Changes in profile of patients submitted to coronary bypass graft surgery

Modificações no perfil do paciente submetido à operaçãode revascularização do miocárdio

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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 operaçãode revascularização miocárdica (RM) foram modificadas pela introdução de novas
drogas e da angioplastia coronária transluminal percutânea (ACTP), sendo o procedimento cada vez mais 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 (respectiveivamente 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. Medicação de risco. Cardiopatias, cirurgia.
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 \( \alpha \) 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 symptomatic profile, 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%).
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).

Table 3. Co-morbidities in patients

| Characteristics          | Ten-year Group | Current Group | p-value |
|--------------------------|----------------|---------------|---------|
| Sample (n)               | 153            | 154           | 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 infarct | 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 infarct | 75 (49%)       | 87 (56.5%)    | 0.116 ns|
| stroke                   | 2 (1.3%)       | 8 (5.2%)      | 0.053 ns|
| p-value                  |                |               |         |
| ns: non-significant for p-value < 0.05 |

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

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 = 0.001). 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).

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     | 0.001   |
| Urgent surgery           | 47 (30.7%)     | 14 (9.1%)     |         |
| 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|
| p-value                  |                |               |         |
| ns: non-significant for p-value < 0.05 |

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performed more recently. This is because possible surgical results, reducing the number of urgent surgeries in the number of these procedures has favored the current interventions was made, but it is possible that an increase attempt to identify direct effects of percutaneous coronary urgent surgeries which was considered preponderant. No it was close to the normal) and the higher prevalence of evidenced in the heart catheterism examination (even though as the prevalence of unstable angina, a lower mean EF increased mortality of patients in the Ten-year Group, such 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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