



CLÍNICA

Analysis of the trans and postoperative of individuals with diabetes mellitus undergoing cardiac surgery

Análise do trans e pós-operatório de indivíduos com diabetes melitus submetidos a cirurgia cardíaca

Análisis del trans y postoperatorio de pacientes con diabetes mellitus sometidos a cirugía cardíaca

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Palabras Clave: Cirugía Torácica; Diabetes Mellitus; Evaluación en Salud; Epidemiología

ABSTRACT

The objective of this study was to analyzing the presence of complications in diabetic and no diabetic patients undergoing cardiac surgery. This is a cross sectional analytical study. 50 patients undergoing cardiac surgery were included and analyzed for the presence or absence of diabetes mellitus, each group contained 25 patients. Data collection was performed by analyzing the medical records. Among the surgical procedures were CABG 30 (60 %), TrVA 11 (22 %), TrVM 6 (12 %), CRM +TrVA 1 (2 %), TrVA + TrVM 1 (2 %) and TrVA +TrVP 1 (2%). The study population had an average age of 60,4 years old in the diabetic group and 56 years old in the group of non-diabetics. Regarding risk factors, the

hypertension prevailed in the diabetic group 19 (76,0%). Regarding the postoperative complications it was observed a higher number of hemodynamic and respiratory complications between the immediate postoperative period until the third postoperative day in both groups. The conclusion of this study shows that there is no statistically significant difference among the variables, thus we find that diabetes mellitus alone was not an aggravating factor in trans and post-cardiac surgery.

RESUMO

O objetivo deste estudo é analisar a presença de complicações em pacientes diabéticos e não diabéticos submetidos a cirurgia cardíaca. Estudo transversal, analítico. Foram incluídos 50 pacientes submetidos a cirurgia cardíaca e analisados quanto a presença ou não de diabetes mellitus, contendo cada grupo 25 pacientes. A coleta de dados realizou-se através de análise do prontuário do paciente. Dentre os procedimentos cirúrgicos foram CRM 30 (60%), TrVA 11 (22%), TrVM 6 (12%), CRM + TrVA 1 (2%), TrVA + TrVM 1 (2%) e TrVA + TrVP 1 (2%). A população estudada apresentou média de idade de 60,4 anos no grupo dos diabéticos e 56 anos no grupo dos não diabéticos. Em relação aos fatores de risco, a hipertensão arterial sistêmica prevaleceu no grupo de diabéticos 19 (76,0%). Em relação as complicações pós operatórias observou-se maior número de complicações hemodinâmicas e respiratórias entre o PO imediato até o 3º PO em ambos os grupos. Conclui-se que não há diferença estatisticamente significativa entre as variáveis analisadas, desta forma concluímos que a diabetes mellitus, isoladamente, não foi um fator agravante no trans e pós-operatório de cirurgia cardíaca.

RESUMEN

La investigación trata de analizar la presencia de complicaciones en los pacientes diabéticos y no diabéticos sometidos a cirugía cardíaca. Estudio analítico de corte transversal. Se incluyeron 50 pacientes sometidos a cirugía cardíaca y se analizaron según la presencia o ausencia de diabetes mellitus, cada grupo contiene 25 pacientes. La recolección de datos se realizó mediante el análisis de la historia clínica del paciente. De los 30 procedimientos quirúrgicos fueron CABG (60 %), TRVA 11 (22%), TrVM 6 (12 %), CRM TRVA + 1 (2 %), TRVA TrVM + 1 (2 %) y TRVA TRVP + 1 (2%). La población del estudio tenía una edad media de 60,4 años en el grupo de diabéticos y 56 años en el grupo de no diabéticos. En cuanto a los factores de riesgo, la hipertensión 19 (76,0 %) tenía diferencias que prevalecen en el grupo de diabéticos. En cuanto a las complicaciones postoperatorias se observó un mayor número de complicaciones hemodinámicas y respiratorias entre el postoperatorio inmediato hasta el tercer día del postoperatorio en ambos grupos. A partir de las respuestas se puede decir que no existen diferencias estadísticamente significativas entre las variables, por lo tanto, llegamos a la conclusión de que la diabetes mellitus, solo, no fue un factor agravante de la cirugía trans y post-cardíaca.

INTRODUCTION

Diabetes mellitus (DM) is a disease caused by a metabolic disorder characterized by elevated glucose levels in the blood and for cardiovascular and microvascular long-term complications, which increase the chance of morbidity and mortality associated with other diseases⁽¹⁾. It is a chronic disease that most helps for the development of cardiovascular diseases.

