

Surgical treatment of active infectious endocarditis: a study of 361 surgical cases

Tratamento cirúrgico da endocardite infecciosa ativa: análise de 361 doentes operados

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Abstract

Objective: To report on the experience achieved with the surgical treatment of 361 patients with acute infectious endocarditis who were operated on in the Heart Institute of the University of São Paulo.

Method: The ages of the patients ranged from 3 to 81 years, with an average age of 38 ± 8.3 years. There were 230 male patients. It was possible to identify the etiologic agent in 311 (86.20%) patients. The diagnosis of acute infectious endocarditis was obtained by clinical, echocardiographic and microbiological evaluations. Two hundred and five patients had lesions of heart valves and 156 patients had lesions of cardiac valvular prostheses. Ninety had annular abscesses and 11 had fistulae. Of the group of diseased native valves, 104 (50.73) were operated on because of severe heart failure and 87 (42.44%) because of progressive sepsis. All natural aortic valves (136) were replaced by artificial valves. There were 107 diseased native mitral valves. In this group partial resections of infected tissue (vegetations) were carried out in 13 patients while maintaining the valvar apparatus. Of the 16 infected tricuspid valves, 8 were replaced. All the prostheses were substituted. The abscesses were cleaned and closed when their diameter was less than 10 mm. The larger abscesses

were cleaned and closed with a pericardial graft, which was the support for the artificial valve.

Results: There were 75 (20.78%) hospital deaths, most of which caused by heart problems and their complications. There were 15 cases of postoperative endocarditis, 10 of which were re-operated on. The late follow-up showed good functional and clinical results, with 222 (77.62%) patients as NYHA Class I.

Conclusions: When indicated, the surgical treatment must be instituted as early as possible. All diseased and infected tissue must be removed to achieve good results.

Descriptors: Endocarditis, surgery. Heart valves, surgery. Abscess, heart valves.

Resumo

Objetivo: O trabalho analisa a experiência obtida com o tratamento cirúrgico da endocardite infecciosa ativa (EIA) realizado em 361 doentes operados.

Método: As idades variaram de 3 a 81 anos com média de $38 \pm 8,3$ anos, sendo 230 pacientes do sexo masculino. Os agentes etiológicos foram identificados em 311 (86,20%)

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doentes, sendo o diagnóstico baseado no quadro clínico, ecocardiográfico e microbiológico. Duzentos e cinco doentes apresentavam comprometimento em valvas nativas e 156 em próteses. Noventa doentes apresentavam abscessos anulares e 11 apresentavam fistulas. Deste grupo de 205 pacientes, 104 (50,73%) foram operados por insuficiência cardíaca incontrolável e 87 (42,44%) devido a sepsis progressiva. Todas as valvas aórticas infectadas (136) foram substituídas. Das as 107 valvas mitrais doentes, foram possíveis ressecções isoladas de vegetações em 13 pacientes. De 16 valvas tricúspides comprometidas, foram ressecadas oito e realizada ressecção parcial nas demais. As 156 próteses foram substituídas, a maioria por biopróteses. Os abscessos foram tratados por sutura direta, quando de diâmetros menores que 10 mm.

INTRODUCTION

WALLACE et al. [1] published in 1965 a report of a patient with active infectious endocarditis (AIE), who, due to the persistent fever and progressive aortic failure, was submitted to surgical treatment with the replacement of the aortic valve and successful removal of the focus of the infection.

In 1986, we presented [2] the experience of the Heart Institute, Hospital das Clínicas of the Medical school in São Paulo (InCor) and from then until the present time, the number of patients operated on for AIE in our institution has increased greatly.

In this work we analyzed some aspects of this disease, as well as the results of the surgical treatment of AIE of a total of 361 operated patients.

METHOD

The results of a total of 361 patients operated on for AIE in InCor over a period of 19 years were evaluated.

The diagnosis of endocarditis was based on the clinical history of the patient, blood cultures and echocardiographic studies. The cultures were positive in 311 (86.20%) of the patients. The identified agents are shown in Table 1.

Table 1. Active infectious endocarditis: surgical treatment Identified etiological agents

Name	Nº	%
S. Viridans	75	24,20
S. Aureus	50	16,10
Streptococcus sp.	45	14,41
Enterococcus	35	11,20
Cocos G+	31	10,17
S. Epidermidis	26	8,47
Fungi	21	6,78
Other etiological agents	28	8,73
Total	311	100,06

Quando maiores, foram limpos e ocluídos com retalhos de pericárdio bovino sobre os quais as próteses foram fixadas. As fistulas foram limpas e ocluídas nas duas extremidades.

