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Does the coronary disease increase the hospital mortality in patients with aortic stenosis undergoing valve replacement?

A doença coronária aumenta a mortalidade hospitalar de portadores de estenose aórtica submetidos à substituição valvar?

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Abstract

Objectives: **With the increase in life expectancy occurred in recent decades, it has been noted the concomitant increase in the prevalence of aortic stenosis and degenerative disease of atherosclerotic coronary artery. This study aims to evaluate the influence of atherosclerotic coronary artery disease in patients with critical aortic stenosis undergoing isolated or combined implant valve prosthesis and coronary artery bypass grafting.**

Methods: **In the period of January 2001 to March 2006, there were analyzed 448 patients undergoing isolated implant aortic valve prosthesis (Group I) and 167 patients undergoing aortic valve prosthesis implant combined with coronary artery bypass grafting (Group II). Pre- and intra-operative variables elected for analysis were: age, gender, body mass index, stroke, diabetes mellitus, chronic obstructive pulmonary disease, rheumatic fever, hypertension, endocarditis, acute myocardial infarction, smoking, Fraction of the left ventricular ejection, critical atherosclerotic coronary artery disease, chronic atrial fibrillation, aortic valve operation prior (conservative), functional class of congestive heart failure, value serum creatinine, total cholesterol, size of the prosthesis used, length and number of distal anastomoses held in myocardial revascularization, duration of cardiopulmonary bypass and aortic clamping time. The statistical study employed invariant and multivariate analysis.**

Results: **Hospital mortality was 14.3% (64 deaths) in Group I, and 14.5% (58 deaths) in patients with atherosclerotic coronary artery disease associated criticism (Group IB) and 12.8% (six deaths) in which had this association (Group IA). Hospital mortality in Group II was 17.6% (29 deaths), and 16.1% (20 deaths) in patients undergoing implantation of prosthetic aortic valve combined to complete myocardial revascularization (Group II) and 20.9% (nine deaths) in the myocardial revascularization with incomplete (Group IIB).**

Conclusions: **In patients undergoing implant isolated from aortic valve prosthesis, the presence of atherosclerotic coronary artery disease associated critical in at least two arteries, influenced the hospital mortality. In patients undergoing surgical treatment combined the number of coronary arteries with critical atherosclerotic disease and extent of coronary artery bypass grafting (complete or incomplete), did not affect the hospital mortality, but the realization of more than three anastomoses in the distal myocardial revascularization interfered.**

Descriptors: **Hospital mortality. Aortic valve stenosis. Heart valve prosthesis implantation.**

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Resumo

Objetivos: **Com o aumento da expectativa de vida nas últimas décadas, tem-se um aumento concomitante da prevalência da estenose aórtica degenerativa e da doença aterosclerótica arterial coronária. O presente estudo visa avaliar a influência da doença aterosclerótica arterial coronária crítica em pacientes portadores de estenose aórtica submetidos ao implante isolado de prótese valvar ou combinado à revascularização do miocárdio.**

Métodos: **No período de janeiro de 2001 a março de 2006, foram analisados 448 pacientes submetidos ao implante isolado de prótese valvar aórtica (Grupo I) e 167 pacientes submetidos à substituição valvar aórtica combinada à revascularização do miocárdio (Grupo II). As variáveis pré e intra-operatórias eleitas para análise foram: sexo, idade, índice de massa corpórea, acidente vascular cerebral, diabete melito, doença pulmonar obstrutiva crônica, febre reumática, hipertensão arterial sistêmica, endocardite, infarto agudo do miocárdio e tabagismo, fração de ejeção do ventrículo esquerdo, doença aterosclerótica arterial coronária crítica, fibrilação atrial crônica, operação valvar aórtica prévia (conservadora), classe funcional de insuficiência cardíaca congestiva, valor sérico de creatinina, colesterol total, tamanho da prótese utilizada, extensão e número de anastomoses distais da revascularização do miocárdio realizada, tempos de circulação extracorpórea de pinçamento aórtico. No estudo estatístico empregou-se análise univariada multivariada.**

