Introduction and objectives. Risk of hospital death is one of the key factors considered by the clinical cardiologist when weighting indications for surgery. Risk estimation scales establish distinct levels of risk in quantitative terms. The aim of the present study was to investigate whether a low EuroSCORE value corresponds to low mortality in our setting.

Patients and methods. During 1999-2000 we prospectively calculated the EuroSCORE for all patients who underwent isolated coronary (CS) or valvular (VS) surgery. We then analyzed intrahospital mortality of patients with a low EuroSCORE. The validation group consisted of patients who underwent surgery in 2001 and obtained a low EuroSCORE.

Results. During 1999-2000 we identified 116 patients (16.2% of all patients treated with isolated CS or CV) with a low EuroSCORE (50 ± 8.6 years; 65% male). Fifty-seven of these patients underwent isolated CS, and 59 of them isolated VS. Intrahospital mortality was zero. In 2001 we identified 59 (16.1%) such patients (49 ± 8.7 years; 68% male), of whom 35 underwent isolated CS and 24 underwent isolated VS. Intrahospital mortality during this period was again zero.

Conclusions. A low EuroSCORE identifies a population of patients with minimum risk of mortality after isolated coronary or valve surgery. The score may be useful as a sentinel indicator in analyses of the complex issue of quality of cardiac surgery.

Key words: Surgery. Mortality. Prognosis.

¿Se puede identificar mediante el EuroSCORE a los pacientes con mortalidad mínima en cirugía cardíaca?

Introducción y objetivos. El nivel de riesgo de muerte hospitalaria ha sido uno de los factores clave que el cardiólogo clínico ha sopesado a la hora de establecer una indicación quirúrgica. Las escalas de estimación de riesgo evalúan cuantitativamente el riesgo, estableciendo niveles muy diferentes. El objetivo de nuestro estudio es investigar si, en nuestro medio, un valor mínimo del EuroSCORE se corresponde, en efecto, con una mínima mortalidad.

Pacientes y métodos. Durante 1999 y 2000 cuantificamos prospectivamente el EuroSCORE de todos los pacientes con cirugía de revascularización coronaria y valvular aisladas. Analizamos la mortalidad intrahospitalaria en aquellos con un valor mínimo del EuroSCORE. Los pacientes intervenidos en el año 2001 que obtuvieron un valor mínimo del EuroSCORE constituyeron el grupo de validación.

Resultados. Durante 1999-2000 identificamos a 116 (16,2% del total de la cirugía de revascularización coronaria y cirugía valvular aisladas) pacientes (50 ± 8,6 años; 65%, varones) con un valor mínimo del EuroSCORE. En 2001 identificamos a 59 (16,1%) pacientes (49 ± 8,7 años; 68% varones), de los cuales 35 fueron sometidos a cirugía coronaria y 24 a cirugía valvular. La mortalidad intrahospitalaria fue nula.

Conclusiones. Un valor mínimo del EuroSCORE identifica a una población de pacientes cuyo riesgo de fallecimiento, tras una cirugía coronaria o valvular aisladas, es mínimo. Este valor podría ser utilizado como indicador centinela en el complejo tema de la calidad en la cirugía cardíaca.
A total of 452 operations were performed in 2001; 147 (32.5%) were CABG and 219 (55.6%) were VS. The validation group included surgical patients with a minimum EuroSCORE.

Risk scoring system and mortality

The EuroSCORE (Appendix 1) was prospectively calculated at the time of admission when the patient had been referred for surgical treatment by his or her cardiologist in the usual manner; i.e., without applying any of the risk scales.

The minimum score indicates that there are no risk variables, except those pertaining to gender and the type of surgery (Appendix 1). Therefore, patients at minimum risk were defined as men undergoing CABG (EuroSCORE 0), women undergoing CABG (EuroSCORE 1), men undergoing VS (EuroSCORE 2) and women undergoing VS (EuroSCORE 3).

