



CHIRURGIE CARDIAQUE / CARDIAC SURGERY

SURGICAL RESULTS FOR RHEUMATIC HEART VALVE DISEASE IN SENEGAL

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Résumé

Objectif : Evaluer les résultats de la chirurgie des valvulopathies rhumatismales au Sénégal en terme de mortalité et de morbidité.

Patients et Méthodes : C'est une étude rétrospective sur 10 ans portant sur 250 patients opérés de valvulopathies rhumatismales à Dakar. Nous avons étudié les données cliniques, échographiques, les procédures opératoires ainsi que les complications post-opératoires. L'analyse statistique recherchait les variables liés à la mortalité et à la morbidité. L'âge moyen était de 38 ans et 47% des patients avaient moins de 20 ans.

Résultats : La mortalité post-opératoire immédiate était de 7.6% (n=19), elle était due à une protection myocardique insuffisante (n=3), à une instabilité hémodynamique (n=7), à une tamponnade cardiaque (n=3), à un accident vasculaire cérébral (n=2) et à une coagulopathie (n=4). La mortalité tardive était de 2% ; elle était due à une thrombose sur prothèse mécanique (n=2) et à une endocardite infectieuse (n=2). La mortalité opératoire était 4 fois plus élevée chez les patients qui avaient un temps de circulation extra-corporelle supérieur à 180 mn (HR= 6,18 ; p = 0.01). La fibrillation auriculaire était un facteur de mortalité (p < 0,001). Quatre malades (2 %) présentaient une fuite mitrale importante après plastie mitrale. Les résultats de la plastie étaient satisfaisantes dans 44% des cas.

Conclusion :

La pathologie cardiaque au Sénégal est dominée par les valvulopathies rhumatismales. La mortalité post-opératoire importante exige un renforcement des moyens en réanimation.

Mots clés : chirurgie, valves rhumatismales, résultats

Summary

Background : In Africa, rheumatic valve lesions are severe and require valve repair or replacement. The main purpose of this study is to evaluate outcomes of surgery for rheumatic heart valve disease in Senegal.

Patients and Methods : This is a 10-year retrospective study conducted in the cardiovascular center of Dakar University Hospital, involving 250 patients who underwent open-heart surgery. The study included clinical and ultrasound data. Additionally, surgical options, procedures and complications were also

included. The statistical analysis was done to assess the relationship between the mortality and the other variables. The mean age was 38 years, and 47% of patients were under the age of twenty. Mitral valve repair was performed in 40% of cases.

Results : The operative deaths (7.6%) were due to myocardial protection failure (n=3), to a low cardiac output (n=7), to a late-diagnosed cardiac tamponade (n=3), cerebral stroke (n=2) and a coagulation disorder (n=4). Late deaths (2%) were due to prosthesis thromboses and endocarditis. Mortality was four times higher in patients with CPB time > 180 min than patients with CPB time < 180 min (HR= 6,18 ; p =.01). Four patients (2%) had severe mitral valve leak after valve repair. Valve repair mid-term results were good in 44 % of patients and average (moderate mitral regurgitation) in 40 % of patients.

Conclusion : Rheumatic heart valve is the main cardiac disease in Senegal. The significant post-operative mortality requires the development of intensive care unit means.

Key words: cardiac surgery, Rheumatic valve, outcomes

Introduction

Cardio-vascular disease is the main cause of mortality in the world [11]. In the Western countries, coronary lesions are the most prevalent whereas in Africa, rheumatic heart valve disease is the most predominant [8]. In Africa, cardiac surgery is recent [14], and in Senegal, the first open-heart interventions were done in 1996. Valve lesions are severe there are due to recurrent rheumatic fever attacks and often requiring valve replacement. The prognosis of patients has been improved by surgical treatment. The main purpose of this study is to evaluate the outcomes of surgery for rheumatic heart valve disease in Senegal.

