

**Research Article**

# Valve Surgery After the Age Of 70: Evaluation Risk Factors for Hospital Mortality

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**Abstract:**

**Objective:** Valve surgery after the age of 70 is increasingly common in Algeria. The aim of this study was to identify risk factors for in-hospital mortality in this population.

**Methods:** 56 patients with a mean age of 72 years (70-81) underwent valve surgery between 2016 and December 2019. 32 patients (57.4%) had aortic valve replacement, 17 patients (29.7%) had mitral surgery and 07 patients (12.9%) had aorto-mitral surgery. 04 procedures (8%) were urgent. The Euroscore was used to predict operative risk. The mean additive Euroscore was 9.05 and the mean logistic Euroscore was 14.2%.

**Results:** Operative mortality was 3.8%. Preoperative risk factors were: NYHA III class, repeat operations, critical status according to the Euroscore, STS score, PAH, mitral surgery and tricuspid surgery. Post-operative complications were: low flow (12%), supra-ventricular arrhythmia (32.7%), renal dysfunction (14.6%), pulmonary (11%), intestinal (3.5%), infection (4%) and surgical re-exploration (6.5%). Post-operative risk factors for mortality were low flow, renal dysfunction, gastrointestinal complications and surgical re-exploration.

**Conclusion:** Valve surgery after the age of 70 is a low-risk procedure. Our data are correlated with the Euroscore.

**Key words:** Valve surgery, elderly subjects, mortality.

## 1. Introduction:

In Algeria, as in other industrialised countries, the decline in mortality in all age groups has contributed to the gradual ageing of the population. The prevalence of cardiovascular pathologies is higher after the age of 70, and can reach 40%.

In recent years, we have seen a significant increase in the number of elderly patients referred for surgery. Recent advances in the surgical and peri-operative management of these patients have improved outcomes in this at-risk subgroup.

The aim of this study was to evaluate the Euroscore and STS score and to identify pre- and post-operative risk factors for in-hospital mortality in this group of at-risk patients referred to our institution for valve surgery.

**Table 1: Variables studied**

<b>Pre-operative</b>
<ul style="list-style-type: none"> <li>-age</li> <li>-gender</li> <li>-NYHA class</li> <li>-angina</li> <li>-systemic arterial hypertension</li> <li>-diabetes</li> <li>-peripheral arterial disease</li> <li>-cerebrovascular pathology</li> <li>-chronic bronchopneumonia</li> <li>-renal insufficiency</li> <li>-LVEF</li> <li>-PAH</li> <li>-infective endocarditis</li> <li>-associated coronary artery disease</li> <li>-type of valve disease-</li> </ul>
<b>Intraoperative</b>
<ul style="list-style-type: none"> <li>- Procedure</li> <li>- Re-operation</li> <li>- Duration of extracorporeal circulation</li> <li>- Associated coronary bypasses</li> <li>- Delay (emergency, critical condition)</li> <li>- Duration of aortic clamping</li> <li>- Procedure on the thoracic aorta</li> </ul>
<b>Post-operative</b>
<ul style="list-style-type: none"> <li>-Resuscitation time</li> <li>-Low cardiac output</li> <li>-Myocardial infarction</li> <li>-Atrial fibrillation</li> <li>-Conduction disorder</li> <li>-Need for transfusion</li> <li>-Digestive ischaemia</li> <li>-Pulmonary complication</li> <li>-Cerebrovascular accident</li> <li>-Renal failure</li> <li>-Infection</li> <li>-Surgical re-exploration</li> </ul>

## 2. Patients and Methods:

**Patients:** Between January 2016 and december 2019, 56 consecutive patients aged over 70 underwent valve surgery with extracorporeal circulation.

**Data:** Data-t-on demographic characteristics, pre-operative status, surgical data and post-operative follow-up were collected retrospectively. The variables studied are listed in Table I. The definition of variables corresponds to their title in the Euroscore calculation sheet. Cardiac catheterisation data including significant coronary lesions (>50%), presence and degree of valvular dysfunction and left ventricular ejection fraction (LVEF) were reported where available.