Resultados: **A mortalidade hospitalar foi 14,3% (64 óbitos) no Grupo I, sendo 14,5% (58 óbitos) nos pacientes sem doença aterosclerótica arterial coronária crítica associada (Grupo IB) e 12,8% (6 óbitos) nos que apresentavam essa associação (Grupo IA). A mortalidade hospitalar no Grupo II foi 17,6% (29 óbitos), sendo 16,1% (20 óbitos) nos pacientes submetidos à substituição valvar aórtica combinada à revascularização completa do miocárdio (Grupo IIA) e 20,9% (nove óbitos) nos com revascularização incompleta do miocárdio (Grupo IIB).**

Conclusões: **Nos pacientes submetidos à substituição valvar aórtica isolada, a presença de doença aterosclerótica arterial coronária crítica associada, em pelo menos duas artérias, influenciou a mortalidade hospitalar. Nos pacientes submetidos ao tratamento cirúrgico combinado, o número de artérias coronárias com doença aterosclerótica crítica e a extensão da revascularização do miocárdio (RM completa ou incompleta), não influenciaram a mortalidade hospitalar, mas a realização de mais de três anastomoses distais interferiu.**

Descritores: **Mortalidade hospitalar. Estenose da valva aórtica. Implante de prótese de valva.**

INTRODUCTION

For holders of aortic stenosis (AoS), the start of symptoms represents a critical point, by reducing life expectancy. In the 1950's, Kirklin et al. acquired unsatisfactory results with the surgical treatment of the aortic valve [1]. In the following decades, the aortic valve substitution (AVS) became an efficient therapeutic alternative [2], achieving better results than those in drug or percutaneous treatments [3]. The profile of the patients submitted to AVS has changed over the last few years, with an increase in the proportion of high risk patients [4,5]. The surgical treatment combined of the coronary artery disease (CAD) + AoS represents about 15% of the cardiac operations currently performed in the United States [6]. In the early 1990's, Lytle et al. [7], revising the operative results of the *Cleveland Clinic Foundation*, observed that the isolated surgical approach in the aortic valve had a negative impact in the operative mortality of patients holding valvar lesion combined to CAD. More recently, Florath et al. [8] reported a significant reduction in operative mortality of patients submitted to the combined procedure.

This study aims to evaluate the influence of CAD, in hospital mortality of patients holding AoS, submitted to AVS isolated or combined to myocardial revascularization (MR).

METHODS

Perspective observational study (Coorte), involving two consecutive groups of patients, holders of AoS, associated or not to critical CAD, submitted to AVS, combined or not to RM, operated at the InCor-HC-FMUSP, between 2001 and 2006. Not including: patients submitted to any other combined surgical procedure; operated for acute endocarditis; holders of AoS associated to aortic insufficiency; submitted to any other previous heart surgery, other than the conservative surgical treatment of AoS; with more than one previous aortic valve operation; previous AVS, urgency or emergency. The patients were divided in two groups:

- Group G1: holders of AoS submitted to isolated AVS, with associated CAD (G1A), without associated CAD (G1B);
- Group G2 holders of AoS, associated to critical CAD, submitted to AVS combined to complete MR (G2A) or incomplete MR (G2B).

In the G1, the average age was 53.9 ±16.2 years, 47 (10.5%) patients presented critical associated CAD, 163 (36.4%) were female. In the GII, the average age was 67.3 ± 9.5 years, 42 (25.1%) were female. The frequency of preoperative and intra-operative data is described in Tables 1 and 2.

Table 1. Comparison of frequencies of preoperative and intraoperative data of G1A and G1B.

