

ORIGINAL ARTICLE

Surgical Risk and Functionality in Patients Undergoing Heart Surgery

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Abstract

Background: Cardiac surgery can lead to a decline in lung and peripheral function. EuroSCORE is a scale that assesses cardiac surgery risk and the measurement of functional independence evaluates the ability to perform functional activities.

Objective: To identify the correlation between a cardiac risk scale and functionality in patients undergoing CS.

Methods: This is a prospective cross-sectional study, carried out with patients submitted to functional evaluation in the preoperative period, through the measurement of functional independence and evaluation by the EuroSCORE, to establish the level of risk for cardiac surgery. After the surgical procedure, on the first day after discharge from the intensive care unit, the functional independence measurement (FIM) was reevaluated and compared to the initial value.

Results: We included 52 patients (55.8% men) with a mean age of 56.9 ± 14.2 years. The mean preoperative and postoperative FIM values were 125.4 and 106.78. The *t* test was performed, which showed a significant reduction between the analyzed periods, with a value of $p = 0.000$. By correlating the postoperative FIM values with the cardiac risk, it was observed that there was an important association, with $p = 0.006$ and $r = -0.37$.

Conclusion: We concluded that a preoperative assessment showing an increased cardiac risk has a negative impact on the functionality of patients undergoing cardiac surgery. (Int J Cardiovasc Sci. 2016;29(5):385-389)

Keywords: Myocardial Infarction / surgery; Thoracic Surgery; Cardiac Surgical Procedures; Risk; Physical Therapy Speciality.

Introduction

An increase in the number of cardiac surgeries has been observed in recent years. In Brazil, the mortality rate of acute myocardial infarction (AMI) and heart failure (HF), as a matter of urgency, was 10.20% in January 2014.¹ All cardiac surgeries are aimed at ensuring symptom relief, preventing myocardial infarction, improving cardiac function and recovering the patient's physical condition.²

Fantinati and Oliveira³ found that the main complications related to cardiac surgeries are associated with the pulmonary system, of which hypoxemia,

decreased lung compliance and reduced pulmonary volume and capacity are emphasized. These include studies that address the main objectives of physical therapy. Reducing the risk of pulmonary complications, improving pulmonary ventilation, and reducing postoperative pain are among the main objectives of physical therapy.

Prolonged mechanical ventilation (PMV) is associated with high morbidity rates and longer hospital length of stay, which have deleterious effects on pulmonary mechanics and significantly interferes with the functionality and capacity to perform activities of daily living.^{4,5}

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Patient functionality is usually assessed by the Functional Independence Measurement (FIM) scale. The FIM scale was developed in the 1980s by a North-American task force of physical medicine and rehabilitation. It is a measure that meets criteria of reliability, validity, precision, practicality and facility. Its goal is to determine the necessary care to be provided so that the patient can perform activities of daily living.⁶

In this sense, the objective of this study was to identify the correlation between a cardiac risk scale and the patient's post-cardiac surgery functionality.

Methods

This is a retrospective study, carried out at the Inpatient Unit of Instituto Nobre de Cardiologia (INCARDIO) of Santa Casa de Misericórdia located in the city of Feira de Santana, state of Bahia, Brazil, from April to September 2015.

The sample consisted of 52 patients. Individuals of both genders older than 18 years submitted to elective cardiac surgeries, such as Coronary Artery Bypass Grafting (CABG), mitral and / or aortic valve replacement surgery, were included. Individuals who did not agree with the Free and Informed Consent criteria, those with hemodynamic instability, previous functional limitation, clinical contraindication or emergency surgery, making preoperative functional evaluations impossible and those with insufficient data in the medical records to fill out the surgical risk scale were excluded.

After meeting the inclusion criteria, the patients underwent a functional evaluation in the preoperative period through FIM, which evaluates the patient's ability regarding self-care, sphincter control, transfers and locomotion, as well as cognitive function, such as communication and memory, in addition to the evaluation by the European System for Cardiac Operative Risk Evaluation (EuroSCORE) to establish the level of risk for cardiac surgery.