In all patients, we analyzed the total in-hospital mortality, defined as death occurring before hospital discharge.

Statistical analysis

The data are expressed as the mean±standard deviation (SD). The discrete variables are expressed as a percentage. Qualitative variables were analyzed by the χ² test and the Fisher exact test. For the analysis of quantitative variables, we used the Student’s t-test. Significance was set at a P<.05.

RESULTS

Study period (1999-2000)

A total of 714 isolated CABG and VS were performed during this period; 55% (n=180) of the CABG were done off-pump. During this period we identified 116 patients (16.2%) with a minimum EuroSCORE. The patients’ baseline characteristics are shown in Table 1. CABG was performed in 57 patients (17.4% of all CABG) and one valvular surgery was performed in 59 (15.2% of all VS); 70% (n=40) of the CABG were performed off-pump.

By definition (minimum EuroSCORE), the patients did not present any of the EuroSCORE risk factors. However, an occasional risk factor was observed in other risk assessment scales (modified Parsonnet). Thus, 11.4% of patients had diabetes mellitus, 32% a history of hypertension, 9.7% congestive heart failure and 1.1% (2 patients) had creatinine values of 1.5-2 mg/dL. A total of 14 patients (12%) had suffered an acute myocardial infarction (AMI) at least 90 days earlier (not one of the risk criteria defined in the
Total group

CABG was performed in 81 patients (46.3%) and VS in 94 (53.7%). A total of 71 patients (40.6%) had a EuroSCORE of 0; 10 patients (5.7%) had 1; 45 patients (25.7%) had 2 and 49 (28%) had 3.

There were 34 patients with the minimum Parsonnet score: 27 patients with CABG (25 men with 0 and 2 women with 1) and 7 patients with VS (5 men and 1 woman with aortic VS and 1 woman with mitral VS).

We found no statistically significant differences in either the study group (1999-2000) or the validation group (2001) in terms of the type of surgical procedure, age, gender, associated diseases, EuroSCORE or Parsonnet score (Table 1).

Mortality

No patient in the study group or validation group died during the assessment period.

DISCUSSION

In our setting, 16% of patients who underwent cardiac surgery (isolated coronary artery bypass and valvular surgery) had no risk variables except those related to gender or type of surgical procedure. This minimum-risk population of 175 patients collected over 3 years of activity presented no in-hospital mortality. The hospital mortality of any surgical procedure is an extremely important factor for the clinical cardiologist and is the first obstacle to be overcome in order to achieve the benefits of surgery. Although the indications for coronary artery bypass and valvular surgery are presently well-defined in the clinical guidelines issued by various medical societies, there are some situations in which the indication should be individualized. If the cardiologist considers that the mortality associated with a procedure is high in relation to the mortality of the disorder, there will be some hesitation in deciding the indication for surgery, unless the objective is to improve the patient’s quality of life, something that is not always accomplished.

As a result, scoring systems to predict the risk of operative mortality have been under development for more than a decade. One of their main uses is to provide a quality control mechanism to compare expected mortality with observed mortality. The clinical practice guidelines for coronary artery bypass grafting of the Sociedad Española de Cardiología (Spanish Society of Cardiology) suggest that each medical-surgical team become familiar with one of these risk scoring systems and adapt it to their particular situation when making decisions concerning their patients.

The EuroSCORE is one of the risk scoring systems that is gradually increasing in use, as it is less complex than other systems and originated within Europe.
the participation of several Spanish hospitals). The EuroSCORE system is also now starting to be evaluated in the U.S. Nevertheless, its diagnostic accuracy has not been definitively ascertained. The area under the curve values (obtained by ROC analysis) were below 0.80 in the original article, although other authors have found higher values. At our hospital, the EuroSCORE is the risk scoring system with the highest diagnostic accuracy for both isolated coronary and valvular surgery, a finding that has been reported by other authors. Additionally, the use of the EuroSCORE in our setting; nevertheless, it would be worthwhile to further evaluate these findings in a multicenter registry.