Clinical data	Mean (sd) or N. (proportion)				
	GIB = 401p.		GIA = 47 p.		*P*
Preoperative	N	%	N	%	
Sociodemographic					
Age (average)					
Male	54.1	16	52.3	18.5	0.489
Clinical	250	63	32	68.1	0.491
HBP					
CVA (BS)	121	30.2	18	38.3	0.255
COPD	18	4.5	3	6.4	0.474*
Smoking	15	3.7	4	8.5	0.127*
RF	63	15.7	16	34.0	0.002
Endocarditis	113	28.2	0	0.0	< 0.001
CAF	2	0,5	0	0.0	> 0.999*
Serum creatinine ≥ 1.5 mg/	71	17.7	8	17.0	0.907
dL	17	4.2	8	17.0	0.002*
High level of colesterol	8	2.0	1	2.1	> 0.999*
Chagas Disease	3	0.7	0	0.0	> 0.999*
CCI-FC III/IV	230	57.4	26	55.3	0.789
LVEF < 50%	142	35.4	16	34.0	0.853
DM	31	7.7	6	12.8	0.258*
Previous cardiac surgery	135	33.7	20	42.6	0.226
BMI	24.7	4.4	25.5	4.9	0.213
AMI	1	0.2	4	8.5	< 0.001*
CAD					< 0.001
0 arteries compromised	413	100	0	0	
1 artery compromised	0	0.0	32	68.1	
2 arteries compromised	0	0.0	12	25.5	
3 arteries compromised	0	0.0	3	6.4	
Intraoperative					
Number of the prosthesis					0.047
19	16	4.0	2	4.3	
21	127	31.7	24	51.1	
23	164	40.9	17	36.2	
25	76	19.0	4	8.5	
27	18	4.5	0	0.0	
Aortic Clamp. T.	82.2	33.2	71.1	29.3	0.029
ECC T.	107.8	46	96.7	32.1	0.109

** Results of the exact test of Fisher; G1A: holders of AoS, associated to critical CAD, submitted to isolate AVS (aortic valve substitution); G1B: holders of AoS, without associated critical DAC, submitted to isolate SVA; M: mean; sd: standard deviation; N: number; p: probability of na event; kg: Kilogram; m^2: square meters; %: percentage; HBP: high blood pressure; CVA: cerebrovascular accident (BS: brain stroke); COPD: chronic obstructive pulmonary disease; RF: reumatic fever; CAF: chronic atrial fibrilation; Cr: creatinine; CCI: congestive cardiac insufficiency; FC: functional class; LVEF: left ventricle ejection fraction; DM: diabete mellitus; IBMI:body mass index; AMI: acute myocardial infarction; CAD: coronary arterosclerotic disease; mg: miligram; dl: deciliter; Ao. Clamp. T..: aortic clamping time in minutes; T., ECC: extracorporeal circulation time in minutes*

Table 2. Comparison of frequencies of preoperative and intraoperative data of G2A and G2B.

Clinical data	Mean (sd) ou N. (proporção e %) GIIB = 43p.		GIIA = 124p.		*P*
	N	%	N	%	
Preoperative					
Sociodemographics					
Mean Age	68.4	8	66.9	9,9	0.365
Male	31	72.1	94	75.8	0.629
Clinical					
HBP	24	55.8	75	60.5	0.591
CVA (BS)	4	9.3	3	6.4	0.206*
COPD	4	9.3	4	3.2	0.783*
Smoking	17	39.5	39	31.5	0.333
RF	3	7.0	5	4.0	0.426*
CAF	6	14.0	10	8.1	0.365*
Serum cr. ≥ 1.5 mg/dL	0	0.0	13	10.5	0.022*
Hypercolesterolemia	4	9.3	16	12.9	0.531
CCI-FC III/IV	22	51.2	62	50.0	0.895
LVEF < 50%	17	39.5	37	29.8	0.241
DM	12	27.9	29	23.4	0.553
Previous operation	19	44.2	13	10.5	< 0.001
BMI	26.1	3.8	26.2	4.1	0.920
AMI	1	0.2	4	8.5	0.557
CAD					< 0.001
1 compromised artery	0	0.0	48	38.7	
2 compromised arteries	9	20.9	35	28.2	
3 compromised arteries	34	79.1	41	33.1	
Intraoperative					
N. of the prosthesis					0.523
19	1	2.3	3	2.4	
21	22	51.2	45	36.3	
23	12	27.9	47	37.9	
25	6	14	24	19.4	
27	2	4.7	5	4.0	
N. distal anastomosis					< 0.001
1	21	48.8	48	38.7	
2	22	51.2	34	27.4	
3	0	0%	29	23.4	
4	0	0%	13	10.5	
Mean of distal anast.	1.5	0.5	2.0	1.0	< 0.001
Aortic clamping time	102.3	34.7	106.4	37.4	0.537
Extracorporeal circ. time	150.5	51.8	145.7	49.5	0.584