The second moment of the research occurred after the surgical procedure, on the first day of the patient at the INCARDIO Inpatient Unit, where the FIM was reevaluated. The choice of this moment was due to the greater independence shown by the patient when compared to the period in the Intensive Care Unit (ICU).

Data were considered normal after applying the Kolmogorov-Smirnov test. Pearson's correlation was used to cross FIM and EuroSCORE values and the paired

T-test was used for the analysis of pre- and postoperative FIM values only, with the level of statistical significance being set at 5%.

The present study was carried out according to Resolution 466/12 of the National Commission of Research Ethics (CONEP), which approves the guidelines and norms regulating research involving human beings. It was sent to the Ethics and Research Committee and approved on September 23, 2015.

Results

Between April and September 2015, 68 patients were hospitalized; 16 were excluded due to previous functional limitation (six patients), lack of information in medical records (four) and those who did not agree to sign the free and informed consent form (six). A total of 52 patients (55.8% men) were included, with mean age of 56.9 ± 14.2 years, who were submitted to cardiac surgery (CS) at INCARDIO. Table 1 shows the characteristics of the patients included in the study.

Table 1
Characterization of the sample of patients included in the study

Variable	n (%)
Gender	
Male	29 (55.8)
Female	23 (44.2)
Age, years	56.9 ± 14.2
Type of surgery	
Coronary artery bypass grafting	38 (73.1)
Valvular surgery	12 (23.1)
ASD correction	2 (3.8)
Time of CPB, minutes	70.9 ± 21.2
Time of MV, hours	7.6 ± 2.8

ASD: atrial septal defect; CPB: cardiopulmonary bypass; VM: mechanical ventilation.

The mean preoperative FIM was 125.4 and the postoperative FIM was 106.78. The T-test showed a significant reduction between the analyzed periods, with a p value = 0.000.

When the cardiac risk was correlated with the preoperative FIM, no significant association was found, with a value of $p = 0.83$. However, when correlating postoperative FIM values with cardiac risk, a significant association was observed, with $p = 0.006$ and $r = -0.37$, with the non-parametric Spearman's test and statistical significance being set at $p < 0.05$. No significant correlation was observed at the analysis of cardiac risk and time of MV, with $p = 0.50$. Table 2 shows these analyses.

Table 2
Functional independence measurement (FIM) and cardiac risk in patients submitted to cardiac surgery

	Pre	Post	<i>p</i> value
FIM	125.4 ± 1.1	106.7 ± 8.8	0.000*
EuroSCORE	1.97 ± 2.1	1.97 ± 2.1	
<i>p</i> value	0.83†	0.006†	

Data are shown as mean ± standard deviation. *Student's *t* test for paired samples; † Pearson's correlation.

Discussion

The present study confirmed that there is a positive association between a cardiac risk scale and the functionality in patients submitted to cardiac surgery. Patients who had a higher pre-surgery risk developed worse functionality.

In a study carried out by De Santana et al.⁷ to evaluate the quality of life of 77 patients submitted to cardiac surgery, 55.8% were males and elderly, with a mean age of 52.88 ± 3.17 .

A study carried out by Daniel et al.⁸ with 109 patients submitted to surgical interventions such as CABG, valve replacement, aneurysm repair and atrial septal defect (ASD), CABG prevailed, accounting for 60% of the sample. In a study of 1,065 CS patients, 60% underwent CABG, 32.7% valve replacement, and 7% had a mixed surgery, which consists of CABG and valve replacement. The epidemiological characteristics of these patients were 62% males and elderly, with a mean age of 61.4 ± 11.8 years, in agreement with the findings of this study.⁹

A national study with 14 CS patients, aiming at evaluating the loss of functionality after the surgical

intervention, found similar findings to those of the present study, in which the mean preoperative FIM was 126 and the postoperative FIM was 103, with a $p = 0.0001$.¹⁰ A study carried out by Borges et al.¹¹ with 41 individuals observed that there is a functional capacity deficit in patients submitted to surgical intervention.

