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Research Article

Age Influence in Clinical Descends in Patients Submitted to Coronary Artery Bypass Grafting?

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Abstract

Background: Cardiovascular diseases are more prevalent in the elderly as well as the need for surgical intervention. It is also known that the complication rate is higher in this population, which may influence the clinical outcomes in the postoperative period of cardiac surgery. Objective: To evaluate whether age influences the clinical outcomes of patients undergoing coronary artery bypass grafting. Methodology: This is a prospective cohort. The patients were divided into two groups: elderly (60 years of age or older) and young (less than 60 years of age). Clinical variables were compared between the groups, such as postoperative pulmonary complications, comorbidities rate, time of cardiopulmonary bypass, mechanical ventilation, intensive care unit stay, hospital stay and death. Quantitative variables were expressed as mean and standard deviation and their differences were verified using the independent Student t test or Mann-Whitney test. Results: A total of 99 patients were included, 58 males (59%) and mean age 58 ± 9 years. There was an impact of age on a primary outcome, with a statistically significant difference ($p = 0.02$) with 6 events in the elderly group and 3 in the young. Regarding the clinical outcomes, there was a difference between groups in intensive care unit time variables (3.3 ± 1.4 vs. 2.5 ± 0.7, ($p < 0.001$)), hospital time ($p < 0.001$) and incidence of pneumonia with 11 in the elderly group versus 7 in the young group ($p = 0.02$). Conclusion: Based on these findings, it is concluded that age negatively influences clinical outcomes, especially death, pneumonia and length of hospital stay.

Keywords: *Elderly; Cardiac Surgery; Intensive Care Unit.*

Introduction

Associated with the increase in life expectancy are cardiovascular diseases, which may require corrective interventions such as cardiac surgeries [1]. Coronary Artery Bypass Grafting (CABG) is the most prevalent surgery due to coronary obstruction [2].

This type of surgery is extremely common in the elderly population due to non-modifiable risk factors such as age, gender and family history. However, lifestyle and eating habits have undergone a marked change in recent years, favoring ischemic coronary lesions in younger individuals. Dyslipidemia, sedentarism and stress can be mentioned as the main modifiable factors associated with cardiovascular diseases [3].

Despite all advances in surgical techniques, these still remain a decisive factor for changes in pulmonary and peripheral function [4,5]. Outcomes such as pneumonias, atelectasis, pleural effusion and pneumothorax are common in patients in the postoperative period of cardiac surgery, mainly CABG [5].

As with aging, there will be a decrease in lung capacity due to a mechanical restriction of thoracic expansion, reduction of ventilatory and peripheral muscle strength related to sarcopenia present in this population[6]. These changes make the elderly more vulnerable to postoperative pulmonary complications, in addition, as there is worsening of strength and peripheral muscular resistance, conducts such as mobilization outside the bed become limited.

Iglézias*., et al.* [7] argue that in the elderly patient, if clinical conditions allow, it is better to avoid the use of Extracorporeal Circulation (ECC) in this way reducing hospital mortality by almost four times. Another surgical factor associated with worse prognosis is median sternotomy.

In the young there is a trend towards greater muscle strength, which may be a protective factor against the damaging effects of cardiac surgery. Nevertheless, the pre, peri and postoperative procedures are similar to those of the elderly, and the clinical impact in this population is still questioned.

Therefore, the objective of this study was to evaluate whether age has influence on clinical outcomes in patients undergoing coronary artery bypass grafting.

Methodology

This is a prospective cohort study carried out at the Intensive Care Unit of the Instituto Nobre de Cardiologia/Santa Casa de Misericórdia in Feira de Santana - Bahia, from February 2016 to November 2017. This study was approved by the Committee of Ethics in Research of the Faculdade Nobre in Feira de Santana, BA under nº 796 580. All the participants signed the Term of Free and Informed Consent.

The participants were individuals at least 18 years of age, of both genders and undergoing coronary artery bypass via sternotomy and cardiopulmonary bypass. Were excluded from the study subjects who underwent combined surgery, emergency, with insufficient data in the chart, lung documented by spirometry and not agreed to sign the consent form and clear.

All participants underwent CABG, always by the same surgical team and forwarded to the Intensive Care Unit (ICU) in anesthetic narcosis, which were ventilated using the following parameters: watch-controlled so as to volume, tidal volume 6 ml/kg, Positive End-expiratory Pressure (PEEP) 05 cmH 20 and 100% inspired oxygen fraction. After admission to all management and weaning clinical decisions were made according to the routine of the unit, without any interference of the researchers.

Patients were divided into two groups: Elderly Group (patients over 60 years old) and Young Group (patients up to 59 years old).

Clinical variables were compared between the groups as postoperative complications (pneumonia, atelectasis, pleural effusion, pneumothorax and acute pulmonary edema), comorbidities (systemic arterial hypertension, diabetes mellitus, dyslipidemia, obesity and acute myocardial infarction), circulation time extracorporeal, mechanical ventilation, ICU stay, hospital stay and death. Obesity was considered when the Body Mass Index was greater than or equal to 30 kg/m^2.

The postoperative complications were identified by the day care physician from the time of admission to the ICU until hospital discharge, through radiological identification and clinical/laboratory examination. It is worth mentioning that this professional was not aware of the current study and therefore a blind evaluation.

Information such as age, gender, weight and height were collected in the preoperative phase.

Kolmogorov-Smirnov test was used to identify the normality of the groups. The chi-square test was used for the categorical variables. Quantitative variables were expressed as mean and standard deviation and their differences were verified using the independent Student t test or Mann-Whitney test. The results were considered statistically significant when $p < 0.05$.

