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Research Article

Surgical Myocardial Revascularization in Patients with Severe Left Ventricular Dysfunction: Experience in the Cardiac Surgery Department of the Military Hospital Mohammed V of Rabat

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ABSTRACT

Patients with coronary artery disease associated with severe left ventricular dysfunction, candidates for surgical myocardial revascularization, are with high operative risk. The aim of this study was to assess short and long-term morbidity and mortality and to identify their predictive factors.

Methods: We conducted a retrospective study in the cardiac surgery department of the Military Instruction Hospital Mohammed V- Rabat, between 2000 and 2015. The statistical analysis was executed by SPSS. There were 74 patients (mean age 74 ± 10 years, ejection fraction [FE]: $30.07\% \pm 4.5$, Euroscore: 6.6 ± 2.9).

Results: Hospital mortality was 9.5%, with a follow up time of 59.2 ± 36 months. The survival rate at 10 years was 57%. There was also an improvement in their clinical symptoms and echocardiographic parameters (postoperative FE: $40.36\% \pm 11.2$).

Conclusion: In this group of patients with high operative risk, the long-term results of several studies demonstrate the superiority of surgical treatment on medical treatment.

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Introduction

Patients with coronary artery disease associated with severe left ventricular dysfunction are a group of patients at high operational risk. Despite a high surgical risk, the long-term results of several studies demonstrate the superiority of surgical treatment over other therapies. The purpose of our study was to assess short-term and long-term morbidity and mortality and to identify their predictive factors.

Materials and Methods

We conducted a retrospective study in the department of Cardiac Surgery of the Military Hospital Mohammed V, from January 2000 to December 2015. There were 74 patients with coronary artery disease associated with severe left ventricular dysfunction (LV) who received surgical myocardial revascularization.

I Inclusion and Exclusion Criteria

The patients who underwent an aorto-coronary bypass and had a LV ejection fraction (FE) of less than 35%, assessed by doppler echocardiography or ventriculography, were enrolled in the study. Patients who had received a combined surgical procedure (mitral plasty, valvular replacement, carotid surgery) were excluded.

II Data Collection

Pre and postoperative information was collected retrospectively from patient medical records. The postoperative control was done by calling the patients or by contacting the treating cardiologist.

III Operational Protocol

All the patients were operated by vertical median sternotomy and under general anaesthesia with narcotics, benzodiazepines and muscle relaxants. They took systematic premedication with 100 mg of

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hydroxyzine (ATARAX) the night before and anti-ischaemic treatment the morning of the surgery. The grafts used were the internal mammary arteries and the internal saphenous veins. Hemodynamic assistance by intra-aortic counterpulsation balloon (IACPB) has been indicated when the cardiac index was under 2.5 l / min. All our patients were operated on cardiopulmonary bypass (CPB) in moderate hypothermia at 32°. The anticoagulation was achieved by intravenous heparin at 300 IU/Kg to have an activated cephalin time (ACT) greater than or equal to 400 seconds. Myocardial protection was ensured by cold blood cardioplegia injected by antegrade way and by the application of crushed ice to the epicardium. The order of the bypasses was: marginal branches, right coronary artery or posterior interventricular artery, diagonal branches, and ultimately, anterior interventricular artery (AVI).

IV Statistical Analysis

It was conducted by SPSS 11.5 software (SPSS. Inc, Chicago, IL). The discontinuous quantitative variables were expressed as mean \pm standard deviation and the nominal variables as a percentage. The comparative study of quantitative variables was made by Student's t-test and by the non-parametric Mann-Whitney test in the case of an asymmetric variable. The Chi Square test and Fisher's exact test for the qualitative parameters. The comparative study was done by univariate analysis. A value of $p < 0.05$ was chosen as the significant threshold.

Results

The main demographic data of our patients are summarized in (Tables 1 & 2). We noticed that the average age of our patients was 74 ± 10 years, we are facing an elderly population with a clear male predominance. The prevalence of risk factors was 2.07 ± 1 with a prevalence of smoking and diabetes. The majority of our patients (86.5%) had signs of congestive heart failure. One-third of the patients had a class III or IV angina according to the classification of the Canadian Cardiovascular Society.

