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Results of aortic valve surgery in patients over 75 years old, at 4.5 years of follow-up

Resultados da cirurgia por estenose aórtica em pacientes acima de 75 anos, em 4,5 anos de seguimento

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Abstract

Background: **The increased longevity elevated the frequency of elderly requiring surgery, among them the correction of aortic stenosis.**

Objectives: **To evaluate medium-term mortality, need for reoperation for valve replacement and valve complications [systemic thromboembolism (STE) and prosthetic endocarditis (PE)] in patients over 75 years old who had undergone surgery for aortic stenosis.**

Methods: **Retrospective study of 230 patients from 2002 to 2007. Mean age was 83.4 years and 53% were male. The prevalence of hypertension was 73.2%, atrial fibrillation 17.9% and previous cardiac surgery 14.4%. Another cardiac procedure was associated in 39.1% of the cases.**

Results: **In a mean follow-up of 4.51 years the overall survival of the population studied was 57.4%. Death in the immediate postoperative period occurred in 13.9% (9.4% in the isolated aortic stenosis surgery group vs. 20.9% when another procedure was associated). Deaths in the medium term occurred in 28.7% of the patients (25.0% vs. 34.4%), with 34 of these because of cardiovascular causes. There were 6 cases of PE, 8 cases of STE and 6 reoperations. The predictors of mortality were ischemia time >90 min (OR 1.99 95% CI 1.06-3.74), ejection fraction <60% (OR 1.76 95% CI 1.10-2.81) and prior stroke (OR 2.43 95% CI 1.18-5.30).**

Conclusion: **Although the immediate surgical risk of the elderly is high, survival rates for surgical treatment of patients over 75 years old are acceptable and allow this intervention. The prognosis is worse especially because of the association with coronary artery disease.**

Descriptors: **Aortic valve stenosis. Mortality. Morbidity. Aged.**

Resumo

Introdução: **O aumento da expectativa de vida da população tem levado à maior necessidade de intervenções cirúrgicas sobre a valva aórtica.**

Objetivos: **Avaliar a mortalidade precoce e a médio prazo, a necessidade de reoperação para troca valvar e complicações**

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Abbreviations, acronyms & symbols	
CVA	Cerebral Vascular Accident (Stroke)
CABG	Coronary Artery Bypass Graft Surgery
COPD	Chronic obstructive pulmonary disease
AS	Aortic stenosis
IE	Infective endocarditis
EF	Ejection fraction
HBP	High blood pressure (Hypertension)
HF	Heart failure
BMI	Body mass index
NYHA	New York Heart Association
ST	Systemic thromboembolism

valvares [tromboembolismo sistêmico (TES) e endocardite infecciosa em prótese (EI)] em pacientes acima de 75 anos submetidos a cirurgia de estenose aórtica.

Métodos: **Estudo retrospectivo de 230 casos, operados no período de 2002 a 2007. A idade média foi de 83,4 anos, sendo 53% do sexo masculino, 73,2% hipertensos, 17,9% portadores de fibrilação atrial e 14,4% com cirurgia cardíaca prévia. Outro procedimento cardíaco esteve associado em 39,1% dos casos.**

Resultados: **Em 4,51 anos de seguimento médio, a sobrevida geral foi de 57,4%. Ocorreram 13,9% óbitos intra-hospitalares (9,4% no grupo cirurgia de estenose aórtica isolada vs. 20,9% quando outro procedimento cirúrgico foi associado) e 28,7% óbitos após a alta hospitalar (25,0% *vs.* 34,4%), com 34 destes por causas cardiovasculares. Ocorreram seis casos de EI, oito casos de TES e seis reoperações para troca valvar. Os preditores de mortalidade geral foram: tempo de isquemia >90 min (RC 1,99 IC 95% 1,06-3,74), fração de ejeção <60% (RC 1,76 IC 95% 1,10-2,81) e acidente vascular encefálico prévio (RC 2,43 IC 95% 1,18-5,30).**

