Comparison of two risk stratification models in elective coronary artery bypass patients

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ABSTRACT

OBJECTIVE. To compare the Cleveland Clinical Score and EuroSCORE when evaluating patients submitted to elective CABGS in Rio Grande do Sul, RS, Brazil.

METHODS. This was a cohort study of 202 patients given CABGS between January 2006 and March 2007. Surgical risk was categorized according to the Cleveland Clinic Score and the EuroSCORE as low, medium or high. The incidence of deaths was measured over a 60-day period.

RESULTS. The mean age of patients was 62±10 years and 134 (66%) of them were men. A correlation was observed between the scores for classifying patients into different levels of risk. According to the Cleveland Clinic score and the EuroSCORE, respectively, patients were categorized as follows: 142 (70.3%) and 155 (76.7%) low risk patients, 56 (27.7%) and 43 (21.3%) intermediate risk patients and 4 (2%) and 4 (2%) high risk patients; with a Kaplan correlation coefficient of 0.432; p=0.001. Thirteen (13, 6.4%) patients died during the first 60 days after surgery. There was a correlation between greater incidence of death and higher risk categories for both the Cleveland Clinic score and the EuroSCORE. Deaths occurred in the Cleveland and EuroSCORE risk groups, respectively, as follows: 6 (4.4%) and 7 (4.5%) in the low risk group; 5 (8.9%) and 5 (11.6%) in the intermediate risk group and 2 (50%) and 1 (25%) in the high risk group. Observed sensitivity for surgical mortality prediction was 72.5% and 66.5% for the Cleveland score and EuroSCORE respectively.

CONCLUSION. The Cleveland Clinic and EuroSCORE surgical risk prediction instruments are both moderately effective for predicting mortality among elective CABGS patients.


INTRODUCTION

Coronary artery bypass surgery (CABGS) is a surgical procedure that is widely studied because of the great clinical interest and because its outcomes are very easily defined. Surgical risk assessment is an important part of preoperative preparation for heart surgery. It gives patients and their families an idea of the real risk of complications and death. It is indispensable for the medical team when choosing the procedure, planning postoperative care, predicting prognosis and considering issues of cost against benefit. The Cleveland Clinical Score was first formulated in 1986 at the Cleveland Clinic Foundation in order to assess the risk of surgery in patients with indications for coronary artery surgery. They identified 13 risk factors that constituted a model that was capable of stratifying patients into three different levels of risk of death from coronary artery bypass graft surgery: low risk (score < 3), intermediate risk (score 3 to 6) or high risk (score > 6). The EuroSCORE is one of the most up-to-date risk stratification models. It was developed on the basis of data collected from 130 centers in eight different European countries and is designed to predict mortality both for patients who will undergo CABGS and also for heart valve surgery patients. Elective surgery was not therefore considered when comparing the scores. The objective of this study is to compare the applicability of two risk scores, the Cleveland Clinical Score and the EuroSCORE, in patients with stable coronary artery disease (CAD) scheduled to undergo elective CABGS in the Brazilian state of Rio Grande do Sul.
Methods

This was a prospective cohort study that assessed 215 consecutive, adult, non-hospitalized patients of both sexes who were admitted electively to undergo CABGS with grafts from the saphenous vein and/or mammary artery. These patients were recruited at three public hospitals in Rio Grande do Sul between January of 2006 and March of 2007. Patients were excluded if they were operated on under emergency conditions, had acute coronary syndrome or underwent other surgical procedures at the same time. The primary outcome for this study was mortality, defined as death from all causes while in hospital or within 60 days of hospital discharge.

Ethical considerations

The study was approved by the Ethics Committees and Scientific Committees at the Instituto de Cardiologia do Rio Grande do Sul, the Hospital de Clínicas de Porto Alegre and the Santa Casa de Misericórdia de Porto Alegre. Free and informed consent was obtained from all patients.

Instruments

A structured questionnaire was administered and data were collected on demographic, anthropometric and clinical factors. Each patient was assessed for presence or absence of the 13 risk factors defined by the Cleveland Clinical Score and the 17 risk factors defined by the EuroSCORE, respecting the definitions of each one and attributing the correct scores to them. Patients were stratified into three risk groups and followed-up in outpatient consultations at 30 and 60 days, in order to check for complications and deaths.