Resultados: Houve 75 (20,78%) óbitos imediatos e 26 tardios, a grande maioria devido a causas cardiogênicas. Houve 15 recidivas tardias, com necessidade de reoperação em 10 pacientes. O seguimento tardio mostra uma recuperação funcional em 77,62% dos doentes.

Conclusões: O tratamento deve ser precoce e radical, ressecando-se todo e qualquer tecido comprometido, o que contribue para melhores resultados.

Descritores: Endocardite, cirurgia. Valvas cardíacas, cirurgia. Abscesso, valvas cardíacas.

The ages of the patients varied from 3 to 81 years with a mean of 38 ± 83 years, where 230 patients were male and 131 were female.

Two hundred and 5 patients presented with compromise of native valves, which included 136 aortic valves, 107 mitral valves and 16 tricuspid valves. Several of these patients presented with multiple valve impairment. One hundred and forty-two patients presented with compromise of bioprostheses and 14 of mechanical prostheses (Table 2).

Table 2. Active infectious endocarditis: surgical treatment Affected valves grouped by patient

Native valves	Nº of patients	% of patients
Aortic (Ao)	84	40,98
Mitral (Mi)	56	27,32
Mi + Ao	49	23,90
Tricuspid (T)	13	6,34
Mi + Ao + T	2	0,98
Ao + T	1	0,48
Total	205	100,00
Bioprostheses	142	91,03
Metallic prostheses	14	8,97
Total	156	100,00

The patients with endocarditis in native valves presented with severe regurgitation in about 80% of the cases.

Figure 1 shows the functional class (NYHA) of the patients in the pre-operative period.

Ninety patients suffered from annular abscesses and 11 presented with fistulae.

The surgical indications of the 205 patients with native valve compromise were severe heart failure in 104 (50.73%) individuals; failure of the etiologic treatment in 87 (42.44%); embolic phenomenon in 7 (3.41%); a fungal etiology in 5 (2.44%); and other etiologies in 2 (0.98%).

In the patients with artificial valves, the surgical indications obeyed the same criteria, with the artificial valve introducing an additional element in the indication of surgical treatment.

The surgical procedures complied with the basic methodological principles of complete eradication of all the

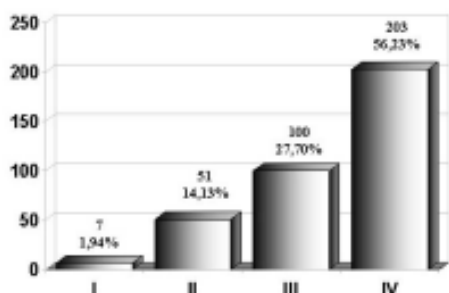


Fig. 1 - Active infectious endocarditis: surgical treatment Functional class - pre-operative period

growths, as well as the infected tissue surrounding the focus of the infection [3-6].

There was a necessity to replace the native aortic valves in 136 patients. The mitral valves were replaced in 94 individuals, with resection of the vegetation in isolation possible with another 13 mitral valves. Of the 16 infected tricuspid valves it was possible to partially resect the septal and/or posterior cusps in 8 individuals, thus preserving the anterior cusps. Bioprostheses were employed in 203 (99%) of the patients.

Annular abscesses were found during surgery in 90 patients, where 66 (73.34%) of these abscesses were equal to or less than 10 mm in diameter. In all these 66 abscesses it was possible to completely remove the purulent material with the resulting wounds treated with ethanolic iodine and occluded with a direct suturing after the implantation of the corresponding valvar prosthesis. In 43 patients these abscesses were on the aortic annuli and in 23 they were located in the mitral annuli.

In 24 (26.66%) of the patients, the abscesses presented with diameters greater than 10 mm, making the treatment more complex; 18 of these abscesses were found on aortic annuli and 6 on mitral annuli.

With wounds of greater than 10 mm, after cleaning and treatment with ethanolic iodine, occlusion was achieved with a bovine pericardial membrane patch fixed in glutaraldehyde which was sutured onto the abscess cavity in all our cases, although other materials can be used for this purpose [7-9]. The corresponding valvar prostheses were sutured on the previously fixed bovine pericardial patches.

Ten of these abscesses with diameters greater than 10 mm were located on aortic annuli and 6 in mitral annuli.