Conclusão: **Ainda que o risco cirúrgico imediato de idosos seja elevado, as taxas de sobrevida referentes ao tratamento cirúrgico em pacientes acima de 75 anos são aceitáveis e permitem essa intervenção. O prognóstico é agravado, sobretudo, pela associação com doença arterial coronariana.**

Descritores: **Estenose da valva aórtica. Mortalidade. Morbidade. Idoso.**

INTRODUCTION

The prevalence of cardiovascular disease is considerably higher in elderly patients, affecting approximately 40% of the elderly and constituting the main cause of death. Because aortic stenosis (AS) is a prevalent condition among older people, affecting about 5% of octogenarians [1,2] and causing very poor prognosis, increased life expectancy of the population has led to increased need for surgical interventions on the aortic valve [3].

In Brazil, the elderly account for 10.8% of the population and approximately 26.7% of these have 75 years or more [4]. At the meeting of this progressive increase in the elderly population, the medical literature has demonstrated the growing number of patients older than 75 years operated in major heart surgery centers, emphasizing the valve replacement.

The natural evolution of patients with AS is associated with a long latency period, during which the severity of stenosis is only mild to moderate and survival is similar to that of the general population in that age group. However, since the symptoms are present survival decreases dramatically [5,6].

Recent studies have shown that although the postoperative morbidity is higher in patients over 80 years, the late postoperative mortality is similar to younger patients, with 2-year survival comparable to that of the general population, matched for age and gender [7-9].

In a previous paper we reported a hospital mortality of elderly patients with varying degrees of risk, in the period prior to the introduction of percutaneous methods. To contribute to better evaluation of surgical outcomes, it is appropriate to report the evolution of these patients [10].

The objective of this study is to evaluate the medium-term mortality, and reoperation for valve replacement and the occurrence of valvular complications [systemic thromboembolism (ST) and infective endocarditis (IE) prosthesis] in patients aged 75 years undergoing surgery by AS alone or combined with other injuries.

METHODS

Retrospective study of consecutive case series. A total of 1873 valve procedures performed from January 2002 to December 2007, 230 (12.3%) were in people over 75 years undergoing cardiac surgery by AS, in a reference hospital in cardiology.

Data were collected directly from patients' records, entered and analyzed with SPSS 18.0.

Follow-up was conducted through telephone contact and consultation with medical records, and checked one last time in the first quarter of 2011. Failing these, he was made consulting the Register of Deaths of the Health Secretariat of Rio Grande do Sul, which revealed the existence of deaths among patients not contacted, as well as their causes.

The study included the following preoperative variables: age, sex, obesity, hypertension (HBP), renal dysfunction, atrial fibrillation, previous cardiac surgery, ejection fraction (EF) of the left ventricle less than 60.0% severe lesion of the mitral valve associated cerebrovascular accident (CVA) prior, current smoking, and functional class by New York Heart Association (NYHA) III / IV. The intraoperative variables were evaluated: cardiopulmonary bypass time, ischemia time, surgery (conservative surgery / valve replacement) and associated surgery. The term conservative surgery refers to the performance of surgical valvuloplasty with debridement of calcium.

In the preoperative clinical characteristics, the definition of obesity was performed by calculating the body mass index (BMI), being considered obese individuals with BMI ≥ 30.0 kg / m². Patients who had a history of hypertension and were in regular use of medication (s) antihypertensive (s) were considered as having hypertension. Renal dysfunction pre-or post-operative was defined as serum creatinine greater than 2.0 mg / dl. The preoperative atrial fibrillation was defined by the presence of atrial fibrillation on resting electrocardiogram preoperatively. The classification of heart failure (HF) followed the criteria established by the NYHA. Previous stroke was defined as the presence of previous history of stroke, neurological disorders associated with localized. The low cardiac output was considered hemodynamic instability requiring vasoactive drugs, with or without the use of intra-aortic balloon.

