

Impact of socio-economic profile on the prosthesis type choice used on heart surgery

Impacto do perfil socioeconômico na escolha da prótese valvar em cirurgia cardíaca

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Abstract

Background: Valvar heart disease is an important public health problem, more common in developing countries, especially in younger.

Objective: To evaluate the epidemiological features of patients and its influence on the prosthesis type choice used on patients who underwent valve surgery.

Methods: Cross-sectional. Data such as age, sex, provenance, surgery procedure and prosthesis type were retrospectively analyzed. We reviewed 366 charts of all patients submitted to heart valve surgery during three years in a public health cardiovascular treatment center.

Results: 52% of patients were female. The age range was from 5 to 82, the median was 41 years old. In regards 37.7% of patients came from Salvador (Bahia, Brazil) and 62.3% from countryside. Valve replacement was performed in 73% of patients, whereas 7.38% underwent valvuloplasty and 18.3% underwent valve repair and replacement. Regarding

type of prosthesis, 70.0% received bioprosthesis and 30.0% received metal prosthesis. On note bioprosthesis were more used in younger (66 vs. 14; $P < 0,001$).

Conclusion: Biological prostheses were used predominantly in younger. This might be possible due to a low social-economic status, avoiding metal valve implantation and the consequent anticoagulation therapy.

Descriptors: Heart valve diseases. Prosthesis implantation. Socioeconomic factors.

Resumo

Introdução: A doença cardíaca valvar é um grave problema de saúde pública, mais frequente em países em desenvolvimento, acometendo indivíduos em idade laboralmente produtiva.

Objetivo: Avaliar o perfil socioeconômico e

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Abbreviations, Acronyms & Symbols	
SD	Standard deviation
EF	Ejection fraction
NR	Non-rheumatic
R	Rheumatic
SUS	Unified Health System

epidemiológico dos pacientes submetidos a cirurgia valvar e a sua relação com os tipos de próteses utilizadas em um centro de referência público de Salvador, BA, Brasil.

Métodos: Estudo de corte transversal descritivo de prevalência, no qual foram analisados retrospectivamente idade, sexo, procedência, tipo de valvopatia, cirurgia a qual o paciente foi submetido e o tipo de prótese utilizada em casos de trocas, em centro de referência público de cardiologia.

Resultados: Foram revisados 366 prontuários, de todos os pacientes submetidos a cirurgia de valva cardíaca, de janeiro de 2007 a dezembro de 2009. Em relação ao sexo, 52% dos

pacientes eram do sexo feminino. A idade média \pm DP foi de $41,70 \pm 17,85$ anos. Dentre os pacientes, 37,7% eram procedentes da capital e 62,3%, do interior do estado da Bahia (Brasil). A troca valvar foi realizada em 73% dos pacientes, enquanto que 7,38% realizaram plastia valvar e 18,3% realizaram tanto plastia quanto troca. Dos pacientes que realizaram troca valvar, 70% receberam bioprótese e 30% do tipo metálica, com predominância do uso bioprótese nas faixas etárias jovens ($P < 0,001$).

Conclusão: Próteses biológicas foram predominantemente usadas em jovens. Esse fato, possivelmente, pode ser atribuído ao baixo nível socioeconômico da população em questão, distância de centros urbanos, dificuldade de realização de exames para controle da anticoagulação e nível educacional ruim, inviabilizando o uso de valva metálica e a consequente terapia anticoagulante.

Descritores: Doenças das valvas cardíacas. Implante de prótese. Fatores socioeconômicos.

INTRODUCTION

Most valvular heart disease can cause valvular stenosis with obstruction to anterograde flow, valvular failure with retrograde flow, or both [1]. The valve abnormalities may be caused by congenital disorders or by a variety of acquired diseases, such as, for example, rheumatic fever [2], which occurs at an early age, reproductive and active labor phase of individuals, marking significant differences in the socioepidemiologic aspect when compared to developed countries [3].