In 2 patients with large abscesses there was a discontinuity between the left ventricle and the aorta, which obliged the use of valved tubular grafts and re-implantation of the coronary arteries, the so-called valvar translocation, which was necessary given the intensity of the annular damage observed [10-14].

In 6 patients, of the group with large abscesses, there was

severe compromise of the transition between the aortic and mitral valves. In these patients the surgical methodological principles as proposed by DAVID et al. [5] and ERGIN et al. [6] were followed, which can be summarized as follows:

a) Complete removal of the compromised structures, including the fibrous trigones, transforming the mitral-aortic region into a single orifice.

b) Reconstruction using a double triangular bovine pericardial membrane patches; one of these sheets is used to close the aortic root and the other to close the left atrium, suturing laterally to the remaining tissue of the fibrous trigones.

c) On the transition line created between the mitral and aortic annuli, segments corresponding to the aortic and mitral prostheses are sutured, thus restoring the mitral and aortic orifices.

In 11 patients fistulae were evidenced, with 6 from the aorta to the right atrium, 3 from the aorta to the right ventricle and 2 cases from the aorta to the left atrium.

All the courses of the fistulae were rigorously cleaned and closed with bovine pericardial patches sutured over the two orifices.

RESULTS

Table 3 reports the main complications that occurred in the immediate post-operative period.

Table 3. Active infectious endocarditis: surgical treatment Complications in the post-operative period

Type of complication	N° of cases	%
Low output syndrome	44	26.03
Acute renal failure	30	17.75
Acute myocardial infarction	17	10.06
Bleeding with re-operation	16	9.47
Recurrent endocarditis	12	7.10
Bronchopneumonia	10	5.92
Septicemia	9	5.33
Neurological complications	8	4.73
Respiratory failure	8	4.73
Multiple organ failure	7	4.14
total atrioventricular block	3	1.78
Atrial fibrillation	3	1.78
Thromboembolism	2	1.18
Total	169	100.00

There were 75 (20.78%) deaths in the immediate post-operative period, the causes of which are shown in Table 4, but were predominantly related to cardiogenic problems.

Of the 286 patients who were released from hospital, 225 (78.67%) were accompanied for periods ranging from 18 to 200 months.

The patients presented with a considerable improvement in their functional class, as can be observed in Figure 2. In fact 222 (77.62%) of the patients were functional class I after surgical treatment.

Table 4. Active infectious endocarditis: surgical treatment Causes of hospital deaths

Type of complication	Nº of cases	%
Low output syndrome	26	34.67
Multiple organ failure	21	28.00
Septicemia	13	17.34
Recurrent endocarditis	6	8.00
Respiratory failure	3	4.00
Acute myocardial infarction	2	2.67
Cardiac tamponade	1	1.33
Arrhythmia	1	1.33
Neurological complications	1	1.33
Coagulopathy	1	1.33
Total	75	100.00

There were 26 late deaths, the majority of which (73.07%) were due to heart failure (Table 6).

The global survival rate was $67.3 \pm 5.1\%$ at 160 months (Figure 3) and the AIE-free survival rate was $92.3 \pm 2.8\%$ (Figure 4).

Table 6. Active infectious endocarditis: surgical treatment Causes of late deaths

Type of complication	Nº of cases	%
Heart failure	19	73.07
Acute myocardial infarction	2	7.69
Chronic renal failure	2	7.69
Sudden death	1	3.85
Endocarditis	1	3.85
Unknown	1	3.85
Total	26	100.00

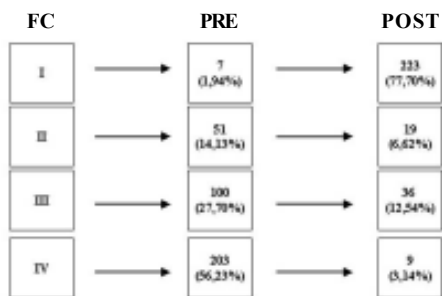


Fig. 2 - Active infectious endocarditis: surgical treatment Surgical treatment - functional class

Thirty-six late complications occurred, of which 15 were relapsed endocarditis. Ten of these patients required reoperations (Table 5).