** Results of the exact test of* Fisher*; G2A: holders of AoS, associated to critical CAD, submitted to AVS combined with complete RM; G2B: holders of AoS, associated to critical CAD, submitted to AVS combined with incomplete RM; M: mean; sd: standard deviation; N: number; p: probability of na event; kg: kilogram; m^2:square meters; %: percentage; HBP:high blood pressure; CVA: cerebrovascular accident; COPD: chronic obstructive pulmonary disease; RF: reumatic fever; CAF: chronic atrial fibrilation; Cr: creatinine; CCI: congestive cardiac insufficiency; FC: functional class; LVEF: left ventricle ejection fraction; DM: diabete mellitus*; *IBMI:body mass index; AMI: acute myocardial infarction; CAD: coronary arterosclerotic disease; mg: miligram; dl: deciliter; Ao. Clamp. T..: aortic clamping time in minutes; ECC T.: extracorporeal circulation time in minutes*

For the statistical analysis in the group composition evaluation, the following tests were used: qui-square test, *t of Student and* exact test of *Fisher,* followed by multivariate analysis (logistical regression model). Admiting statistical significance level of $P \leq 0.05$. The *Hosmer-Lemeshow* test was applied to test the model adjustment. The hospital deaths were considered routinely.

RESULTS

The patients submitted to isolated AVS (G1), the hospital mortality was 14.3%, being 57.8% due to cardiac causes and 42.2% due to non-cardiac causes. The distribution of hospital mortality of G1, according to perioperative data, is described in Tables 3 and 4. In G1B, the hospital mortality was 14.5%, in G1A, 12.8%, being 6.3% in patients with uniarterial disease, 33.3% in two arteries compromised, with no deaths in the three arteries compromised. In G1, serum creatinine e"1.5 mg/dL ($P = 0.001$), extracorporeal circulation time higher than 90 minutes ($P = 0.022$) and aortic clamping higher than 60 ($P = 0.010$), presence of associated CAD, in at least two arteries ($P = 0.016$) influenced hospital mortality (Table 5).

The patients submitted to AVS combined with MR (G2), the hospital mortality was 17.4%, being 10.4% in the one artery compromised, 13.6% in the two arteries compromised and 24.0% in the three arteries compromised. The distribution of hospital mortality in GII, according to perioperative data, is described in Tables 6 and 7. In G2A,

Table 3. Distribution of hospital mortality of G1, according to reoperative data.