Patients and Methods

This 10-year retrospective study January 1998 to December 2007 was carried out in the Thoracic and Cardio-Vascular Department of Dakar University Hospital. It involved 250 patients surgically treated by cardiopulmonary bypass (CPB). All patients had one or more rheumatic valve lesions. Patients with incomplete files or patients who underwent closed heart surgery were excluded from the study. Epidemiological profile, clinical and echographic data, types of surgery as well as treatment of post-operative complications and outcomes were studied. A statistical analysis was performed to determine relationships between early hospital mortality, epidemiological profile, clinical and echographic data, treatment options, complications and outcomes. Proportional regression hazard was used to estimate all predictive variables; all variables were characterized for hazard ratio interpretation and analysis was completed using SAS 9.1 (SAS incorporation). Variables with $p < 0.20$ in a univariable analysis were chosen for multivariable analysis. Linear regression models were used to establish relationship between

variables and operative mortality. In the final model, variables with $p < 0.05$ were considered significant.

This series included 172 female and 78 male patients. The mean age was 38 years (6-60 years), 47% (117) of patients were below 20 years old. All patients suffered from rheumatic-related lesions were socially disadvantaged. 212 patients had a dyspnea, the reason for consultation was stage II (NYHA) dyspnea for 85% (212 patients) of cases and stage III of NYHA functional classification for 15% (38 patients). All patients were referred by cardiologists from small hospitals and were under medical therapy. Four patients with severe mitral stenosis had cerebral stroke sequelae. The mean cardio-thoracic index (MCI) on frontal view of pulmonary X-Rays was 0.63 (0.51-0.75). Atrial fibrillation (AF) was observed in 38 patients (15%). Trans-thoracic echocardiography (TTE) revealed mitral regurgitation (MR) in 104 patients (42%), mitral stenosis (MS) in 48 patients (19%), MR and MS (MRS 0) in 44 patients (18%), aortic regurgitation (AR) in patients (5%), aortic stenosis (AS) in 3 patients (1%), aortic mixed lesion (AML) in 19 patients (8 %), mitral and aortic lesion (MAL) in 20 patients (8 %).

In 12% of patients (n=30), a significant tricuspid regurgitation was also observed. Mean systolic pulmonary arterial pressure at trans-thoracic echocardiography was 60 mmHg (40 to 125 mmHg). Patients with a pulmonary arterial hypertension greater than 100 mmHg at TTE had to undergo right heart (n=4) catheterization. Left ventricular dysfunction was observed in 2% of patients with an ejection fraction below 50%. All patients underwent cardio-pulmonary bypass (CPB) between an aortic cannula and two vena cava cannula, with moderate hypothermia (34°). Crystalloid antegrade cardioplegia was used in

80% (n=200) of patients and the remaining 20% (n=50) had blood antegrade cardioplegia.

The access approach was through median sternotomy. Mitral valve exposure was via left atriotomy. Mitral valve repair (table 1) was performed in 40% of cases (n=100), mean age for this group was 12 +/-5 years.

Mitral valve replacement by a bileaflet mechanical prostheses was performed in 103 patients (41%) ; aortic valve replacement by mechanical prostheses : 37 patients (15%) and double mechanical valve replacement : 10 patients (4%). The posterior mitral valve has been preserved in all patients, and all of them were under anticoagulation oral therapy. Prothrombin-INR rate monitoring was free of events. Tricuspid regurgitation was treated by "De Vega" annuloplasty in 11% of patients (n=27) and in three patients (1%), a simple tricuspid plication of the anterior commissure of the tricuspid valve was acceptable.

A TTE was performed at discharge and subsequently every 6 months. Aspirin and antiobioophylaxis were administrated to patients with mitral valve repair-endocarditis prophylaxis.

Results

Mean aortic cross-clamp time was 57 minutes (31 to 132 mins). Mean CPB time was 72 minutes (62 to 220 mins). Mean tracheal intubation duration in intensive care unit (ICU) was 13 hours (6-23hrs). Mean ICU stay was 4 days (3- 13 days) and mean hospital stay was 7 days (5-15 days).