Table 1: Characteristics of patients.

Variable	Average \pm standard deviation Number (%) n=74
Age (years)	74 \pm 10
Sex ratio (F/H)	4/70
Number of risk factors	2,07 \pm 1
Smokers	52 (70,3%)
Diabetes	39 (52,7%)
Hypertension	24 (32,4%)
Chronic obstructive pulmonary disease	14 (18,9%)
Chronic renal insufficiency	5 (6,8%)
Peripheral vascular disease	23 (31,1%)
Cerebrovascular stroke	2 (2,7%)
NYHA III-IV	56 (86,5%)
Angor class III-IV CCS	25 (33,8%)

The analysis of associated comorbidity found that the prevalence of myocardial infarction was 43.1% and Peripheral vascular disease was 31.1%. The mean number of stenosis at coronary angiography was 2.73 ± 1 . The percentage of tritroncular patients was 60.8%. The operational risk evolved by euroscore was 6.6 ± 2.9 . Preoperatively, the diameters of the LV were EDD: 61.6 ± 7.1 mm, ESD: 49.6 ± 5.2 mm. The

ejection fraction was $30.07 \pm 4.5\%$. (Table 3). The average number of bypass performed was 2.58 ± 0.7 anastomoses per patient.

Table 2: Pre-operative characteristics.

Variable	Average \pm standard deviation Number (%) n=74
Cardiothoracic ratio	0,54 \pm 0,04
Prior myocardial infarction < 3 months	28 (43,1%)
Thrombolysis	3 (4,2%)
Angioplasty	4 (5,6%)
Left ventricle diameter	
-Telediastolic (mm)	61,6 \pm 7,1
-Telesystolic (mm)	49,6 \pm 5,7
Ejection fraction %	30,07 \pm 4,5
Systolic pulmonary artery pressure	44,15 \pm 20
Number of stenosis	2,73 \pm 1,02
Left main disease	14(18,9%)
Triple vessel disease	45(60,8%)
Two vessel disease	20(27%)
One vessel disease	9(12,2%)
Euroscore	6,6 \pm 2,9
Viability test %	20 (27%)
Viability	15 (75%)

Table 3: Per-operative characteristics.

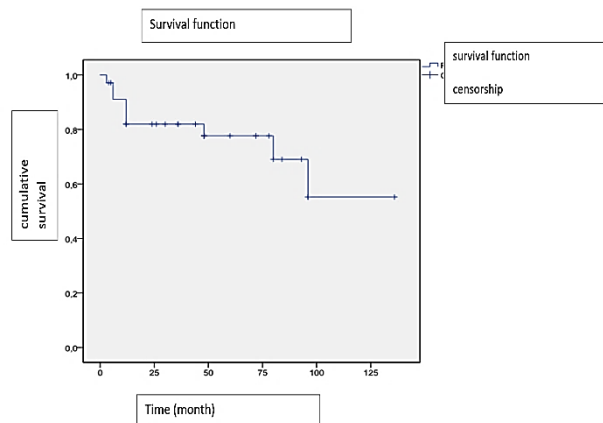
Variable	Average \pm standard deviation Number (%) n=74
Emergency of the intervention (%)	5 (6,8%)
Number of distal anastomosis/patients	2,58 \pm 0,7
Grafts used:	
- Left internal mammary artery	69 (93,2%)
- Right internal mammary artery	07 (9,5%)
- Internal saphenous vein	55 (74,3%)
Bridged Arteries :	
- Left anterior descending artery	70 (94,6%)
- Diagonal artery	20 (27%)
- Left marginal artery	38 (51%)
- Right coronary artery	34 (46%)
CPB duration	113,9 \pm 27
Aortic clamping duration	63,8 \pm 18,7