Table 5. Active infectious endocarditis: surgical treatment Late complications

Type of complication	Nº of cases	%
E. I. with re-operation	10	27.78
E. I.	5	13.89
Dysfunctions		
Valvar	10	52.77
Calcification	7	
PB rupture	2	
with re-operation	2	
Others	2	5.56
Total	36	100.00

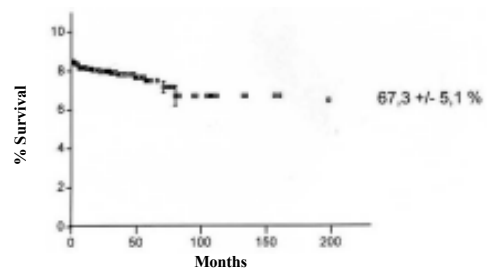


Fig. 3 - Actuarial curve free of endocarditis

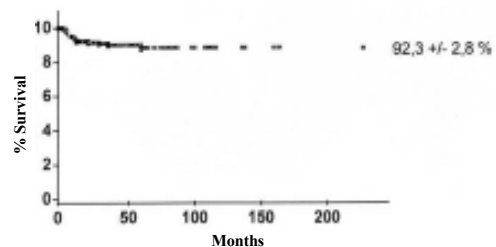


Fig. 4 - Survival curve free of endocarditis

COMMENTS

Surgical treatment of AIE constitutes a great challenge as, not always, the post-operative examinations, in particular the echocardiographic studies, precisely demonstrate the total extension of the annulo-valvar infectious process, especially in patients with valvar prostheses, fistulae and multiple valve lesions.

Another factor that greatly aggravates the situation is the duration of the process. It is common for patients to arrive at InCor after months of suffering from symptoms and sometimes after inadequate antibiotic treatment.

There is a consensus in the literature that surgical treatment must be radical in the sense of removing all infected tissue, thus the surgeon can not concern himself with the extension of the tissues to be removed [4,5,7,10,15-17]. Not to comply with this basic principle is to be certain of relapse and its consequences. In our work and in particular over the last ten years, these principles have been observed rigorously. The surgeon, sometimes, has to use his resourcefulness for the reconstruction that is necessary, using skill [4] and improvisation. The important thing is the reconstruction of the function without septic residue.

In our casuistic there were 24 large abscesses with diameters greater than 10 mm for which, after cleaning and removal of all the infected tissue, bovine pericardial patches fixed in glutaraldehyde were required. Through these patches sutures are employed in order to fix the respective prostheses. In 2 patients, abscesses affected 2/3 of the aortic annulus.

In another 2 patients, the annular damage associated to previous reoperations compromised the aortic annulus in such a way as to compel the utilization of valved tubes in the supracoronary position and concomitant coronary artery bypass grafting [10].

In 13 mitral valves, the lesions were small and focal constituting of vegetative points the majority of which (9 valves) were located on the anterior cuspid, with the possibility of their removal giving a good result.

In 8 tricuspid valves, removal was partial, the septal cuspid in 6 and the septal and posterior cuspids in 2. The remaining anterior cuspids were sufficient to guarantee a good functional result with negligible hemodynamic reflux [18].

In one of the eight patients submitted to resection and implantation of bioprostheses in the tricuspid position, there was relapse of the infectious process by *P. aeruginosa*. The patient was re-operated and the annulus was found to be severely compromised. The prosthesis was dried out and another was not implanted in its place, as was proposed by ARBULU & ASFAW in 1981 [19].

Occlusion of the fistulae was achieved with bovine pericardial patches fixed in both orifices, after cleaning the

fistulous course. There are published reports of the use of fresh autologous pericardium with a good result [10].

We consider our hospital mortality rate of 20.77% (75 of the total cases) as high, although this fact bears a direct relation to the condition that many patients arrive in our hospital, with severe cardiovascular compromise, sepsis, abscesses, etc. These factors are predictors of a higher surgical risk that is always accompanied by a greater morbidity rate [20-24].

Our experience demonstrates that the best results are obtained in cases which are correctly indicated for surgery at an early stage, combined with astuteness of the physician and the experience of the surgeon to perform adequate treatment within the principles and norms summarized herein.

CONCLUSION

The predominant indication for surgery (50.73%) was the presence of severe heart failure, resistant to correctly established clinical treatment, followed by a persistent septic state (42.43%).

Surgical treatment should be radical, completely removing all the infected tissue, without which relapse is inevitable.

Reconstruction of the affected structures should be performed with technical rigor in order to obtain the best functional result possible.

Hospital and late morbidity and mortality are closely related to cardiovascular events.

The majority of surviving patients (77.62%) fully recover normal functional conditions.

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