The operative deaths was 7.6% (n=19) due to myocardial protection failure (n=3), to a low cardiac output (n=7), to a coagulation disorders (n=4), to a late-diagnosed cardiac tamponade (n=3) and to an hemorrhagic cerebrovascular stroke (n=2). Late mortality was 2% (n=4) with two cases of mechanical prostheses thrombosis in patients who did not comply with their anticoagulant therapy. The other two deaths were due to infective endocarditis with mitral prostheses dehiscence. Among deceased patients, 10% suffered atrial fibrillation (28 patients). Among the 10 patients who underwent double valve replacement (aortic and mitral), three died. Causes of death are listed in Table 2. Mortality was four times higher in patients with CPB time superior to 180 min than patients with CPB time inferior to 180 min (HR= 6, 18; p =. 01). Atrial fibrillation, preoperative dyspnea and double valve replacement have an important impact in operative mortality, but not statistically significant (table 3).

Early complications are mainly cardiac tamponade 6% (14 patients) which were treated

by pericardial drainage through tubes. Major hemodynamic disorders were observed in 17 patients (7 %), stabilized by inotropes. Three patients with complete atrio-ventricular block were fitted with a pacemaker. The main infectious complication was lung infection in 39 patients (16%) associated with serofibrinous pleuritis (10%) and malaria (with *Plasmodium falciparum*) 10% (25 patients). Skin infections were due to *pseudomonas* (3%) requiring debridement and local care of the wound in four patients, one case of mediastinal infection was treated by surgical drainage associated with antibiotics. An infective endocarditis with mitral prostheses dehiscence required reoperation with use of an annular patch and new prostheses placement. Pulmonary arterial hypertension (2%) was stabilized with Corotrope, intubation and prolonged sedation. The other complications were renal failure (2%), hemorrhagic cerebrovascular stroke (1%), paraprothetic leaks (1 %) and neuropsychological disorders (2 %).

Four patients (2%) had severe mitral leak after mitral repair. Among them, two presented with trans-mitral gradients of 8 and 12 mmHg respectively. These mitral leaks were associated with significant tricuspid regurgitation and high arterial pulmonary pressure in three patients; all of them were stabilized with medical treatment. A rheumatic fever attack was observed in two patients without deterioration of the repair. Regular echocardiography checks were performed in patients who had undergone mitral valve repair. Valve repair mid-term results were considered satisfactory in 44 % of patients, average (moderate MR) in 40% of patients and poor (severe MR) in 4% of patients. Mean follow-up was 60 months (12 to 96 months) and 10% of patients (15 valve replacements and 10 mitral valve repair) were lost to follow-up (figure 1).

Discussion

In Africa, cardiac surgery is conducted predominantly for rheumatic heart valve disease [8]. Rheumatic fever prevails with a variation between 3 % and 14% [13]. This disease affects young people of school age. The low income of people and their limited access to medical care expose them to severe cardiac infectious lesions. Mitral valve repair is the most-preferred procedure, since preservation of the native valve allows ventricular function to be safeguarded, avoiding anticoagulation treatment-related events [7]. The study team carried out 100 mitral valve repair (40%) using the Carpentier techniques [5].

This repair is usually performed in children with mitral regurgitation as predominant lesion [8].

However, in the case of a rheumatic valve, plasty is technically difficult and the results may be compromised by a new emergence of the disease. Despite this difficulty, valve repairs in children must be favored over biological valve replacements because of potentially early bio-prosthetic degenerations [15]. The study team performed mechanical prosthetic valve replacements in 60% of patients. The sub-valvular apparatus was preserved to reduce left ventricular function loss and cardiac rupture risks. The study presents an high mortality rate (9.2%) compared to others (2% to 7%) [4,3]; and mortality was higher in patients, with long CPB time. The severity of lesions and left ventricular dysfunction after CPB can explain this mortality. Atrial fibrillation represents a morbid-mortality risk factor [1].