Variable	N	Mortality	%	OR	$CI_{95\%}$	*P*
Gender						0.306
Male	286	37	13.1	1		
Female	162	27	16.7	1.32	0.77 - 2.27	
Age						0.865
Up to 39 years	92	14	15.2	1.00		
40 to 49 years	81	11	13.6	0.88	0.37 - 2.05	
50 to 59 years	92	16	17.4	1.17	0.54 - 2.57	
60 to 69 years	93	12	12.9	0.83	0.36 - 1.90	
≥ 70 years	90	11	12.2	0.78	0.33 - 1.81	
BMI						0.134
18,5 to 24,9 kg/m²	227	35	14.5	1.00		
Below 18,5 kg/m²	23	06	26.1	2.07	0.76 - 5.65	
25,0 to 29,9 kg/m²	146	15	10.3	0.67	0.35 - 1.29	
≥ 30,0 kg/m²	52	10	19.2	1.40	0.64 - 3.06	
Previous cardiac Op.	155	31	20.0	1.97	1.15 - 3.36	0.012
CAF	79	19	24.1	2.28	1.25 - 4.17	0.006
CCI- FC III / IV	256	35	13.7	0.89	0.52 - 1.52	0.668
AMI	05	00	0.0	0.00	-	0.359
CAD						0.167
0 compromised arteries	401	58	14.5	1.00		
1 compromised artery	32	02	6.3	0.39	0.09 - 1.69	
2/3 compromised arteries	15	04	26.7	2.15	0.66 - 6.98	
Without CAD (G-IB)	401	58	14.5	1.00		
With CAD (G-IA)	47	06	12.8	0.87	0.35 - 2.13	0.753

G1: holders of AoS, associated or not with critical CAD, submitted to isolated AVS; G1A: holders of AoS, associated or not with critical CAD, submitted to isolated AVS; GIB: holders of AoS, without critical associated CAD, submitted to isolated AVS; sd: standard deviation; N: number; p: probability of na event; OR: odds ratio (association measure); $IC_{95\%}$: interval of confidence with confidence level of 95% of each association measure; CVA: cerebrovascular accident; COPD: chronic obstructive pulmonary disease; RF: reumatic fever; CAF: chronic atrial fibrilation; Cr: creatinine; CCI: congestive cardiac insufficiency; FC: functional class; LVEF: left ventricle ejection fraction; DM: diabete mellitus; IBMI:body mass index; AMI: acute myocardial infarction; CAD: coronary arterosclerotic disease, critical CAD %: percentage

Table 4. Distribution of hospital mortality of G1, according to intraoperative data.

Variable	No	Deaths	%	OR	$CI_{95\%}$	*P*
Prosthesis size						0.123
27	18	3	16.7	1		
25	80	13	16.2	0.97	0.24 - 3.86	
23	181	15	8.3	0.45	0.11 - 1.73	
21	151	30	19.9	1.14	0.31 - 4.22	
19	18	3	16.7	1.92	0.37 - 10.1	
ECC T.						<0.001
Up to 90 minutes	207	21	10.1	1.00		
91 to 120 minutes	115	9	7.8	0.75	0.33 - 1.70	
121 to 180 minutes	96	18	18.8	2.04	1.03 - 4.05	
181 minutes or longer	30	16	53.3	10.12	4.34 - 23.62	
Ao. cl. T.						<0.001
Up to 60 minutes	140	9	6.4	1.00		
61 to 90 minutes	178	21	11.8	1.95	0.86 - 4.40	
91 to 120 minutes	73	16	21.9	4.09	1.71 - 9.79	
121 minutes or longer	57	18	31.6	6.72	2.80 - 16.14	

G1: holders of AoS, associated or not with critical CAD, submitted to isolated AVS. N: number. OR: odds ratio (association measure). $IC_{95\%}$: interval of confidence with confidence level of 95% of each association measure. p: probability of na event. Ao. Clamp. T..: aortic clamping time in minutes; ECC T.: extracorporeal circulation time in minutes. %: percentage

Table 5. Results of the logistic regression model of G1.