Peripheral vascular disease was defined by the presence of claudication, carotid occlusion or stenosis > 50% and by a history of arterial surgery on the abdominal aorta, neck vessels or lower limbs. Cerebrovascular pathology was defined by a history of cerebrovascular accident (CVA), transient ischaemic attack (TIA), or both. Renal failure was defined as a creatinine level greater than 200 µmol/l. Pulmonary arterial hypertension (PAH) was analysed by Doppler echocardiography.

**Table 2: Demographic characteristics and associated comorbidities**

Variables	N° (%)
NYHA class	4.7
II	33.7
III	51
IV	10.6
Diabetes	10.9
HYPERTENSION	33
Unstable angina	2.2
History of angina	31.2
Renal dysfunction	23.2
Creatin 130-200µmol/l	19.5
Creat > 200µmol/l	3.7
Chronic bronchopneumopathy	13.9
Cerebrovascular pathology	7.2
Peripheral arterial disease	12.9
LV dysfunction	23.2
LVEF 30-50	20.4
LVEF <30	2.8
Active endocarditis	4.1
HTAP	40.3
PAPs 40-60mmHg	27.5
PAPS	12.8
Coronary artery disease	36.1

**NYHA, New York Heart Association; Creat, creatinine; LV, left ventricle; LVEF, left ventricular ejection fraction; PAPS, systemic pulmonary artery pressures.**

**Table 3: Operating data**

Operating data	N° (%)
Response time	
Set	90
Emergency	8
Critical condition	2
Procedure	

<b>RV Ao</b>	<b>57</b>
<b>Mitral surgery</b>	<b>29.7</b>
<b>RV Ao+ Mitral surgery</b>	<b>12.9</b>
<b>Tricuspid surgery</b>	<b>7.1</b>
<b>Associated CABG</b>	<b>23</b>
<b>Ascending aorta relacement</b>	<b>2.8</b>

**AVR: aortic valve replacement; CABG: coronary artery bypass graft.**

La mortalité hospitalière était de 8% (4 Patients), pour une mortalité attendue de 9,05 avec l'Euroscore additif et de 14,2% avec l'Euroscore logistique. Les patients ont été divisés en 3 sous-groupes selon leur Euroscore, et la mortalité a été analysée pour chacun d'entre eux (Tableau 5). Durant la première partie de l'étude (2006-2007) la mortalité hospitalière était de 10,6% pour un Euroscore additif de 8,6, et durant la seconde partie de l'étude (2008-2009), la mortalité hospitalière était de 6,4% pour un Euroscore additif de 9,3. Concernant les réinterventions, la mortalité hospitalière était de 13,4%.

## 3. Risk factors for mortality

Univariate analysis of factors influencing overall in-hospital mortality revealed that significant pre-operative risk factors were NYHA class III or IV (P=0.04), repeat surgery (P=0.02), critical status according to Euroscore (P=0.03), pulmonary arterial hypertension (P=0.01), mitral surgery (P=0.02) and tricuspid surgery (P<0.001). Post-operative risk factors for mortality were low cardiac output (P<0.001), renal dysfunction (P=0.01), gastrointestinal complications (P=0.02), surgical re-exploration (P<0.001), and need for blood transfusion (P=0.02). The results of the multivariate analysis are reported in Table 6.

## 4. Discussion:

Women accounted for the majority (55.4%), as in other studies of elderly patients, due to their longer life expectancy. Pre-operative risk factors were similar to those for younger patients, with the exception of the proportion of patients with diabetes (10.9%), which remains lower because of the lower life expectancy in this sub-group. In our series, in-hospital mortality was 8%, similar to the results reported by Akins et al [2] for patients undergoing isolated valve replacement, and lower than other series involving elderly patients [3,4]. With regard to the Euroscore, we showed that in the low-risk and moderate-risk subgroups, the additive Euroscore gave excellent discrimination, and even slightly overestimated the operative risk, as reported by Stoica et al. [5], especially in the second period of our study. In the high-risk subgroup [Euroscore>12], our results show that the additive Euroscore underestimates the operative risk, as reported by Jin et al [6].

Concerning the logistic Euroscore, there is good discrimination in low-risk patients, whereas it overestimates operative mortality in the moderate-risk subgroups and even more so in the high-risk subgroup (49.3% predicted for 17.1% observed). With regard to reinterventions, Kirsch et al [7] report an operative mortality of 32% in 22 patients, whereas reintervention was not a risk factor in their previous study [4].