In the postoperative period, 39 patients required the use of positive inotropic drugs, and 20 patients (27.1%) required circulatory assistance by BCPIA. (Table 4). The average duration of assisted ventilation was 34.43 ± 16 h and the average duration of intensive care stay was 95.63 ± 44 h. Hospital mortality was 9.5%. The mean control time was 59.2 ± 36 months. Thirty-two patients were lost to follow-up. Of the 35 patients checked, 5-year survival was 78% and 10-year survival was 57%. Functionally, 42.8% of patients became asymptomatic and 34.2% patients moved from class III and IV of NYHA to class II of NYHA. This was due to the postoperative improvement in their left ventricular function, increased from 30% to 41%.

Table 4: Post-operative characteristics.

Variable	Average \pm standard
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	deviation
	Number (%) n=74
Inotropic support	39 (52,7%)
Low cardiac output	27 (36,5%)
Intra-aortic balloon pump insertion	20 (27,1%)
Total ventilation time (H)	34,43 ± 16
Ventilation > 48H (%)	15 (20,3%)
Total intensive care unit time (H)	95,63
Duration of postoperative stay (D)	12,79 ± 6,4
Blood transfusion (%)	45 (60,8%)
Postoperative renal failure (%)	08 (10,8%)
Postoperative myocardial infarction	08 (10,8%)
In-hospital mortality	7 (9,5%)
Infection %	6 (8,1%)
Postoperative dialysis	3 (4,1%)
Re intervention (%)	3 (4,1%)
Postoperative stroke	0



Discussion

Patients with coronary artery disease associated with left ventricular dysfunction are a group of high-risk patients. In his study, Houssein Ahmadi compared coronary bypass results in patients with EF < 35% and those with EF > 35% [1]. Patients with severe LV dysfunction have more cardiovascular risk factors and more comorbidity. Most of the patients have signs of congestive heart failure with recent history of myocardial infarction was related to severe coronary artery disease. Several surgical techniques have been proposed in these patients to improve short and long-term mortality. In a study carried out by Ueki comparing the results of bypasses performed under CPB and without CPB with beating heart [2]. The authors found that the duration of surgery is prolonged in the CEC-operated group, as these patients received a more complete myocardial revascularization than the beating heart-operated group. The authors also noticed that surgical mortality (3.3% - 6.1%) was lower in the group of patients operated on beating heart, with less operating complications compared to the group of patients operated on CPB. However, the risk of having recourse to a second revascularization during the 30 days following bypass surgery was multiplied by 1.9 in those patients [3]. In the long term, there was no significant difference in mortality between both the techniques [4].

Another study compared the use of the conventional CPB vs the assistive CPB in this patient group [5]. The authors found that assistive CEC

reduced significantly the operative mortality and the incidence of major perioperative complications. This technique also allows complete myocardial revascularization compared to techniques using only the beating heart [6]. Some authors recommend the use of hybrid revascularization in these patients [7]. The choice of graft used for coronary artery bypass, either all arterial or combining internal mammary artery and internal saphenous vein, does not interfere with short and long-term mortality [8]. Operative mortality was high in older studies, with up to 11% in Carr's and LEE's studies [9, 10]. Five-year survival varied between 55.7% and 80.9% [10-12]. In recent studies, we find an improvement in operative mortality which was between 3 and 7% and in medium-term survival 89.3% at 8 years. Operative mortality in our series was 9%, 5-year survival was 78% [12-14].

Several predictors of hospital mortality have been described. In the majority of studies, we find lengthening of the time of the CPB, use of IACPB, the emergency of the surgery and the presence of congestive heart failure preoperatively as in our study [15]. Surgical treatment, despite acceptable hospital mortality has proven its superiority in the medium and long-term follow-up compared to other therapies with an improvement in the quality of life of operated patients [16]. This is due to the improved hemodynamic performance of LV [17].

Conclusion

Patients with coronary artery disease with left ventricular dysfunction constitute a group of patients at high operational risk. Surgical myocardial revascularization seems to be the treatment of choice as it improves their quality of life and their medium and long-term survival.

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