Hospital mortality was defined as any death occurring during hospitalization of the patient, regardless of its duration. Since mortality after hospital discharge only took into account the deaths occurred after hospital discharge (including early deaths - the time of hospital discharge until one year mean follow-up and deaths in the medium term - from one year mean follow-up after hospital discharge), and overall mortality the sum of the previous two. Cardiovascular deaths were analyzed only for the cases of mortality after hospital discharge and the occurrence of valvular complications.

Considering the methodology of this retrospective study, it would be natural to expect some loss of data and patients who could not be found. These losses totaled 15.65% of the patients initially enrolled, resulting from the abandonment of outpatient care and / or change of address and telephone number.

The descriptive analysis for categorical variables was performed by the distribution of absolute and relative frequency, and for quantitative as mean, standard deviation and median, as indicated. The description of the actuarial survival was performed by Kaplan-Meier method. The predictors of mortality were analyzed by Cox regression and those that were significant in univariate analysis or had clinical relevance were subsequently adjusted in the multivariate Cox confidence interval of 95% was calculated when deemed appropriate, should be provided between parentheses. The level of significance for all tests was 5%.

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This study was approved by the Ethics Committee of the institution where it was performed (UP 4580/10).

Table 1. Preoperative clinical characteristics of the sample.

Variable	Total population n=230	Another surgery associated n=90	AS Surgery alone n=140	*P*
HBP	156 (68.7%)	65 (72.22%)	91 (65.0%)	0.172
NYHA III/IV Functional Class	103 (44.8%)	38 (42.22%)	65 (46.42%)	0.486
Obesity	34 (15.9%)	12 (13.33%)	22 (15.71%)	0.606
Ejection fraction < 60,0 %	62 (27.0%)	28 (31.11%)	34 (24.28%)	0.226
Atrial fibrilation	41 (17.9%)	16 (17.77%)	25 (17.85%)	0.982
Previous heart surgery	32 (14.4%)	11 (12.22%)	21 (15.0%)	0.547
COPD	30 (13.0%)	14 (15.55%)	16 (11.42%)	0.531
Severe mitral valve injury	18 (7.8%)	14 (15.55%)	4 (2.85%)	0.001
Current smoking	17 (7.4%)	8 (8.88%)	9 (6.42%)	0.491
Current CVA	15 (6.5%)	7 (7.77%)	8 (5.71%)	0.504
Kidney dysfunction	8 (3.5%)	3 (3.33%)	5 (3.57%)	0.319

CVA = Stroke, COPD = Chronic obstructive pulmonary disease; AS = aortic stenosis; HBP = High blood pressure, NYHA = New York Heart Association

RESULTS

The patients' ages ranged from 75 to 94 years, mean (± SD) 79.5 ± 3.7 years, whereas 122 (53%) were male and 189 (82.17%) already had some degree of IC, with 44.8% (n = 103) belonging to class III or IV by the NYHA classification of HF. The clinical characteristics of the sample are shown in Table 1.

Regarding the surgical procedure, 29 (12.6%) patients underwent breast-conserving surgery and 201 (87.4%), valve replacement with prosthesis being used in all these cases biological prosthetic implants. In 90 (39.1%) patients, surgery was associated with AS for other surgical procedures, and in 30.9% (71 cases) associated with coronary artery bypass grafting (CABG) and 3.47% (eight cases) mitral valve replacement. The mean cardiopulmonary bypass time was 84.1 ± 30.1 minutes and myocardial ischemia, 62.8 ± 22.1 minutes.