Atrial fibrillation involvement as a mortality risk factor should encourage the team to perform per-operative treatment of AF with the Cox maze III procedure [6]. There was a significantly high death rate among patients who underwent double valve replacement (3 patients), but the small sample of 10 patients weakens the validity of the test.

Left ventricular dysfunction before surgery is also an important post-operative mortality factor [7]. In the series conducted by the team, the left ventricular dysfunction rate was low (2%), which can be explained by the pre-operative selection of patients with acceptable left ventricular function.

The main cause of morbidity was lung infection; patients were intubated and ventilated for a mean duration of 13 hours (6 to 23 hrs). Early or fast track extubation is currently being assessed in cardiac valve surgery with promising results [9]. Cases of malaria in ICU are explained by the fact that the country (Senegal) is located within the endemic area [12]. Mediastinitis cases were treated by debridement, drainage and irrigation. Despite care taken in patients suffering from severe pulmonary arterial hypertension, the team experienced 2% of post-operative acute PAHT events. In these cases, the only option left by the team was to extend intubation duration (> 12hrs) with a 100% FIO₂ associated with phosphodiesterase inhibitors, since nitric oxide (NO) is not available in the country (Senegal). In the Said series, repair-related morbidity concerned four patients, two of whom presented mitral disease with severe valve lesions making the plasty technique difficult (7). As recommended by Antunes et al. [2] all children were treated with penicillin in the post-operative period.

Administration of aspirin reduces the embolic risk. Patients with mechanical valve prostheses had their hemostasis check-up performed in the center without charge, thus facilitating their follow-up. This contributes to the small rate of patients lost to follow-up (10%) compared with earlier patients operated on abroad [10].

Conclusion

In Senegal, cardiac surgery is relatively a recent speciality. The primary cardiac disease is rheumatic valve disease. The patients are young with low income; they experienced severe heart lesions. There is a high level of post-operative morbid-mortality ; but reinforcement of human resources and ICU equipment should improve patient care management.

References

1. Almassi GH., Schowalter T., Nicolosi AC., Aggarwal A., Moritz TE., Henderson WG. Atrial fibrillation after cardiac surgery: a major morbid event ? *Ann Surg* 1997; 226: 501-511
2. Antunes MJ., Magalhaes MP., Colsen PR., Kinsley RH. Valvuloplasty for rheumatic mitral valve disease. A surgical challenge. *J Thorac Cardiovasc Surg* 1987; 94: 44-56
3. Ayegnon KG., Yangni-Angate H., Farid AN. et al. Suivi à long terme de 226 patients porteurs de prothèses valvulaires cardiaques. *Ann Afr Chir Thor Cardiovasc* 2007; 1: 9-12
4. Camilleri L., Bailly P., Legault B., Miguel B., D'Agrosa-Boiteux MC., De Riberolles C. Mitral and mitro-aortic valve replacement with Sorin Bicarbon valves compared with St. Jude Medical valves. *Cardiovasc Surg* 2001; 9: 272-280
5. Carpentier A. Cardiac valve surgery. The French correction. *J Thorac Cardiovasc Surg.* 1983; 86: 323-337
6. Chen MC., Chang JP., Chen YL. Surgical treatment of atrial fibrillation with concomitant valve disease: an Asian review. *Chang Gung Med J.* 2008; 31: 538-545
7. Choudary S., Talwar S., Dubey B., Saxena A., Kumar S. Mitral valve repair in a predominantly rheumatic population: long term results. *Texas Heart Inst J* 2001; 28: 8-15
8. Essop MR., Nkomo VT. Rheumatic and non rheumatic valvular heart disease Epidemiology, management, and prevention in Africa. *Circulation* 2005; 112: 3584-3591
9. Hemmerling TM., Nhiên L., Olivier JF., Choiniere JL., Basile F., Prieto I. Immediate extubation after aortic valve surgery using high thoracic epidural analgesia or opioid based. *J Cardiothorac Vasc Anesth* 2005; 19: 176-181