Rheumatic disease remains a major public health problem in developing countries [3]. In Brazil, rheumatic disease is a disease with a higher cost to the Unified Health System (SUS). It is estimated that 30% of cardiac surgeries in the country are associated with valvular sequelae of rheumatic fever [1]. Over a period of 18 months between 1995 and 1996, 18,500 cases of rheumatic disease were treated, resulting in 1.8 million doctor visits and 4,500 surgical procedures, with an estimated cost of R\$ 19 million [4]. According to latest data from the Ministry of Health, in 2010 there were 12,917 hospitalizations for rheumatic disease, resulting in an approximate cost of R\$72 million [5].

In a study performed in Rio Grande do Sul, the heart valve diseases are around 12% to 15% of outpatient and

the incidence of valvular heart disease is approximately 220 patients/year [6].

Still, the Brazilian data of prevalence and epidemiological studies in the population are scarce and controversial, particularly in the city of Salvador, Bahia, Brazil.

The aim of this study was to assess the impact of socioepidemiologic profile of patients undergoing valve surgery and its relation to the types of prostheses used in a public reference center of Salvador, Bahia, Brazil.

METHODS

This is a descriptive cross-sectional study of prevalence, which were retrospectively assessed data as gender, origin, age, length of hospital stay, etiology, main valves involved, echocardiographic data, the type of surgery the patient underwent and type of prosthesis used in cases of replacement, through the review of 366 medical records, transcribed in standard form. For this purpose, samples were defined as all patients undergoing cardiac surgery for valve repair or replacement from January 2007 to December 2009 in a public referral center located in the city of Salvador, Bahia, Brazil.

The variables were tested for normality and as mean \pm standard deviation (SD) when classified as normal distribution, and median when the distribution was

abnormal. For categorical variables we used the analysis with chi-square and, for continuous variables, means were compared using Student's t test. Data were assessed using SPSS version 17.0.

The project was approved by the Ethics Committee of Hospital Ana Nery, under protocol 59/10.

RESULTS

General Characteristics

The sample was constituted by 366 patients who underwent cardiac surgery for valve replacement or repair, of which 176 (48%) were male and 190 (52%) were female. The patients' ages ranged from 5 to 82 years, averaging 41.7 ± 17.8 years. As regards origin, 138 (37.7%) were from the state capital, while 228 (62.3%) were from the countryside. The number of days of hospitalization ranged from 1 to 163, with a median of 24 days.

As for valve lesions, 714 valves were affected, of these, 470 valve presented failure, 185, double lesion, and 59 stenosis. The valve lesion and lesion type (stenosis, failure or double lesion) are detailed in Figure 1.

Regarding the simultaneous involvement of the valves, the prevailing association occurred with the tricuspid and

mitral valves in 186 patients, followed by the simultaneous involvement of aortic and mitral valves in 176 patients. The remaining patients had other possible combinations, with values much less expressive.

Rheumatic disease was the main cause of valve disease, and 211 (57.6%) patients had rheumatic etiology and 128 (35%), non-rheumatic valvular heart disease. In the population studied, we found that the etiologies of valve disease of 27 (7.4%) patients were not defined.

Of the 176 male patients, 76 (43.18%) had rheumatic valve disease, while 82 (46.59%) had non-rheumatic lesions, 18 (10.23%) patients had no records on the cause of valve disease. Among female, 135 (71.05%) had rheumatic valve disease and 46 (24.21%) patients had non-rheumatic lesions (P<0.001). Nine (4.74%) women had no clear cause (Table 1).

Echocardiographic data

Ejection fraction (EF) was 62.68 ± 12% by the Teicholz method. The valve echocardiographic analysis found that when excluding the values of EF in patients with mitral failure, the mean ± SD was 66.05 ± 11.74%, with no statistically significant difference when compared to the general population.

Figure 2 shows the distribution of lesion severity.

Table 1. Relationship among gender, age and cause of valve disease

	Male		Female		Total	P value
	R*	NR†	R	NR		
5 – 27 years	29	14	43	06	92	0.018
28 – 55 years	38	30	79	17	164	0.000
56 – 82 years	09	38	13	23	83	0.069
Total	76	82	135	46	339	

* R - Rheumatic, † NR - Non-rheumatic

Table 2. Age x type of prosthesis.