Variable	OR_{gross}	$OR_{Adjusted}$	$CI_{95\%}$	*P*
Serum creatinine e”1,5 mg/dL				
No	1.00	1.00		
Yes	3.76	5.37	1.90 - 15.14	0.001
ECC T.				
Up to 90 minutes	1.00	1.00		
91 to 120 minutes	0.75	0.32	0.12 - 0.85	0.022
121 to 180 minutes	2.04	1.98	1.29 - 3.39	0.019
181 minutes or longer	10.12	5.67	1.16 - 27.73	0.032
Aortic clamping T.				
Up to 60 minutes	1.00	1.00		
61 to 90 minutes	1.95	3.49	1.36 - 8.97	0.010
91 to 120 minutes	4.09	5.87	1.41 - 24.4	0.015
121 minutes or longer	6.72	8.21	1.63 - 16.35	0.016
CAD				
0 compromised arteries	1.00	1.00		
1 compromised artery	0.39	0.36	0.07 - 1.74	0.202
2/3 compromised arteries	2.15	4.99	1.36 - 18.36	0.016

G1: holders of AoS, associated or not with critical CAD, submitted to isolated AVS. N: number. OR: odds ratio (association measure). $IC_{95\%}$: interval of confidence with confidence level of 95% of each association measure. p: probability of na event. CAD: critical CAD. Ao. Clamp. T..: aortic clamping time in minutes; ECC T.: extracorporeal circulation time in minutes. %: percentage

Table 6. Distribution of hospital mortality of G2, according to preoperative data.

Variable	Nº	Mortality	%	OR	$CI_{95\%}$	*P*
Gender						
Male	125	18	14.4	1.00		
Female	42	11	26.2	2.11	0.90 - 4.93	
Age						0.931
Up to 49 years	8	1	12.5	1.00		
50 to 59 years	21	3	14.3	1.17	0.10 - 13.2	
60 to 69 years	62	12	19.4	1.68	0.19 - 14.98	
≥ 70 years	76	13	17.1	1.44	0.16 - 12.76	
CVA	8	4	50.0	5.36	1.26 - 22.85	0.013
Serum Cr. ≥ 1,5 mg/dL	13	5	38.5	3.39	1.02 - 11.23	0.037
LVEF < 50%	54	10	18.5	1.12	0.48 - 2.62	0.786
DM	41	7	17.1	0.97	0.38 - 2.48	0.955
Hypercolesterolemia	20	3	15.0	0.82	0.22 - 3.01	0.766
COPD	19	6	31.6	2.51	0.86 - 7.27	0.082
RF	8	2	25.0	1.63	0.31 - 8.51	0.559
HBP	99	17	17.2	0.97	0.43 - 2.18	0.936
Smoking	56	8	14.3	0.71	0.29 - 1.73	0.456
BMI						0.307
18,5 to 24,9 kg/m²	70	12	17.1	1.00		
Below 18,5 kg/m²	1	0	0.0	0.00	#	
25,0 to 29,9 kg/m²	67	15	22.4	1.39	0.60 - 3.25	
≥ 30,0 kg/m²	29	2	6.9	0.36	0.07 - 1.71	
Previous cardiac op.	32	6	18.8	1.12	0.42 - 3.04	0.818
CAF	16	2	12.5	0.66	0.14 - 3.06	0.589
CCI - FC III / IV	84	14	16.7	0.91	0.41 - 2.02	0.811
AMI	30	5	16.7	0.94	0.33 - 2.71	0.911
CAD						0.114
1 compromised artery	48	5	10.4	1.00		
2 compromised arteries	44	6	13.6	1.36	0.38 - 4.81	
3 compromised arteries	75	18	24.0	2.72	0.93 - 7.89	
1/2 compromised arteries	92	11	12.0	1		0.04
3 compromised arteries	75	18	24.0	1.81	1.01 - 3.23	