10. Kane A., Balde MM., Thiam M., Diao M., Diop IB., Tarrat R. La surveillance post-opératoire des porteurs de prothèses valvulaires cardiaques au Sénégal: aspects médicaux et socio-économiques. *Cardiologie tropicale* 2001; 27: 41-44

11. Murray CJ., Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global burden of disease study. *Lancet* 1997; 349: 1498-1504

12. Raccurt CP., Le Bras M., Riport C., Cuisinier-Raynal JC., Carteron B., Briestel ML. Paludisme d'importation à Bordeaux : évaluation du risque d'infestation par plasmodium falciparum en fonction de la destination. *Bull World Health Organ* 1991; 69: 85-91

13. Rheumatic fever and rheumatic heart disease: report of a WHO expert consultation :Geneva, 29 October-1 November 2001. WHO Tech Rep 2001;923

14. Yangni-Angate H., Ayegnon G., Meneas C., Diby FL., Yapobi Y., Kangah M. Open heart surgery in Côte d'Ivoire : a twenty year surgical experience. *Journal of medical sciences and hospital management* 2007; 1: 18-24

15 Yangni-Angate H., Tanauh Y., Yapobi Y et al. Les réinterventions sur bioprothèses valvulaires à Abidjan. Résultats précoces, indications et risques opératoires. *Cardiologie Tropicale* 1990; 16: 87-92

Table 1: Mitral Valve Repair Procedures

Surgical procedures	Percentage
Rings (Carpentier, homemade)	84%
Tendinae chordae shortening	73%
Double commissurotomy	22%
Split closure	17%
Anterior leaflet resection	5 %
Posterior leaflet enlargement	18%

Table 2: Causes of Death

Causes of Death	Effectif	Percentage
Early Mortality		
• Myocardial protection insufficiency	3	1%
• Low cardiac output	7	3%
• Coagulation disorder	4	2%
• Tamponade	3	1%
• Hemorrhagic cerebrovascular accident	2	1%
Late Mortality		
• Infective Endocarditis	2	1%
• Prostheses thrombosis	2	1%

Table 3: Multivariable analysis of Hazard Ratio

Parameters	Hazard Ratio	Valeur de p
Preoperative dyspnea	3,73	.12
Double valve surgery	2,40	.41
CPB time	6,18	.01

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	95% Hazard confidence	Ratio I Limits
Preoperative dyspnea	1	1.31582	0.84473	2.4264	0.1193	3.728	0.712	19.520
Double valve surgery	1	0.87710	1.05931	0.6856	0.4077	2.404	0.301	19.169
CPB time	1	1.82091	0.74192	6.0237	0.0141	6.177	1.443	26.44

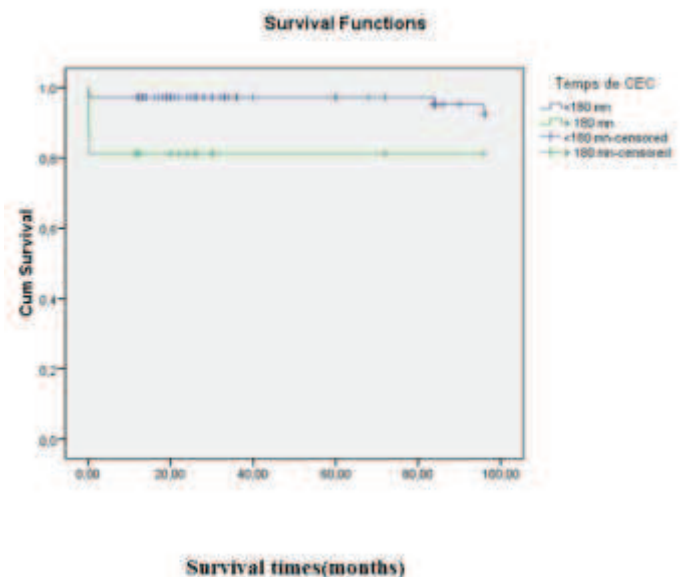


Figure 1: Kaplan-Meier survival curves: Survival on whether CPB time was > 180 min or CPB time < 180 min