In our study, repeat operations were a significant risk factor for operative mortality, with 13.4% of deaths. Contrary to other series, operative mortality was not higher in emergency procedures [4]. The preoperative risk factors were NYHA class >2 and PAH, as reported by Kirsch et al [4], mitral surgery, as reported by Goldsmith et al [9], and tricuspid surgery. The prevalence of coronary artery disease increases with age.

The association of valvular pathology and coronary lesions is frequent in elderly populations [2]. An associated myocardial revascularisation procedure did not increase operative mortality in our series. In fact, several series [3,9] have shown a reduction in operative mortality when valve surgery was associated with myocardial revascularisation, especially using the internal mammary artery. Systematic pre-operative coronary angiography, both antero- and retrograde myocardial protection [10], and coronary artery bypass grafting in cases of significant stenosis (70%) appear to be beneficial for these patients.

Supraventricular arrhythmia was the most frequent complication in our series (32.7% of patients), but less so than in Avery's series [3] where atrial fibrillation occurred in 55.3% of patients, with no additional mortality. Low cardiac output was observed in 12% of patients in our series, with an increase in mortality, as shown in the majority of studies.

Renal dysfunction was a risk factor for in-hospital mortality, as shown by Akins [2], although it was not found to be significant in other series [7,8]. Digestive complications (especially mesenteric ischaemia) are rare but associated with excess mortality in these frail patients. The need for repeat surgery ranges from 9.4 to 13% in the literature [4,81], coupled with an increased need for blood transfusions, there is a higher risk of infection, pulmonary failure and in-hospital death. Our results in this area are comparable. Despite increased technical difficulties in elderly patients, several studies report a definite functional gain and long-term survival parallel to that of the general population of the same age.

## 5. Conclusion:

The results of our study show that valve surgery after the age of 70 is safe and low-risk. The mortality rate in the most recent period is low. The additive Euroscore is correlated with overall mortality, but overestimates the risk in the most recent period of our study.

## 6. Références:

1. **ASSEY ME.** Heart disease in the elderly. *Heart DisStroke* 1993; 2: 330-4.
2. **AKINS CW, DAGGETT WM, VLAHAKES GJ, et al.** Cardiac operations in patients 80 years old and older. *Ann Thorac Surg* 1997; 64: 606-14.
3. **AVERY GU, LEY SU, HILL JD, HERSHON JJ, DICKSE.** Cardiac surgery in the octogenarian: evaluation of risk, cost, and outcome. *Ann Thorac Surg* 2001; 71: 591-6.
4. **KIRSCH M, GUESNIER L, LE BESNERAIS P, et al.** Cardiac operations in octogenarians: peri operative risk factors for death and impaired autonomy. *Ann Thorac Surg* 1998; 66: 60-7.
5. **STOICA S, CAFFERTY F, KITCAT J, et al.** Octogenarians undergoing cardiac surgery outlive their peers - a case for early referral. *Heart* 2005; Jin R, Grunkemeier GL; Providence Health System Cardiovascular Study Group. *Eur J Cardiothorac Surg* 2005; 28: 240-3.
6. **KIRSCH M, NAKASHIMA K, KUBOTA S, HOUEL R, HILLION ML, LOISANCE D.** The risk of reoperative heart valve procedures in Octogenarian patients. *J Heart Valve Dis* 2004; 13: 991-6.
7. **GOLDSMITH I, LIP GYH, KAUKUNTALA H, PATEL RL.** Hospital morbidity and mortality and changes in quality of life following mitral valve surgery in the elderly. *J Heart Valve Dis* 1999; 8: 702-707.
8. **KLEIKAMP G, MINAMI BREYMAN T, et al.** Aortic valve replacement in octogenarians. *J Heart Valve Dis* 1992; 1: 196-200
9. **BHAYANA JN, KALMBACH I, BOOTH FVM, MENTZER RM, SCHIMERT G.** Combined antegrade/retrograde cardioplegia for myocardial protection: a clinical trial. *J Thorac Cardiovasc Surg* 1989; 98: 956-60.
10. **CRAVER M, PUSKAS JD, WEINTRAUB W W, et al.** 60 octogenarians undergoing cardiac surgery: outcome and comparison with Younger age groups. *Ann Thorac Surg* 1999; 67: 1104-10.

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