Results

During the research period, 121 patients were operated on, 5 of whom were excluded due to emergency surgery and 17 due to pneumopathy. A total of 99 patients were included, 58 males (59%) and mean age 58 ± 9 years. In the elderly group were 58 patients with mean age of 68 ± 6 years and in the Young group 41 patients with mean age of 48 ± 11 years. Table 1 shows the characteristics of the patients included.

Table 1 shows the impact of age on a primary outcome that was death, with a statistical difference (p = 0.02) with 6 events in the elderly group and 3 in the young.

Variable	Elderly Group (n = 58)	Young Group (n = 41)	p
Gender			
Male	33	25	0,21[a]
Female	25	16	
Age (years)	68 ± 6	48 ± 11	< 0,001[b]
Comorbidities			
SAH	20	16	0,23[a]
DM	21	20	0,32[a]
Dyslipidemia	14	10	0,13[a]
AMI	8	7	0,32[a]
Obesity	11	15	0,4[a]
Death	6	3	0,02[a]

Table 1: *Clinical characteristics and hospital outcome of patients undergoing cardiac surgery.*

a. Qui-quadrado test; b. Independent Student T test; c. Mann-Whitney Test.. SAH: Systemic Arterial Hypertension; DM: Diabetes Mellitus; AMI: Acute Myocardial Infarction.

Table 2 shows the surgical data of the patients evaluated. There were no differences between groups.

Variable	Elderly Group (n = 58)	Young Group (n = 41)	p
ECC time (minutes)	72,5 ± 22,7	71,7 ± 21,6	0,9[a]
MV time (hours)	8,1 ± 3,4	7,4 ± 2,8	0,43[b]
Bypass	2,4 ± 0,5	2,3 ± 0,6	0,78[b]

Table 2: *Surgical data of assessed patients.*

a. *Mann-Whitney test; b. Independent Student T test; ECC: Extracorporeal Circulation; MV: Mechanical Ventilation.*

Regarding the clinical outcomes, there was a difference between groups in ICU time variables (3.3 ± 1.4 vs. 2.5 ± 0.7, (p < 0.001)), hospital time (p < 0.001) and incidence of pneumonia with 11 in the elderly group versus 7 in the young group (p = 0.02). Table 3 shows the other variables analyzed.

Variable	Elderly Group (n = 58)	Young Group (n = 41)	p
ICU time (days)	3,3 ± 1,4	2,5 ± 0,7	< 0,001[a]
Hospital time (days)	10,3 ± 2,1	8,6 ± 1,8	< 0,001[a]
Post Operative Complications			
Pneumonia	11	7	0,02[b]
Atelectasis	8	8	0,97[b]
Pleural effusion	15	14	0,76[b]
Pneumothorax	3	1	0,33[b]
Acute lung edema	2	2	0,89[b]

Table 3: *Clinical outcomes among the groups studied.*

a. Independent Student T test; B. Chi-square test; ICU: Intensive Care Unit.

Discussion

In the present study, it was verified that age has influence on the death rate, length of stay in the ICU, the hospital and the incidence of postoperative pneumonia in patients submitted to myocardial revascularization.

Other studies have shown that myocardial revascularization is more prevalent in males and hypertension with comorbidities is more evident in this patient profile [8,9]. Males are a non-modifiable risk factor for ischemic myocardial injury.

Curiel-Balsera., *et al.* [10] affirm that age above 75 years is an independent risk factor for mortality, as in older patients, there was a greater tendency to negative outcomes during ICU stay. In our study, we verified that age was associated with death, but the only complication after surgery was pneumonia.

Pneumonia was also a finding of the study by Soares., *et al.* [11] The probable explanation for this complication, especially in the elderly, is the more pronounced reduction of ventilatory muscle strength leading to a reduction in peak expiratory flow and, consequently, making coughing an inefficient mechanism for cleaning the airways. The impact is the same in the young, but the muscular recovery capacity is more accelerated making it more protected from these complications.

This high incidence of death may be associated with cardiovascular complications and the presence of bleeding in the immediate postoperative period, especially in the elderly over 80 years of age [12]. In our study, we did not stratify patients by age and, therefore, a limitation.

Vegni., *et al.* [13] compared elderly with young people and stratified the elderly every ten years from 60 years. They verified that age and time of body movement were risk factors for complication, increasing the length of stay in the ICU and mortality. It is worth noting that the group most affected was over 80 years. We found no difference in CPB time between groups probably due to the similar number of bridges used by the patients, which could end up equaling the time of cardiac manipulation.

We demonstrated that ICU and hospital length of stay were higher in the elderly group when compared to the young, a result similar to that found by Cacciatore., *et al* [14]. This increase in length of stay may be associated with the need for longer vasoactive drugs, arrhythmias, renal dysfunction, reduction of myocardial contractility, and greater limitation of exercise for cardiovascular conditioning.

One variable that needs to be discussed in this study is the presence of diabetes mellitus that alters the physiology of the micro and macrocirculation generating greater vascular fragility and difficulty of postoperative healing. Li., *et al.* [15] verified that percutaneous coronary intervention reduces the risk of hemorrhagic brain injury in young patients aged 18 to 45 years.

Further research is needed to compare the accuracy of functional assessment scales between young and old. Kovacs., *et al.* [16] demonstrated that the application of fragility scales and EuroEscore II were accurate to predict time of mechanical ventilation and in-hospital mortality. In the present study, we did not observe a difference in the mechanical ventilation time between the groups, this is due to the management of these patients through protocols that standardize the applied behaviors. One limitation was the non-questioning to the anesthesia team if there was difference in anesthetic induction according to the age of the patient.

Conclusion

Based on these findings, it is concluded that age negatively influences clinical outcomes, especially death, pneumonia and length of hospital stay in patients undergoing myocardial revascularization.

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