Mechanical Aortic Valve Replacement in Octogenarian

Seksen Yaş Üstü Hastalarda Mekanik Aort Kapak Replasmanı

Seksen Yaş Üstünde Aort Kapak / Aortic Valve in Octogenarian

İrfan Taşoğlu[1], Aslı Demir[2], Emre Kubat[1], Metin Yılmaz[1], Gökhan Lafçı[1], Adnan Yalçınkaya[1], Ümit Kervan[1], Necmettin Çolak[3]
[1]Department of Cardiovascular Surgery, Turkiye Yuksek Ihtisas Hospital, [2]Department of Anesthesiology, Turkiye Yuksek Ihtisas Hospital,
[3]Department of Cardiovascular Surgery, Fatih Unıversty Medical Faculty, Ankara, Turkey

Özet

Amaç: Bu çalışmada seksen yaş üstü hastalarda mekanik aort kapak replasmanının uzun dönem sonuçları analiz edilmiştir. Gereç ve Yöntem: 23 seksen yaş üstü mekanik aort kapak replasmanı yapılan hasta retrospektif olarak tarandı. Hastane mortalitesi, postoperatif yoğun bakımda kalış, hastanede kalış ve uzun dönem sonuçları değerlendirildi. Kümülatif olay ölüm oranı tahminleri Kaplan-Meier metodu ile hesaplanmıştır. Bulgular: Hastaların ortalama yaşları 82.9±2.3 yıldı ve çoğunluk erkekti (65.22%). Ortalama ejeksiyon fraksiyonu %45'ti. Hastaların %73.91'i New York Heart Association Sınıf III-IV'tü. Bu çalışmada 13 hasta'ya (%56.52) kombine prosedür, geri kalan 10 hastaya (%43.48) izole aort kapak replasmanı uygulandı. En sık kapak ölçüsü 23mm'ydi. Ortalama yoğun bakımda kalış süresi 1.76±1.14 gündü. Ortalama hastanede kalış süresi 9.33±5.06 gündü. Hastaların %56.52'sında hastanede kalış süresince herhangi bir komplikasyon gözlenmedi. Toplam hastane mortalitesi %8.7'ydi. 23 hastanın tamamında takip tamamlandı. Ortalama takip süresi 33 aydı (1-108 ay). Hastaneden taburcu olanlarda sağ kalım 5 yılda %59'du. Tartışma: Mekanik aort kapak replasmanı seksen yaş üstü hastalarda güvenli bir prosedürdür ve kombine prosedürle bile güvenle yapılabilir.

Anahtar Kelimeler

Kalp Kapağı; Aortik Kapak; Seksen Yaş Üstü

Abstract

Aim: This study analyzes the long-term outcomes of mechanical aortic valve replacement in octogenarian patients. Material and Method: A retrospective review was performed on 23 octogenarian patients who underwent mechanical aortic valve replacement. Hospital mortality, postoperative intensive care unit stay, hospital stay and long-term results was examined. Estimates of the cumulative event mortality rate were calculated by the Kaplan-Meier method. Results: The mean age of all patients was 82.9±2.3 years and most were men (65.22%). The median ejection fraction was 45%. 73.91% of patients were in New York Heart Association class III-IV. Thirteen patients (56.52%) in this study underwent combined procedure, the remaining 10 (43.48%) patients underwent isolated aortic valve replacement. The most common valve size was 23 mm. The mean intensive care unit stay was 1.76±1.14 days. The mean hospital stay was 9.33±5.06 days. No complications were observed in 56.52% patients during their hospital stay. The overall hospital mortality was 8.7%. Follow-up was completed for all 23 patients. Median follow-up time was 33 months (1-108 months). Actuarial survival among discharged from hospital was 59% at 5 years. Discussion: Mechanical aortic valve replacement is a safe procedure in octogenarian patients and can be performed safely even in combined procedure.

Keywords

Heart Valve; Aortic Valve; Octogenarian

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Corresponding Author: Irfan Tasoglu, Turkiye Yuksek Ihtisas Hastanesi, Kalp-Damar Cerrahisi Kliniği, 06100 Sıhiye, Ankara, Türkiye.
T.: +90 3123051816 F.: +90 3123124120 E-Mail: irfantasoglu@yahoo.com

Introduction

The life expectancy increase has led to a spectacular rise of geriatric population in developed countries. In recent years, however, the scientific literature reporting lower morbimortality after conventional aortic valve replacement (AVR) in elderly patients has continued to increase.(1-3) The choice between different types of valve implants is an important issue and there has been several studies trying to decide whether one should use a mechanical or a biological valve substitute in elderly patients. Still there is no consensus on this issue.(2) The development of less aggressive techniques than open surgery has restored the medical population's interest in valvular replacement and encourages us to review the real current state of long-term results of conventional mechanical aortic valve replacement (MAVR) in patients above 80 years of age.

Material and Method

A retrospective review was conducted of all patients 80 years and older undergoing MAVR at our Hospital, between June 2003 and May 2011. Patients with a previous mitral or aortic prosthesis, senile dementia or disabling conditions that prevented independent or semi-independent living activities were excluded. Medical records used in this retrospective study included demographic data, preexisting comorbidities, and clinical outcomes. The study was approved by the Institutional Review Board.

Surgical Technique

Generally, all patients were performed with standard cardiopulmonary bypass techniques utilizing roller head pumps, cold antegrade and retrograde blood cardioplegia, and moderate systemic hypothermia. Direct aortic clamping was utilized in all patients. The selected size and brand of the prosthesis depended on the surgeons' criteria. Mechanical prosthesis was chosen based on the patient's preferences, life expectancy and comorbidities together with the doctor's criteria.

