = peripheral vascular disease; CVD = cerebral vascular disease; COPD = chronic obstructive pulmonary disease:
ns: non-significant for p-value < 0.05

c) Comorbidities (Table 3)

In respect to comorbidities, there was a significant preponderance in the Current Group in comparison with Ten-year Group for DM (36.4% versus 21.6%, respectively; p-value = 0.003), PVD (16.2% versus 5.2%; p-value = 0.001), CVD (10.4% versus 4.6%; p-value = 0.04) and RI (8.4% versus 0%, p-value < 0.001). Only COPD prevailed in the Ten-year Group in comparison with the Current Group, though the difference was not statistically significant (11.8% versus 6.5%; p-value = 0.08).

d) Operative variables (Table 4)

A higher frequency of urgent surgery was observed in the Ten-year as opposed to the Current Group (30.7% versus 9.1%, respectively; p-value = 0.01). Of the patients from the Ten-year Group, 4.6% had performed previous CABG and of the Current group, 4.5% (no significant difference). Preoperative IAB were used in five patients, all belonging to the Current Group (p-value < 0.05).

Trans-operative data such as CPB time, ischemia time and number of grafts utilized were not significantly distinct between the groups. Only the use of the internal mammary artery graft prevailed in the Current Group with relation to the Ten-year Group (74% versus 39.9%, p-value = 0.01).

Table 4. Operative variables of evaluated patients

Characteristics	Ten-year Group	Current Group	p-value
Sample (n)	153	154	
period of surgery	1991-1992	2001-2002	
Urgent surgery	47 (30.7%)	14 (9.1%)	0.001
Prior revascularization	7 (4.6%)	7 (4.5%)	0.602.ns
pre-operative intra-aortic balloon	0	5 (3.2%)	0.031
Surgical procedure			
myocardial revascularization (MR)	146 (95.4%)	141 (91.6%)	
MR & aneurysmectomy of LV	6 (3.9%)	5 (3.2%)	
MR & carotid endarterectomy	1 (0.7%)	7 (4.5%)	
MR & ventriculoseptoplasty	0	1 (0,6%)	
Number of grafts	3.04 ± 1.08	2.97 ± 0.77	0.504.ns
mammary arterial grafts	61 (39.9%)	114 (74%)	0.001
Cardiopulmonary bypass (min)	77.82 ± 23.62	80.78 ± 23.17	0.268.ns
Time of ischemia (min)	51.77 ± 16.95	50.75 ± 15.06	0.576.ns

ns: non-significant for p-value < 0.05

Surgical mortality

The observed surgical mortality was not different between the groups, in the Ten-year

Group it was 3.3% and in the Current Group it was 1.9% (p=0.358).

COMMENTS

In agreement with the literature [1], this study demonstrates that the patients who were submitted to CABG more recently are older. This seems to be consequent to a reduction in the surgical mortality of older patients and by the evolution of the management of patients considered to be high risk, which includes most elderly patients [14,16]. The worst current clinical condition of operated patients, represented by more comorbidities (such as MD, SAH and CVD), of CI, of increased functional class (class III - NYHA) and of multiple arterial disease, can be explained by referring lower-risk patients for PTCA, preferably with stent implantation [9,10]. It was observed that no patients in the Ten-year Group had implanted stents previous to the surgery as the technique was not developed at that time; however we did not find significant differences between groups in respect to previous percutaneous transluminal angioplasty using balloon-catheters (Table 2).

It is recognized that the risk of new procedures after a primary PTCA has been reduced and that the patients who underwent primary angioplasty have a low risk of requiring new revascularization procedures, estimated at 33.6% over two years after intervention in the 1990s, and 12.4% in the 2000s [7]. It is inferred that many patients, excluding those more serious ones in respect to atherosclerotic disease (coronary and systemic diseases), who performed angioplasty did not require CABG later and were excluded from the Current Group.

In spite of the worse clinical conditions presented by the operated patients in 2001/02, a greater number of patients with ejection fractions of less than 30% was not found in this group. On the contrary, patients showed in the heart catheterism examination a higher average ejection fraction than those patients operated on in 1991/92. This finding can not be clearly explained.

Although a lower mortality was seen in the Current Group, this rate was not statistically different from the Ten-year Group. These findings are in agreement with published results [2,4]. Some factors can have contributed to the increased mortality of patients in the Ten-year Group, such as the prevalence of unstable angina, a lower mean EF evidenced in the heart catheterism examination (even though it was close to the normal) and the higher prevalence of urgent surgeries which was considered preponderant. No attempt to identify direct effects of percutaneous coronary interventions was made, but it is possible that an increase in the number of these procedures has favored the current surgical results, reducing the number of urgent surgeries performed more recently. This is because possible candidates for emergency or urgent CABG may have had the severity of the coronary lesions minimized by percutaneous angioplasty and not require surgery in a period of acute ischemia (whether unstable angina or during the evolution of or recovery from acute myocardial infarction). Major thrombolytic diffusion, statins use and the non-suspension of beta-blockers in the preoperative period could have also contributed.

This study was performed retrospectively, based on information from patient report cards, especially when considering patients operated on one decade ago, when computerized registers did not exist. For this, the work may be affected by a significant bias in relation to the Ten-year Group; similarly more recent progress related to the perioperative management of patients was not considered which may have contributed to the reduction in the mortality rate observed. But aiming at better characterizing the populations studied and excluding (negative) effects on the observed mortality rate, patients with valvar disease, requiring concomitant surgical intervention, were not considered [17].

Considering the Current Group, with very exact data collection, the results observed allow us to identify characteristics of the patients who underwent CABG associated with increased hospital mortality and, if correctly analysed this will include recognized operative risk factors [18]. This is an open perspective of the present study, to be concretized within the current methodology [19].

CONCLUSION

Patients who were recently submitted to CABG are older and in worse clinical conditions (heart and systemic conditions) than those operated on ten years ago, but the mortality related to the surgery is comparable between both populations, although slightly lower in the more recent operations. This seems to be justified by the greater prevalence of urgent surgeries among patients operated on one decade ago and by the evolution of the identification and neutralization of some risk factors in CABG.

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