According to the World Health Organization (WHO)⁽²⁾, cardiovascular diseases are the leading cause of death and disability due to increased longevity, habits and inadequate life and socioeconomic conditions unsatisfactory. DM patients have a higher incidence of coronary artery disease in relation to patients without DM, to present greater chances of multiple lesions in the arteries, forming unstable atheroma which leads to a prognosis with shorter survival in the short term, higher risk for recurrence of disease and poor response to proposed treatments⁽³⁾.

Treatment for heart disease has evolved greatly in recent years, however, despite the resources in hemodynamicist cardiology, and thrombolytic drug therapy, surgical treatment remains a comprehensive and widely recognized method for the treatment

of CAD ⁽⁴⁾. But heart surgery is a complex procedure that has important hemodynamic effects, which implies the need for intensive care for a good recovery of patients ⁽⁵⁾.

Added to this, the profile of candidates for heart surgery has presented comprehensive features with a pattern of older patients, consisting of more women, diabetes mellitus⁽⁴⁾, hypertension, dyslipidemia, coronary artery disease and advanced carrier more severe ventricular dysfunction, setting up a profile of patients of higher surgical risk subject to major complications before, during and after surgery ⁽⁶⁾.

Diabetic patients have distinct prognosis of non-diabetics, both in clinical outcome as surgical procedures. In assessing the patient for surgical indication should be recognized that coronary artery disease is related to mortality rate three times higher in diabetic patients compared to non-diabetic ⁽⁷⁾. Thus, the care of patients with diabetes should aim clinical and metabolic control of the disease for better recovery and better prognosis.

Studies have showed that hyperglycemia is a major risk factor for the development of postoperative infections and cardiovascular complications, altering the immune response and the production of a proinflammatory state in the peri operative period⁽⁸⁾. Uncontrolled hyperglycemia presents an increased risk of morbidity and mortality associated with the development of surgical wound infections, respiratory infections and stroke ⁽⁴⁾.

Altered levels of glucose in the trans-operative hospital are related to bad results for both the diabetic patient and the non-diabetic patient. The stress induced by cardiopulmonary bypass procedures and may lead to significant hyperglycemia ⁽⁴⁾. A good glycemic control suppresses the symptoms, prevent acute complications and reduce the incidence and progression of microvascular complications and when associated with proper control of other comorbidities also prevents macrovascular complications ⁽⁹⁾.

Understanding that DM is one of the major risk factors for CAD and its complications can cause serious risks to the quality of life of patients with coronary heart disease especially when undergoing surgical procedures, this study is justified by the need to understand how diabetes mellitus interferes with the recovery of patients undergoing cardiac surgery. Therefore, the aim of the study was to analyze the presence of complications in diabetic and non-diabetic patients undergoing cardiac surgery.

METHODOLOGY

This is a cross-sectional study, analytical and descriptive within a quantitative approach, approved by the Research Ethics Committee of the Regional University of the Northwest of the State of Rio Grande do Sul - UNIJUÍ under nº 02/2011 and is in accordance with the Guidelines and Regulatory Standards for Research involving Human Beings according to the National Health Council (CNS) (nº 437.352).

There were included 50 patients undergoing cardiac surgery in the General Hospital Size IV in the Northwest region of the State of Rio Grande do Sul and analyzed regarding the presence or absence of diabetes mellitus, each group containing 25 patients. Data collection was carried out through analysis of medical records of patients, collecting information about the risk factors for cardiovascular disease, intraoperative variables (duration of surgery, cardiopulmonary bypass, aortic clamping,

recovery of spontaneous beats or shock fraction ejection and postoperative (mechanical ventilation, length of coronary intensive care unit, total hospitalization time), and complications after cardiac surgery.

Complications collected in each system were the neurological, represented by psychomotor agitation, mental confusion and syncope. In the cardiovascular complications it observed hypotension; in respiratory the hemoptysis, noninvasive ventilation, pleural effusion, pleural fistula, pneumothorax, oxygen therapy and reintubation. Already, in vascular complications, ischemia, bleeding and in the hemodynamic thrombocytopenia. They were excluded from the sample patients who did not have the data analyzed in the chart.