	Bioprótese	Metal	Total	P Value
	5 – 27 years	66	14	
28 – 55 years	93	69	162	
56 – 82 years	75	17	92	
Total	234	100	334	0.000

* R - Rheumatic, † NR - Non-rheumatic

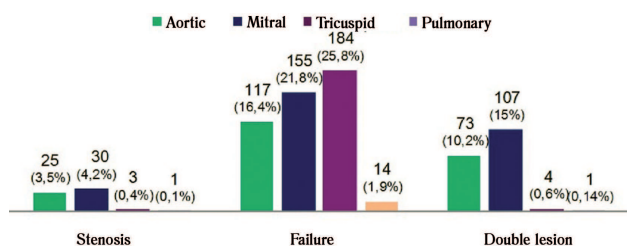


Fig. 1 - Frequency of lesion type and site of involvement

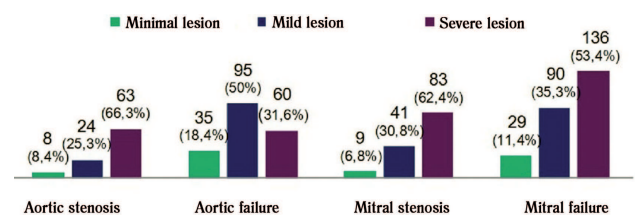


Fig. 2 - Severity of injury

Characteristics of the surgical procedure

Among the operated patients, 267 (72.95%) underwent valve replacement, 27 (7.38%) underwent only valve repair, 67 (18.31%), both repair and replacement, five (1.36%), other procedures such as aortic or mitral commissurotomy.

Of the 334 patients who underwent valve replacement, 188 (56.29%) were of mitral valve, 89 (26.65%) aortic valve and 57 (17.06%) replacement. We used 234 (70.06%) bioprostheses, 121 (51.70%) in female patients and 113 (48.3%) males ($P > 0.001$). We used 100 (29.94%) prosthesis of metallic type, with a distribution of 55 (55%) for male patients and 45 (45%), female ($P > 0.001$) (Table 2).

In a total of 94 patients who underwent valve repair, 56 (59.57%) were tricuspid, 21 (22.34%) mitral, six (6.38%) aortic valve, three (3.19%) aortic and mitral and eight (8.52%) mitral and tricuspid valves.

DISCUSSION

Valvular diseases are common in our environment, and rheumatic fever the main cause of valve lesions referred for cardiac surgery in developing countries. The dominance of etiologic profile and severity of clinical presentation often determine the choice of valve prostheses.

The sample included patients of both genders and the results showed a predominance of females. The age ranged from 5 to 82 years, with a median of 41 years. The number of days of hospitalization ranged from 1 to 163, with a median of 24 days of hospitalization. We observed that more patients were coming from the inner cities of the state. We can infer social implications of these findings for public health, because it is a relatively young population, aged productive labor, providing a great economic impact calculated by years of productive life lost. Furthermore, these results imply higher costs for both the health system and to the families of patients who undergo limited resources and have extra transportation costs, meals and lodging, to move around in search of assistance in the capital the state, emphasizing here the lack of public referral centers in inner cities, able to diagnose and properly treat these patients, promoting overcrowding in specialized hospitals in the city of Salvador.

The association between lesion type and site of commitment differs from pre-existing information in the literature. The stenosis of the aortic and mitral valves are responsible for two thirds of all valve diseases [2], however it was found in our study, more cases of failure or double lesion. Literature data on the prevalence of specific lesion sites and valve are scarce, precluding proper comparison with the sample in question, however, this study showed prevalence of tricuspid regurgitation, compared to the rates of mitral and aortic insufficiency. This finding may be due to a hemodynamic overload on the right ventricle [1],

secondary to left heart disease, and may be an indication of late diagnosis of valvular disease (Figure 1).

As for combined valvular disease in clinical practice it is very common for the simultaneous involvement of aortic and mitral valves [7], as was found in our study, however, the number of patients with mitral and tricuspid simultaneous involvement was slightly higher when compared the number of patients with a concomitant mitral and aortic valve.

In developing countries, rheumatic disease is the leading cause of heart disease from 5 to 30 years [6], and one of the two leading causes of death in young people, being costly to the health system and families [1]. The data from this study are consistent with the literature, and rheumatic disease was the leading cause of valvular heart disease, mainly affecting younger age groups (5-55 years) in both genders, implying a socioeconomic burden to society.