G2: holders of AoS, associated with critical CAD, submitted to AVS combined to MR. N: number. p: probability of an event. OR: odds ratio (association measure). $IC_{95\%}$: interval of confidence with confidence level of 95% of each association measure. CVA: cerebrovascular accident. Cr: serum creatinine. LVEF: left ventricle ejection fraction. DM: diabetes mellitus. COPD: chronic obstructive pulmonary disease RF: reumatic fever. HBP: high blood pressure. BMI: body mass index. Kg.: kilogram. m²: square meters. CAF: chronic atrial fibrilation. CCI: congestive cardiac insufficiency. FC: functional class. AMI: acute myocardial infarction. CAD: CAD. %: percentage

the hospital mortality was 16.1% and 20.9% in G2B. In G2, female (*P* = 0.037), extracorporeal circulation time higher than 180 minutes (*P* = 0.030), serum creatinine ≥ 1.5 mg/dL, cerebrovascular accident antecedent (*P* = 0.041) and performance of more than two distal anastomosis (*P* = 0.031) influenced hospital mortality (Table 8).

Table 7. Distribution of hospital mortality of G2, according to intraoperative data.

Variable	Nº	Deaths	%	OR	$CI_{95\%}$	*P*
Prosthesis size						0.11
27	7	1	14.3	1		
25	30	3	10.0	0.67	0.06 - 7.86	
23	59	9	15.0	1.06	0.11 - 10.04	
21	67	15	22.4	1.73	0.19 - 15.81	
19	4	1	25.0	2.00	0.08 - 53.13	
ECC T.						0.03
Up to 120 minutes	61	7	11.5	1.00		
121 to 180 minutes	76	12	15.8	1.39	0.51 - 3.79	
181 minutes or longer	30	10	33.3	3.71	1.24 - 11.1	
Aortic clamping T.						0.31
Up to 90 minutes	69	10	14.5	1.00		
91 to 120 minutes	57	9	15.8	1.07	0.40 - 2.84	
121 minutes or longer	41	10	24.4	1.84	0.69 - 4.9	
MR extension						0.47
MR complete (GIIA)	124	20	16.1	1.00		
MR incomplete (GIIB)	43	9	20.9	1.38	0.57 - 3.31	
N. distal anastomosis						0.01
1	69	8	11.6	1.00		
2	56	10	17.9	1.66	0.61 - 4.53	
3	29	5	17.2	1.59	0.47 - 5.34	
4	13	6	46.2	6.54	1.75 - 24.37	

G2: holders of AoS, associated with critical CAD, submitted to AVS combined with MR. G2A: holders of AoS, associated with critical CAD, submitted to AVS combined with complete MR. G2B: holders of AoS, associated with critical CAD, submitted to AVS combined with incomplete MR. N: number. OR: odds ratio (association measure). IC_{95}: interval of confidence with confidence level of 95% of each association measure. p: probability of an event. Ao. Clamp. T..: aortic clamping time in minutes; ECC T.: extracorporeal circulation time in minutes. MR: myocardial revascularization. anast: anastomoses. %: percentage

Table 8. Result of the logistic regression model of G2

Variable	OR_{gross}	$OR_{adjusted}$	$CI_{95\%}$	*P*
Gender				0.037
Male	1.00	1.00		
Female	2.11	2.76	1.06 - 7.16	
ECC T.				0.030
Up to 180 minutes	1.00	1.00		
181 minutes or longer	3.05	2.96	1.11 - 7.91	
Serum Creatinine e" 1,5 mg/dL				0.042
No	1.00	1.00		
Yes	3.39	3.83	1.05 - 14.03	
CVA				0.041
No	1.00	1.00		
Yes	5.36	5.42	1.07 - 27.46	
N. distal anastomosis				0.031
1 a 3	1.00	1.00		
4	4.88	4.05	1.14 - 14.37	

G2: holders of AoS, associated with critical CAD, submitted to AVS combined with MR. N: number. OR: odds ratio (association measure). IC_{95}: interval of confidence with confidence level of 95% of each association measure. p: probability of an event. HBP: high blood pressure. ECC: extracorporeal circulation in minutes. CVA: cerebrovascular accident