At median follow-up of 4.51 years (0 - 9.55 years), overall survival of the study population (n = 230) was 57.4%, with mean annual mortality of 9.44%. Of the 98 (42.6%) recorded deaths, 48 (34.3%) occurred in the group undergoing surgery for isolated AS and 50 (55.6%) in group associated with another cardiac procedure (OR 1.686 95% 0.827 - 3.436, P = 0.150). In the subgroup of patients who underwent CABG, overall mortality was 54.9% (n = 39). Figure 1 shows the survival curve adjusted for the variables found to be predictors of mortality in multivariate Cox regression and Figure 2 shows the actuarial survival curves of Kaplan-Meier method with the number of patients at risk each year of follow-up.

Of the total of patients, 13.9% (32 cases) died during the postoperative hospital stay, and this rate of 9.3% (n = 13) in patients undergoing isolated aortic valve surgery and 21.1% (n = 19) when another procedure was associated, a difference that was statistically significant (OR 2.23 95% CI 1.16 to 4.29, *P* = 0.023). Risk factors for hospital mortality were low cardiac output (OR 10.1 95% CI 5.02 to 20.3, *P* <0.001), use of intra-aortic balloon (OR 6.6 95% CI 3.83 - 11.4, *P* <0.001), sepsis (OR 6.77 95% CI 1.66 to 9.48, P <0.001) and postoperative renal dysfunction (OR 6.21 95% CI 3.47 to 11, 1, *P* <0.001). The other factors analyzed were not significant in multivariate analysis.

Mortality after discharge was 28.7% (n = 66), with 35 deaths (25%) in the AS surgery group alone and 31 (34.4%) among patients with other associated cardiac procedure (OR 1.970 95% CI 0.831 to 4.672, *P* = 0.124). Of these deaths, 34 (51.51%) were due to cardiovascular causes, with 13 of them in AS surgery group alone and 21 in the group associated with another procedure (OR 3.146 95% CI 1.237 to 8.002, *P* = 0.016). Figure 3 shows the curve of multivariate Cox regression of cardiovascular mortality after adjusted hospital discharge.

We found six (2.6%) cases of IE, 2 (1.4%) patients in the AS surgery group alone and four (4.4%) in combination with another cardiac surgery, eight (3.5%) cases of systemic thromboembolism, four cases per group (2.9% vs. 4.4%). In addition, six (2.6%) patients required reoperation for valve replacement, five (3.6%) in AS surgery group alone and only one (1.1%) in group associated with other cardiac surgery. Figure 4 shows the curve of multivariate Cox regression survival free of adjusted valvular complications.