The study carried out by Morais et. al.,² in which 22 patients submitted to CS showed functional decline, when comparing the pre- and postoperative periods, also corroborate the present study.

In a Greek study, which aimed to evaluate the EuroSCORE system as a predictor of mortality in myocardial revascularization surgery, the number of deaths was analyzed with the estimation given by the system, demonstrating that the mortality predicted by the system can be considered quite close to the observed mortality. The accuracy or predictive capacity of the system, estimated by the c-statistics of the logistic model, was 69.9% (95% confidence interval: 69% to 70.8%), showing that the EuroSCORE is accurate when identifying groups of patients submitted to cardiac surgery who are less likely to have nonfatal complications.¹²

In a study with 1,173 patients submitted to CS, the model showed a good association with the incidence of in-hospital mortality and safety in predicting patient risk. Among the several surgical risk scores, the EuroSCORE showed superior performance and accuracy, being the most up-to-date and best validated model.¹³

In contrast, Parolari et al.,¹⁴ in a meta-analysis of 12 studies with 26,621 individuals, state that the score has low discriminatory power, because it overestimates mortality. Garofallo et al.⁹ reinforce the aforementioned findings by comparing the European system with the American score, showing that they underestimated in-hospital mortality and were inadequate in the preoperative evaluation of patients submitted to cardiac surgery.

In a study carried out with 94 patients, the risk system was applied, which classified the patients as high, medium and low operative risk, with values of 58.5%, 28.7% and 12.8%, respectively. Of the patients classified as high-risk, 43.6% developed Acute Kidney Injury (AKI) in the postoperative period, with a p value = 0.03 when comparing the onset of AKI and the risk stratification values by the EuroSCORE. In addition to this finding, there was a statistically significant association between risk classification and length of stay in the intensive care unit.¹⁵

Studies have shown that patients submitted to CS have a mean ICU stay of 4.16 ± 3.76 days, but factors such as time of mechanical ventilation, respiratory complications, infections, renal failure, hemodynamic instability such as arrhythmias, arterial hypertension and AMI, can interfere with it, thus increasing hospitalization time.¹⁶

Studies show that the longer the immobilization time, the greater the functional deficit. In this context, we highlight the importance of increasingly early physical therapy interventions. Among the procedures performed by the physical therapist in the postoperative period of CS is ambulation, a procedure that has hemodynamic impact, but is characterized as safe and viable, and which does not generate risks for patients with this profile.¹⁷

In a recent study, Chodór et al.¹⁸ found that cardiac risk reduction through transcatheter aortic valve implantation (TAVI) surgery increases functional capacity assessed by the 6-minute walk test even after 12 months of follow-up. Similar result was found by Gotzmann et al.,¹⁹ when evaluating the same patient profile.

Another group demonstrated that the risk and type of surgery were related to the patients' ability to perform exercises in the postoperative period of valve replacement surgery.²⁰ This result may be a complement to our rationale, since the present study demonstrated decreased functionality, which may be related to worsening exercise capacity.

Some limitations can be mentioned in the present study: lack of sample calculation; no evaluation of variables that could interfere with the increase of patient ICU length of stay, such as the use of vasoactive

drugs; lack of data related to the clinical characteristics of patients.

Conclusion

The higher the cardiac risk, the greater the functional loss in patients submitted to cardiac surgery.

Author contributions

Conception and design of the research: Cordeiro ALL, Brito AAOR, Carvalho I, Oliveira J. Acquisition of data: Cordeiro ALL, Brito AAOR, Carvalho I, Oliveira J. Analysis and interpretation of the data: Araújo TM. Statistical analysis: Araújo TM, Gardenghi G. Writing of the manuscript: Cordeiro ALL, Brito AAOR, Carvalho I, Oliveira J. Critical revision of the manuscript for intellectual content: Cordeiro ALL, Guimarães AR, Araújo TM, Gardenghi G.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

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