DISCUSSION

The aortic valve substitution is currently the most performed valvar operation in the United States [9]. In G1, 10.5% presented critical associated CAD (G1A), that was not approached, in this subgroup, the proportion of one artery compromised patients is high, 68.1%, but the proportion of two arteries compromised or three arteries compromised is small, 25.5% and 6.4% respectively, which suggests higher tendency of being a combined form, patients with more extensive coronary damage. In G2, it was observed a more homogeneous distribution in the proportions of coronary damage, 45% of three arteries compromised patients, 26.3% of two arteries compromised and 28.7% one artery compromised. In this study it was also observed the proportion of two arteries and three arteries compromised patients in G2 (71.3%) was higher than in G1A (31.9%), confirming higher probability of performing the combined surgery in patients with more extensive coronary disease.

In G1, it was observed that the presence of more than one coronary artery critical lesion, determined risk of hospital death 4.99 times higher than in patients without this association. Lytle et al. [10,11], revising data in the *Cleveland Clinics*, between 1972 and 1986, observed that out of 1689 patients submitted to isolated AVS, 181 presented critical associated CAD and in this subgroup, the operative mortality was two times higher than in the pacientes without associated CAD. In this study, the CAD was not only analyzed as a binary variable but also stratified according the number of coronary arteries with critical lesion, thus, it was observed that the "statistic behavior" of the one artery compromised patients was similar to the patients without associated CAD, which explains what was observed when G1 was stratified, due to the presence of critical associated CAD (binary form), hospital mortality in G1A was similar to G1B, noting that the preoperative and intraoperative data analyzed was rather similar in both groups. The absence of death among three arteries compromised patients, the proximity of "statistical behavior" of the uniarterial patients (part of group GIA) compared to the patients without critical associated coronary atherosclerotic lesion (group GIB) and the high proportion of one artery compromised patients in GIA approximated the hospital mortality of the patients without associated CAD or one artery compromised.

In GII, the hospital mortality increased according to the number of arteries compromised, being 10.4% in one artery compromised, 13.6% in two arteries compromised and 24.0% in three arteries compromised, with no statistical significance. The hospital mortality was 24.0% in three arteries compromised and 12.0% in one arteries / two arteries compromised, with statistical significance only in the univariated analysis. The influence of the extension of MR combined to AVS is also controversial in literature. The MR anatomically complete could determine an earlier functional recovery of the ventricle and decrease in the occurrence of cardiovascular events in the mild and long term, although with higher time of ECC and aortic clamping, higher manipulation of the aorta, which could increase morbidity [12]. In this study, as we analyzed holders of AoS, CAD associated or not, having the valvar lesion as the main diagnostic criterion and surgery referral, we used the anatomical criterion in order to define the extension MR performed, which had no influence in hospital mortality, similar results to those described by Cosgrove et al. [13] and Lavee et al. [14]. On the other hand, the patients submitted to MR with more than three distal anastomoses, the risk of hospital death was 6.54 times higher, unlike the one described by Cosgrove et al. [13], to which the performance of a higher number of grafts would work as a "protection", reducing mortality. It is worth noting that correlating the stratification of GII, according to the extension of MR, with the stratification, according the number of coronary arteries with critical lesion, it was observed that hospital mortality, in the one artery or two arteries compromised, submitted to complete MR was 12.1%, in the three arteries compromised submitted to complete MR was 23.8%, in the two arteries submitted to incomplete MR was 11.1% and in the three arteries compromised submitted to incomplete MR was 23.5%.

It can be concluded that:

1. In patients of aortic stenosis submitted to isolate valvar substitution, the presence of critical associated CAD, in at least two arteries, increased hospital mortality;

2. In patients of aortic stenosis, with critical associated CAD, submitted to AVS combined with MR, the number of coronary arteries with critical atherosclerotic lesion had no influence, as well as the performance of complete or incomplete MR, but the performance of more than three distal anastomoses combined to AVS increased hospital mortality.

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