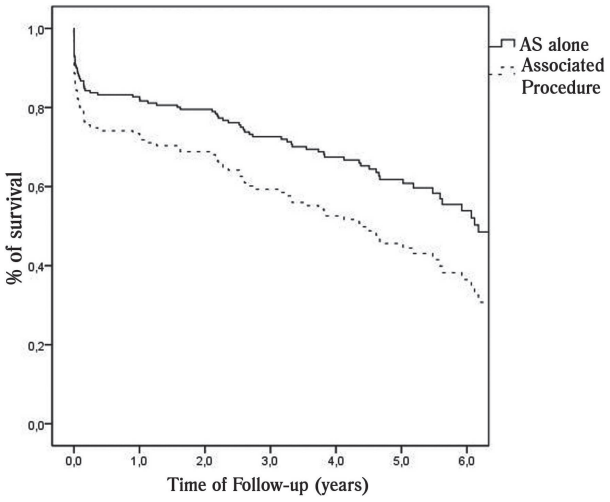

Fig. 1 - Mortality, according to the time period studied. AS = aortic stenosis

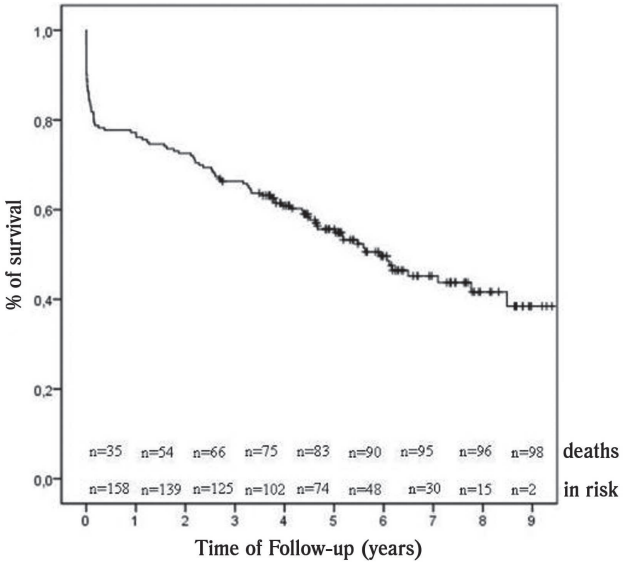

Fig. 2 - Kaplan-Meier actuarial survival, according to the time period studied. AS = aortic stenosis

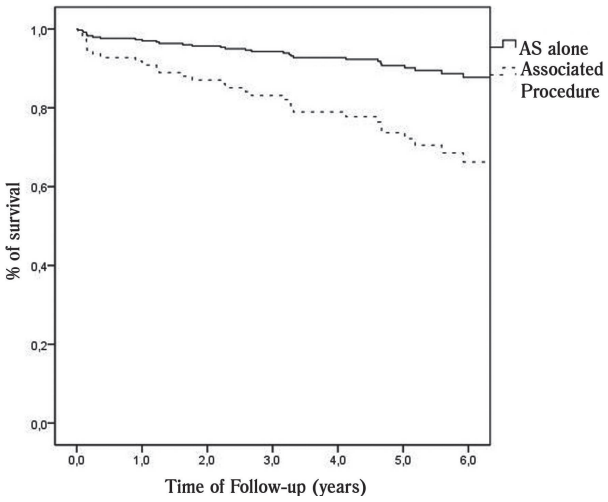

Fig. 3 - Mortality from cardiovascular causes after hospital discharge, according to the time period studied. AS = aortic stenosis

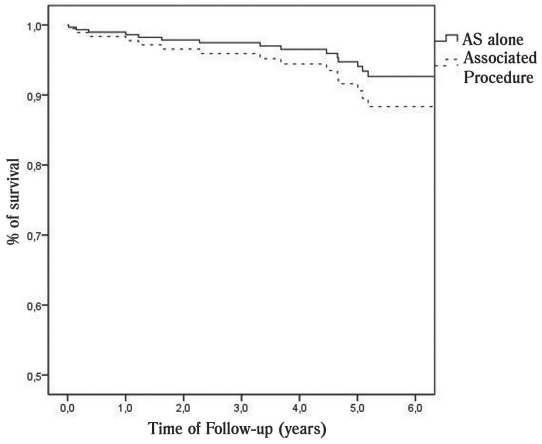

Fig. 4 - Complication-free survival valve in accordance with the time period studied. AS = aortic stenosis

Among the 66 deaths after hospital discharge, the main causes were septic shock (8, 12.12%) and 5 (7.57%) of them triggered by cardiovascular causes, heart failure decompensation (8, 12.12%), cancer (8, 12.12%), stroke (7, 10.60%) and acute coronary syndrome (5, 5.57%).

The predictors of mortality in Cox multivariate analysis were: ischemic time exceeding 90 min (OR 1.99 95% CI 1.06 to 3.74), left ventricular ejection fraction of less than 60% (OR 1.76 95% CI 1.10 to 2.81) and previous stroke (OR 2.43 95% CI 1.18 to 5.30). Since the predictors of mortality after hospital discharge were: left ventricular ejection fraction of less than 60% (OR 1.93 95% CI 1.11 to 3.34) and previous stroke. For the occurrence of valvular complications, associated serious mitral lesion was the only associated significant predictor (OR 3.768 95% CI 1.268 to 11.194).