We did not analyze other types of cardiac surgery. Only one patient with combined valvular and CABG surgery had a minimum EuroSCORE value during the study period. Aortic surgery and the mechanical complications of AMI inherently imply a value above the minimum. Other diseases (pericardial processes, etc.) were infrequent. Surgery for congenital diseases in adults is infrequent and is known to involve low surgical risk. From 1999 to 2001, there was no mortality related to atrial septal defect surgery, the congenital condition most often treated surgically at our hospital (unpublished data).

**Limitations**

Since the cases were highly selected and collected over a three-year period, the number of patients (n=175) in our series is low. A multicenter study should be carried out to obtain a significantly higher number. The objective of our study was to assess the minimum EuroSCORE in our setting; nevertheless, it would be worthwhile to further evaluate these findings in a multicenter registry.

Clinical implications

Use of the mortality rate in a minimum-risk population — such as the population we identified by using the EuroSCORE — can be a quick, first step in assessing the quality of a particular surgical team. If the mortality in this population differs substantially from the expected value, the surgical team should reflect at length on the outcome and define a strategy to improve it. If, in contrast, the mortality is along the lines of the EuroSCORE dividing it into risk intervals, without defining a minimum value. Nevertheless, we could extrapolate that 15%-20% of patients from any cardiac surgery department might have a minimum EuroSCORE value, a number below the percentage of older patients (non-minimum EuroSCORE by definition), a level that is rising.

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What is the percentage of patients with a minimum Euroscore? At our hospital, the percentage of patients who fell in the EuroSCORE low-risk group (≤2) was 25%, lower than that reported by other authors. This is probably because our series included more valvular surgery than CABG and because the EuroSCORE is higher in valvular surgery (this surgery type is automatically assigned 2 points). The percentage of patients with a minimum EuroSCORE was 16%, since we only included patients who underwent isolated CABG or valvular surgery. We cannot compare our data with other Spanish series, since the last national registry for cardiac surgery dates back to 1999 and does not include risk scale data. The rest of the series that assess the EuroSCORE divide it into risk intervals, without defining a minimum value. Nevertheless, we could extrapolate that 15%-20% of patients from any cardiac surgery department might have a minimum EuroSCORE value, a number below the percentage of older patients (non-minimum EuroSCORE by definition), a level that is rising. Therefore, what measure of quality control could be better than minimum mortality?
expected levels, the initial impression of the team would be favorable. In this case, additional analysis should still be performed to determine mortality in other risk groups.

Furthermore, the awareness that a very low-risk population in which mortality is minimum or zero does exist is clinically useful for avoiding unnecessary deferral of an operation in appropriate cases.

REFERENCES


APPENDIX 1. Risk assessment scale. EuroScore

<table>
<thead>
<tr>
<th>Factors</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (per 5 years or part thereof above 60)</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>1</td>
</tr>
<tr>
<td>Extracardiac arteriopathy</td>
<td>2</td>
</tr>
<tr>
<td>Neurological dysfunction disease</td>
<td>2</td>
</tr>
<tr>
<td>Previous cardiac surgery</td>
<td>3</td>
</tr>
<tr>
<td>Serum creatinine &gt;200 µmol/L</td>
<td>2</td>
</tr>
<tr>
<td>Active endocarditis</td>
<td>3</td>
</tr>
<tr>
<td>Critical preoperative state</td>
<td>3</td>
</tr>
<tr>
<td>Operation-related factors</td>
<td></td>
</tr>
<tr>
<td>Emergency</td>
<td>2</td>
</tr>
<tr>
<td>Operation other than isolated CABG</td>
<td>2</td>
</tr>
<tr>
<td>Surgery on thoracic aorta</td>
<td>3</td>
</tr>
<tr>
<td>Postinfarct septal rupture</td>
<td>4</td>
</tr>
</tbody>
</table>