Data were stored and analyzed using the Statistical Package for Social Sciences software (SPSS, version 18.0) and presented in absolute and relative frequencies, average and standard deviation. For evaluating the normality of the variables we applied the Kolmogorov-Smirnov test. In the qualitative variables, we used chi-square test of Pearson. The parametric variables were analyzed using the Student t test, considering statistically significant value of $p \leq 0,05$.

RESULTS

It included 50 patients undergoing cardiac surgery and analyzed for the presence or absence of diabetes mellitus. Clinical and baseline characteristics are presented in Table 1. Among the procedures were CRM 30 (60%), TrVA 11 (22%), TrVM 6 (12%) CRM + TrVA 1 (2%), TrVA + TrVM 1 (2%) and TrVA + TrVP 1 (2%).

Regarding risk factors between the groups, hypertension had differences, prevailing in the group of diabetics, as well as the male and the average older, IAM history and excessive salt intake. In the group of non-diabetics there were no significant differences between the sexes, and had fewer cases of AMI, lower salt intake, more cases of alcoholism, smoking and sedentary lifestyle than the group of diabetics.

Table 1. Clinical characteristics and baseline levels in diabetics and non-diabetics patients undergoing cardiac surgery.

	Diabetics (n: 25)	Non-diabetics (n: 25)	$p \leq 0,05$
Age	60,4 ± 8,7	56 ± 12	0,000**
Gender (male/female)	16/9	13/12	0,390†
FRCv n(%)			
SAH	19 (76)	10 (40)	0,010†*
AMI	12 (48)	4 (16)	0,015†*
Smoking	1 (4)	3 (12)	0,297†
Alcoholism	0 (0)	2 (8)	0,149†
Salt intake	9 (36)	3 (12)	0,047†*
Fat intake	4 (16)	3 (12)	0,500†
Sedentary lifestyle	11 (44)	16 (64)	0,156†
Stress	16 (64)	13 (52)	0,390†

SAH = Systemic Arterial Hypertension; AMI: Acute Myocardial Infarction; †: Chi-square test of Pearson; ‡: Student's T-test; *: $p \leq 0,05$ statistically significant.

Regarding trans and postoperative variables (Table 2) we can see that there was no statistically significant difference between groups. Although not significant, the diabetic group had shorter CPB and aortic clamping and greater postoperative time in the coronary intensive care unit and mechanical ventilation, totaling a longer hospitalization.

Table 2. Description of the variables trans and post-operative in diabetics and non-diabetics patients undergoing cardiac surgery.

	Diabetics (n= 25)	Non- diabetics (n= 25)	Total (n=50)	p≤0,05
Time of surgery (minutes) (average±SD)	237 ± 126	217 ± 51	226,1 ± 92,8	0,359¥
CEC (average±SD)	81 ± 24	98 ± 33	90,1 ± 29,9	0,114¥
Clamp of the aorta (minutes) (average±SD)	62,9 ± 20,5	80,4 ± 27,5	72,0 ± 25,7	0,288¥
Heart rate recovery				
Shock (%)	10 (40,0)	11 (44,0)	21 (42,0)	
Spontaneous (%)	15 (60,0)	14 (56,0)	29 (58,0)	0,372†
Ejection fraction (average±SD)	63 ± 10	66 ± 11	64,7 ± 10,6	0,495¥
Time of MV (min) (average±SD)	690 ± 226	574 ± 162	626,9 ± 200,7	0,377¥
Time of UCO (hours) (average±SD)	65 ± 31	59 ± 18	2,5 ± 1,0	0,100¥
Time of rest in bed (hours) (average±SD)	92 ± 49	96 ± 55	3,9 ± 2,1	0,915¥
Total time of hospitalization (hours) (average±SD)	158 ± 69	147 ± 45	6,3 ± 2,3	0,197¥

CEC: cardiopulmonary bypass; Clamp of aorta: clamping of aorta; MV: mechanical ventilation; UCO: coronary intensive care unit; †: Chi-square test of Pearson; ¥: Student's T-test; *: p≤0,05 statistically significant.

In Table 3 presents the complications/complications after cardiac surgery and the comparative analysis between the two groups, which was not statistically significant difference between them.

In the group of diabetic and non-diabetic there are a larger number of hemodynamic and respiratory complications in the immediate postoperative period until the 3rd postoperative day. Other complications observed in the diabetic group were complications related to neurological and cardiovascular system. Complications associated with hemodynamic system were the cardiovascular and neurological systems and respiratory system hemodynamic and cardiovascular complications.