DISCUSSION

Whereas the data on in-hospital mortality of patients over 75 years undergoing surgery for AS have been discussed in detail in a previous article published by our group in 2010, this study we will address the discussion of data on mortality and surgical complications correction of EA in the medium term [10]. We note only that, currently, the hospital mortality of isolated aortic valve replacement in elderly people varies between 2 and 10% range that covers the 9.4% rate found in our study [11-13].

Thus, this paper describes the survival rates after hospital discharge up to 4.51 years mean follow up of a consecutive series of 230 patients aged over 75 years undergoing surgery for EA alone or associated with other cardiac surgery , from January 2002 to December 2007, observing the overall mortality rate of 42.6%, with median survival of 57.4% in 4.51 years mean follow-up and a mean annual mortality of 9.44% , similar to that found in the general population in this age group (8.21% deaths / year), according to data from DATASUS [4].

Once the AS is a prevalent condition among older people, increasing the life expectancy of the population has led to increased need for surgical intervention on the aortic valve in this age group, still considered the gold standard for the management of symptomatic patients.

It is known that the severity of the obstruction of the ventricular output gradually increases in 10-15 years, there is, thus, a long latency period during which the severity of the stenosis is only mild to moderate and survival is similar to the population generally in the same age [6].

However, since symptoms, even mild, is present, survival decreases dramatically, with an interval between the onset of symptoms and death of approximately 2 years in patients with heart failure, those with syncope 3 years and 5 years in those with angina [6].

The possibility of clinical treatment, a review article published in 2010 makes an interesting comparison between the risks of surgery and the dangers of clinical observation in asymptomatic patients with AS. The authors suggest that in patients with severe stenosis and very high risk factors, is increasingly accepted strategy not to delay surgical treatment, usually because the myocardial damage could be irreversible, symptoms may develop rapidly without the correct perception and the patient's risk of sudden death would increase sharply. They concluded by saying that the conduct must be individualized in these patients: in one extreme, for low-risk patients, the management is conservative, expectant, on the other extreme, for high-risk patients, the procedure is surgical, with aortic valve replacement [14].

In symptomatic patients, the results are even stronger. A cohort study with a population above 80 years compared

patients referred for aortic valve replacement and who agreed with the proposed treatment (group A), patients who require aortic valve replacement that did not agree to undergo surgery (group B) and patients who were unable to undergo surgical treatment and were managed conservatively (group C). The results showed that in group A, the 15 operated patients were alive after 3.6 ± 1.4 years of follow-up, while groups B and C had a mortality of 74% (24) and 76% (62) during follow-up, respectively. Among patients able to perform the surgery, with similar operative risks (Groups A and B), refusal to undergo surgery has increased by more than 12 times the mortality risk (OR 12.61, *P* = 0.001) [15].

Analyzing the results of surgery relating to the elderly, the work of Bakaeen et al. [7], developed in patients above 80 years undergoing aortic valve replacement, demonstrates that this group has a higher postoperative morbidity when compared to patients under the age of 80 years (21.1% vs. 15.5 %, *P* <0.03), however, the late postoperative mortality is similar in both groups (5.2% vs. 3.3%, *P* = 0.19). Likewise, Mihaljevic et al. [8] showed that, two years after aortic valve replacement, elderly patients have survival similar to that of the general population, matched for age, race and gender (85% survival at 2 years and 65% at 5 years for group of patients over 80 years).

When comparing our results with one of the greatest records ever published by AS, the registry of New York, published in 2009 by Hannan et al. [9], which gathered 6,369 patients, we realize that our median survival of 30 months of 78.80% in patients undergoing valve replacement alone was slightly lower than that found in this study in patients above 75 years (86.2 %), a rate equivalent to other published studies [16-19].

The data from the national literature, to analyze the long term evolution (up to 12 years of follow-up) of 287 patients undergoing isolated aortic valve replacement for bovine pericardial bioprosthesis in the period 1992 to 2003, Braile et al. [20] obtained an overall survival of 94.7 ± 1.7% in patients younger than 70 years (n = 252) and 58.1 ± 17.2% in patients older than 70 years (n = 35) (RC 0.20, 95% CI 0.01 to 0.29, *P* = 0.0005).