A recent Brazilian study [8] showed that 22% of patients with rheumatic disease had school-age school failure, and that 5% of parents of patients lost their jobs due to absenteeism from work. Therefore, investment and effective control measures are urgent in our environment, minimizing their consequences, since the disease is clearly linked to socioeconomic conditions and the decline of rheumatic fever in developed countries is related to improving the quality of life, easy access to health care, special attention to primary prophylaxis of rheumatic disease, early diagnosis and treatment of infections of the upper airways [6].

Echocardiographic data

In this study, the vast majority of patients seeking specialized health services showed moderate to severe injury (Figure 2), raising the possibility that these patients undergo surgery later, probably due to difficult access to adequate medical care in a timely manner. The delayed access to surgical treatment promotes greater involvement of the valve or subvalvular apparatus, and consequently, the worse the chances of success and limited surgical benefit in the long term [9].

Characteristics of the surgical procedure

More than 30 years after the introduction of modern prostheses, the choice between biological and mechanical remains controversial [10]. Few randomized trials, controlled and with large numbers of patients to guide a definitive treatment of valvular heart disease. Most evidence of the international guidelines is C-level, i.e. based on studies of less impact [11]. For this reason, doctors are forced to draw conclusions and make recommendations based on incomplete information, limited data on clinical experience and common sense [12].

The choice between the types of prostheses in adults is determined primarily by assessing the risk of

anticoagulation related bleeding versus the risk of structural valve deterioration, but the clinical decision-making becomes increasingly challenging with the increase in life expectancy and the presence of comorbidities such as advanced age, congestive heart failure, coronary artery disease, pulmonary disease and renal failure [10].

In this study, the vast majority of patients underwent valve replacement (72.95%) and among the records of the type of prosthesis used, 70% were biological and only 30% metal.

According to the recommendations set by the American College of Cardiology and American Heart Association, the main indication for valve replacement by a metallic one is the long survival of patients, as it presents a longer lasting [13]. Regarding the use of the bioprosthesis, its main indications are patients who cannot or do not accept treatment with blood thinners, reducing the risk of bleeding associated with such therapy, and/or patients older than 65 years [3]. At this age, there is a lower rate of deterioration in biological valves and increased risk of bleeding with anticoagulant therapy if mechanical valves were implanted. The use of biological prosthesis is considered inappropriate in adolescents during growth in patients with renal failure and hyperkalemia [13].

In this study, in all age groups, there was a significant predominance of the use of bioprostheses. It is noteworthy that, on average, in 10 years young subjects will undergo a new surgical procedure, in view of the life of this type of prosthesis [14]. However, these results can be attributed to a difficult access to health services for the population as a result of low socioeconomic status and provenance predominantly from the countryside of Bahia (Brazil), precluding adequate anticoagulation therapy, adherence and appropriate medical monitoring. On the other hand, the large percentage of female patients of reproductive age interfere in the choice and family planning as a result of anticoagulation [14], the risk of bleeding and potential teratogenic effects of coumarin. Moreover, the hypercoagulable state of pregnancy may favor thrombosis, the main complication of the use of metallic prostheses [15].

In relation to the mitral valve, this is the procedure of choice for mitral valve disease of degenerative cause, due to its lower rate of reoperation, thromboembolism and infection, when compared to mitral valve replacement. However, the repair in rheumatic disease is technically more difficult, and late results may be interfered by new exacerbations. The quality and long-term results in rheumatic disease are controversial and therefore a limiting factor is the evolving character of valve degeneration in this disease. However, the repair in rheumatic patients, when feasible from a technical standpoint and valve morphology, have satisfactory results in the long term, and must always appear as an alternative surgical [16,17].

CONCLUSION

The present study demonstrates that biological prostheses are preferentially used in younger individuals, possibly due to low socioeconomic status and high rates of women of reproductive age. Actions for intervention and prevention in public health to improve early access to control measures of streptococcal infections and epidemics, the efficiency of hospital services and postoperative follow-up can improve the choice of valve prostheses in this population.

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