Complications in greater numbers in the non-diabetic beyond the respiratory and hemodynamic systems were of neurological, cardiovascular and digestive systems. A lesser percentage complication associated with hemodynamic system was cardiovascular complications, respiratory system was the neurological and digestive system was associated with respiratory and hemodynamic.

Table 3. Postoperative complications in diabetics and non-diabetics patients undergoing cardiac surgery

	Diabetics (n=25)	Non-diabetics (n=25)	Total (n=50)	p≤0,05
Complications in the PO immediate n (%)				0,283
Neurological	2 (8,0)	1 (4,0)	3 (6,0)	
Cardiovascular	3 (12,0)	1 (4,0)	4 (8,0)	
Respiratory	0 (0,0)	5 (20,0)	5 (10)	
Hemodynamics	6 (24,0)	2 (8,0)	8 (16)	
Digestive		1 (4,0)	1 (2,0)	
	0 (0,0)			
Vascular		0 (0,0)	1 (2,0)	
	1 (4,0)			
Neurological + Respiratory	0 (0,0)	1 (4,0)	1 (2,0)	
Without Complications	7 (28,0)	14 (56,0)	21 (42,0)	
Complications 1º PO n (%)				0, 866¥
Neurological	1 (4,0)	1 (4,0)	2 (4,0)	
Respiratory	1 (4,0)	1 (4,0)	2 (4,0)	
Hemodynamics	5 (20,0)	4 (16,0)	9 (18,0)	
Digestive + Respiratory	0 (0,0)	1 (4,0)	1 (2,0)	
Without Complications	14 (56,0)	18 (72,0)	32 (64)	
Complications 2º PO n (%)				0,697¥
Neurological	0 (0,0)	1 (4,0)	1 (2,0)	
Respiratory	2 (8,0)	1 (4,0)	3 (6,0)	
Hemodynamics	3 (12,0)	4 (16,0)	7 (14,0)	
Vascular	1 (4,0)	1 (4,0)	2 (4,0)	
Digestive	1 (4,0)	0 (0,0)	1 (2,0)	
Digestive + Hemodynamics	0 (0,0)	1 (4,0)	1 (2,0)	
Respiratory + Hemodynamics	1 (4,0)	0 (0,0)	1 (2,0)	
Without Complications	13 (52,0)	17 (68,0)	30 (60,0)	
Complications 3º PO n (%)				0,516¥
Neurological	17 (68,0)	20 (80,0)	37 (74,0)	
Respiratory	3 (12,0)	1 (4,0)	4 (8,0)	
Hemodynamics	1 (4,0)	2 (8,0)	3 (6,0)	
Hem + Card + Resp+ Renal	0 (0,0)	1 (4,0)	1 (2,0)	
Without Complications	0 (0,0)	1 (4,0)	1 (2,0)	
Complications 4º PO n (%)				0,318¥
Respiratory	0 (0,0)	1 (4,0)	1 (2,0)	
Hemodynamics	0 (0,0)	1 (4,0)	1 (2,0)	
Digestive	0 (0,0)	2 (8,0)	2 (4,0)	
Respiratory + Cardiologic	1 (4,0)	0 (0,0)	1 (2,0)	
Without Complications	20 (80,0)	21 (84,0)	41 (82)	

Complications 5º PO n (%)			0,562¥
Hemodynamics	2 (8,0)	0 (0,0)	2 (4,0)
Without Complications	5 (20,0)	5 (20,0)	10 (40,0)
Hospital discharge	16 (64,0)	17 (68,0)	33 (66,0)
Complications 6º PO n (%)			0,632¥
Respiratory	0 (0,0)	1 (4,0)	1 (2,0)
Without Complications	5 (20,0)	5 (20,0)	10 (40,0)
Hospital discharge	16 (64,0)	19 (76,0)	35 (70,0)
Complications 7º PO n (%)			0,452¥
Respiratory	0 (0,0)	1 (4,0)	1 (2,0)
Hemodynamics	1 (4,0)	0 (0,0)	1 (2,0)
Without Complications	2 (8,0)	1 (4,0)	3 (6,0)
Hospital discharge	17 (68,0)	22 (88,0)	39 (78,0)

Hemo.: Hemodynamics; Cardio.: Cardiovascular; Neuro.: Neurological; Resp.: Respiratory; Digest.: Digestive; SI: Without complications; Chi-square test of Pearson; *:p≤0,05 statistically significant.