Sample

In order to detect a correlation with r greater than 0.3, with statistical power of 90% and a 5% significance level, we calculated that the minimum sample size would be 113 patients. We enrolled 202 patients on this study, who were part of the sample for a study published by Nery and Barbisan5.

Statistical analysis

The data collected were analyzed using the program Statistical Package for the Social Sciences (SPSS version 15.0). Categorical variables are given as absolute frequencies and percentages. Continuous variables with normal distribution are given as means and standard deviations and variables without normal distribution are shown as median and interquartile amplitude (IQ). The level of agreement between scores was assessed using the Intraclass Correlation Coefficient. Predicted mortality (in percentage terms) was defined as the sum of the mortality scores according to each model, divided by the number of patients assessed. The observed mortality was the actual number of deaths divided by the corresponding number of patients. The outcome of interest in this study was death. For any given pair, the predictions of the logistic model are defined as agreeing with the outcome when the patient who died had a greater predicted probability of death than the survivor. The c-statistic is the proportion of predictions agreeing with the outcome. Possible values are in the range of 0.5 to 1.6 The greater the value of the c-statistic, the greater the model’s accuracy or discriminatory power. The c-statistic is also known as the area under the curve of the receiver operating characteristic (ROC AUC).

Results

Thirteen of the 215 patients interviewed at three public hospitals in Rio Grande do Sul were excluded because they were not eligible for surgery. Table 1 lists demographic, anthropometric and clinical variables for the patients. There was a greater proportion of men and a high number of smokers. Preoperative physical activity was defined as any type of physical activity lasting at least 30 minutes, three times a week up to 2 weeks before surgery. The patients who underwent CABGS were classified into one of three risk bands by the Cleveland Clinic and EuroSCORE scales. It was observed that there was moderate agreement between the two scores in terms of classifying patients into different risk bands, with agreement being most evident among high risk patients. Kappa correlation = 0.432; P<0.001. Cleveland score: low risk 142 patients (70.3%), intermediate risk 56 patients (27.7%) high risk 4 patients (2%). EuroSCORE: low risk 155 patients (76.7%), intermediate risk 43 patients (21.3%) and high risk 4 patients (2%). Both scales differentiated significantly between the scores attributed to patients who died and those who survived. Analyzing the medians and interquartile amplitudes, according to the Cleveland score patients who died scored up to two points in the 25% quartile and up to five points in the 75% quintile, with a median of three points (P=0.004). The same occurred with the EuroSCORE, by which the patients who died scored up to one point in the 25% quintile and four points in the 75% quintile with a median of two points (P=0.039). Table 2 relates the number of patients classified into each category according to the Cleveland score and the EuroSCORE to actual surgical mortality. According to the Cleveland score, 142 patients were low risk, 56 were intermediate risk and 4 were high risk. According to the EuroSCORE, there were 155 low risk, 43 intermediate risk and 4 high risk patients. A correlation was observed between increase in the incidence of death and increase in the category of risk for both scores. Figure 1 illustrates the sensitivity and specificity of the Cleveland score and the EuroSCORE for predicting mortality, plotted on a ROC curve. The comparison between the two scores is slightly favorable to the Cleveland Clinic score. We observed 72.5% and 66.5% sensitivity for predicting surgical mortality for the Cleveland score and EuroSCORE, respectively.

Discussion

Our study shows the applicability of both scores for predicting mortality in patients undergoing elective CABGS in Rio Grande do Sul. Similarity between the two was moderate and the Cleveland score proved a little more sensitive with respect to the outcome death. In contrast, a study conducted by Moraes et al. with a group of 752 patients who underwent CABGS at the Instituto do Coração de Pernambuco in 2003
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In both cases the variable emergency surgery had the greatest power to predict mortality\(^7\). Validation of these instruments at different institutions therefore appears to be recommendable. Limitations: the small number of patients enrolled on this study is a result of the fact that this was a secondary objective of a larger project designed to evaluate the influence of physical activity in free time on the prognosis of patients given CABGS, and the sample size was calculated for that study\(^5\). The sample size would have had to be greater in order to assess the outcome mortality. Another factor that impacts on this outcome is developments in surgical techniques and preoperative and postoperative care, reducing the number of complications and, consequently, of deaths.

**Conclusion**

The Cleveland Clinic and EuroSCORE surgical risk prediction instruments are effective for predicting mortality among elective CABGS patients.

**Conflicts of interest:** none

**References**


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