In our series, up to 9.55 years of follow-up, we observed 66 (28.7%) deaths occurred after hospital discharge, which indicates that the procedure can be performed with reasonable mortality. The association of other surgical procedure resulted in an increase in the mortality rate to 34.4%, difference, although clinically relevant when compared to the group that underwent isolated aortic valve replacement (25.0%) was not statistically significant (*P* = 0.124).

Among the surgical procedures associated with aortic valve surgery, the one which was present in most cases was the CABG, with 61 cases (26.51% of procedures), of which 12 (19.67%) died in-hospital and 21 (34.4%) after hospital discharge. A significant influence on the increased mortality related to aortic valve replacement when it is associated with CABG had already been reported by Oliveira et al. [21], which demonstrated that the presence of critical coronary artery disease in at least two arteries, significantly influences mortality rates.

We emphasize that cardiovascular causes accounted for 51.51% (n = 34) of 66 deaths occurred after hospital discharge, with 38.23% of those in the AS surgery group alone and 61.76% in the group associated with another cardiac procedure (OR 3.146 95% CI 1.237 to 8.002, *P* = 0.016). Thus, we can observe that, although the association with another cardiac procedure has not significantly increased rates of late mortality, increased, but, significantly, the rate of deaths from cardiovascular causes, the most reliable indicator of its impact. This increase probably denotes a more severe cases, as well as the frequent association between AS and coronary artery disease [10].

In our series, the prognosis of surgery for AS was much aggravated by the presence of surgical factors (ischemia times greater than 90 min), and clinical trials of patients (EF less than 60% and a history of prior stroke), but mainly by association with coronary artery disease that required CABG.

Despite the significant increase in survival of patients with AS with surgical indication found in our study, it is estimated that one third of cases of severe symptoms associated with degenerative is not operated at high surgical risk [22]. Aiming precisely or very elderly patients with high surgical risk, there has been the alternative of percutaneous aortic bioprosthesis method feasible, safe and highly effective in this subgroup of patients [23-27].

Although not serve as a comparison because it is a sample of cases selected by the severity and difficult decision for surgery was preferred state in which the percutaneous implantation, it is worth mentioning that in our institution over the past two years, 20 patients with high surgical risk aged between 62 and 99 years and high EuroSCORE (8-92%) underwent percutaneous aortic valve implantation. Throughout the following, we verified the occurrence of a perioperative death, sudden death and death from noncardiac causes, totaling 15% of the sample. The remaining patients showed improvement in functional class, significant immediate decrease in the gradients between the left ventricle and the aorta and increase in valve area [28].

Limitations

This report is retrospective and describes a series of cases operated in a single referral center for cardiovascular surgery, and its results can not be extrapolated to other centers. However, it should be noted that there was no pre-

selection of patients, surgery was indicated when the clinical situation and in accordance with the attending physician. In addition, we search for patients in the Death Records Services, which helped to significantly reduce our losses, increasing, however, our rates of MACE. The experience reported here refers to a period prior to the availability of percutaneous implantation of aortic prostheses in our midst. Therefore, some high-risk surgical patients underwent surgery as the only treatment option at the moment, may have contributed to an increase in mortality observed.

CONCLUSIONS

Although the immediate surgical risk of elderly is high, the high mortality rates for the non-symptomatic treatment of severe AS and acceptable survival rates for the surgical treatment in patients over 75 years, similar to the general population in this age group, consent to that intervention. The medium-term prognosis is worsened by the presence of comorbidities and surgical and clinical factors such as low left ventricular EF, longer duration of surgery and prior stroke, but above all, by association with coronary artery disease. These data should be taken into account in deciding the indications for intervention in elderly patients with AS.

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