DISCUSSION

It's expected large increase in the prevalence of DM worldwide in the coming years. These patients are at risk of death three times higher than the general population, especially aged less than 69 years of age and due to cardiovascular events ⁽¹⁰⁾.

This study performed the analysis of the trans and postoperative variables in cardiac surgery compared with patients with and without diabetes mellitus. It was observed in the analysis between these groups that there is no statistically significant difference between the variables, not being diabetes mellitus alone an aggravating factor in cardiac surgery.

The characterization of our diabetic patients shows the presence of other risk factors such as hypertension, history of AMI and salt intake, male and the most advanced average age, factors that can contribute to post-operative complications in these patients. Other incidence of postoperative complications increase factors are associated with the natural process of population aging associated with increased prevalence of chronic degenerative diseases among them diabetes mellitus ⁽¹¹⁾.

The worsening of prognosis in patients with DM undergoing CABG can be explained by several factors associated with its development, as the presence of previous comorbidities to surgery, the greater chance of early vascular damage worse phagocytic activity more susceptible to inflammatory processes ⁽³⁾. Although trans and postoperative variables had no significant difference between diabetic and non-diabetic patients, the group of diabetics showed lower CPB time and aortic clamping. Study comparing diabetic and non-diabetic patients in cardiac surgery¹², also showed no difference between CPB and aortic clamping. The CEC causes an inflammatory response in cardiac surgery; however their inflammatory response is significantly lower when the CPB duration is less than 70 minutes ⁽¹³⁾.

As in other studies ⁽¹⁴⁾ respiratory complications were more frequently found in the postoperative period of cardiac surgery (atelectasis, respiratory failure, pneumonia and pneumothorax). The etiology of pulmonary complications after cardiac surgery can be determined by multifactorial causes of anesthesia, surgical trauma, cardiopulmonary bypass (CPB), time of surgery, mechanical ventilation time and pain, causing decrease in residual functional capacity ⁽¹⁴⁾

The most frequent complications between the POI and the first 24 hours of surgery in this study were respiratory, hemodynamic and neurologic, not differentiating between diabetic and non-diabetic groups. But Tonial and Moreira⁽¹⁵⁾ report that the postoperative period of cardiac surgery, patients with DM were more prone to complications from surgical intervention and need for reintubation, superficial and deep infections, stroke, kidney failure and more length of stay. Furthermore, the study of Behr ⁽¹⁶⁾ showed that blood glucose levels greater than 150 mg/dl in the operating period and higher than 350 mg / dl during the period of extracorporeal circulation were related to increased cardiovascular, respiratory, infectious complications, neurological and kidney.

Neurologic abnormalities found in cardiac surgery postoperative period remains a major cause of morbidity for patients, ranging from 3% to 8% in statistics ⁽¹⁷⁾. In this study the neurological complications were found between the immediate postoperative period (POI) and postoperative first in the group of non-diabetic and diabetic patients that the complications were present among the POI to the third OP. Silva and Bachur ⁽¹⁷⁾ showed that diabetes mellitus is one of the contributing risk factors for stroke in the postoperative period of cardiac surgery.

Regarding hospital stay time we had not significantly increased hospital stay resulting from DM, some studies verify this increase which represents more hospital costs ⁽³⁾. For this it is necessary to adopt measures to minimize the clinical outcomes of patients with DM as a good glycemic control throughout your stay ⁽⁸⁾. According to Fernandes et al ⁽¹⁸⁾, the length of stay in cardiac surgery is, on average, around 6.6 days preoperatively, averaging $5,4 \pm 5,9$ days in the ICU.

Study comparing diabetic and non-diabetic patients undergoing myocardial revascularization with the use of two internal mammary artery grafts showed a similar incidence of morbidity and mortality among both groups of patients ⁽¹⁰⁾, as found in this study. On the other hand, Sá⁽¹⁹⁾ found 11,8% of mortality rate in the hospital intra period in diabetic patients undergoing coronary artery bypass graft surgery; data in which one can realize that the surgical risks in diabetic patients may be related to more contributing factors for triggering more postoperative complications.

CONCLUSION

It was observed that patients with DM undergoing cardiac surgery show more comorbidity in the preoperative clinical evaluation and have similar perioperative characteristics of patients without DM. There is no statistically significant difference between the variables analyzed. In this way we conclude that diabetes mellitus, alone, has not been an aggravating factor in trans and postoperative cardiac surgery.

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