Postoperative Period

The additive and logistic EuroSCORE ratings were calculated to assess the postoperative risk. Meticulous preoperative and postoperative care, including aggressive early mobilization (performed by a physiotherapist), was utilized to minimize complications and shorten the postoperative stay. We defined the postoperative period as follows: 30 days after the intervention or postoperative in-hospital stay. Post-operative death was defined as hospital mortality. All post-operative complications were recorded. Low cardiac output was defined as a post-operative inotropic support for more than 24 h. Pulmonary complications comprised all those leading to prolonged mechanical ventilation. Infection included any post-operative infectious complication requiring antibiotic therapy.

Anticoagulant Therapy

Anticoagulant therapy was performed with oral sodium warfarin in all patients, and international normalized ratio (INR) assessment was routinely required daily during the postoperative hospital stay, then weekly until the first postoperative month, and thereafter as indicated by our outpatient clinic, which is completely dedicated to anticoagulation therapy monitoring. Our anticoagulation protocol required a target INR of 2.25 (range, 2 to 2.5) for patients with bileaflet prostheses in the aortic position.

Patients were contacted by telephone and underwent routine check-up at our centre on a periodic, but not uniform, basis. During the follow-up, the following events were registered: 1. Mortality for all causes, 2. Readmission to hospital, 3. Thromboembolic complications, 4. Prosthetic endocarditis, and 5. Bleeding complications.

For each patient who died prior to the cut off date of August 15, 2011, a mortality date was provided. The number of days between the date of surgery and the mortality date is the primary variable of interest in the midterm portion of the study. For patients still alive at the study cut off date, no mortality date was given and these patients were considered to be censored for the purposes of the survival analysis.

Results

Preoperative

Out of the 23 patients in the study, 15 were males (65.22%) and 8 were females (34.78%). The average age was 82.9±2.3 years with an age range of 80–85 years. Patients' characteristics and preoperative risk factors are given in Table 1. The median ejection fraction was 45%, and 73.91% were in New York Heart Association (NYHA) class III-IV. As expected in these high-risk patients, 43.47% had preoperative chronic lung disease. Associated coronary heart disease was present in 8 (34.78%) patients.

Table 1. Patients' characteristics and pre-operative risk factors.

Characteristic	All Patients (n = 23)
Age	82.9 ± 2.3 80 to 85 years
Female/Male Gender	8/15
Body Mass Index	27.3 ± 6.0 [Median: 26.4(23.1-28.2)]
Ejection Fraction	0.42 ± 0.153 [Median: 45%(35%-50%)]
NYHA Class III-IV	17 (73.91%)
Congestive Heart Failure	1 (4.34%)
Previous Myocardial Infarction	5 (21.73%)
Angina	12 (52.17%)
ACVA	2 (8.69%)
PAD	2 (8.69%)
COPD	10 (43.47%)
Current Smoker	1 (4.34%)
Diabetes Mellitus	8 (29.6%)
Hypertension	12 (52.17%)
Renal Failure	2 (8.69%)
EuroSCORE	8.64 ± 1.7

Results are presented as mean (SD), median and interquartile range. Categorical variables were summarized as percentages. ACVA - Acute Cerebrovascular Accident With Neurological Sequelae, CABG - Coronary Artery Bypass Grafting, COPD - Chronic Obstructive Pulmonary Disease (Treated With Bronchodilator), Current smoker - 30 days prior to the surgery, CVA - Cerebrovascular Accident, NYHA - New-York Heart Association, PAD - Peripheral Artery Disease. Renal failure - plasmatic creatinine 1.5 mg/dl.

Operative Results

Table 2 presents the operative characteristics for all patients. There was 1 (3%) urgent operation due to aortic dissection (De Bakey type II). The majority of patients, 13 (56.52%), in this study underwent combined procedure; the remaining 10 (43.48%) patients underwent isolated AVR. The most common

Table 2. Operative details.

Details	Patients n (%)
Aortic Valve Size Implanted (mm)	Median: 23(21-25)
19-21 mm	6 (26.08%)
23 mm	11 (47.82%)
25-27 mm	6 (26.08%)
Mitral Valve Size Implanted (mm)	Median: 27(25-29)
Isolated MAVR	10 (43.47%)
Combined Procedure	13 (56.52%)
AVR and MVR	2 (8.69%)
AVR and CABG	8 (34.78%)
AVR and SGI	3 (13.04%)
Urgent Operation	1 (4.34%)
Brand of the Prosthesis	
St. Jude Medical (Aort)	15 (65,21%)
Sorin (Aort)	4 (17.3%)
Carbomedics (Aort)	3 (13.04%)
Edward (Aort)	1 (4.34%)
St. Jude Medical (Mitral)	2 (8.69%)
Aortic Cross-Clamp Time (minutes) (mean ± SD)	94.6 ± 21.2 [Median: 97(85-121)]
Cardiopulmonary Bypass Time (minutes) (mean ± SD)	117.8 ± 39.6 [Median: 115(80-134)]
Minimum Operative Temperature	28.95 ± 6.0 °C [Median: 29(27-30)]
Intraoperative Intraaortic Balloon Pump	1 (4.34%)

Results are presented as mean (SD), median and interquartile range. Categorical variables were summarized as percentages. CABG - Coronary Artery Bypass Grafting, MAVR - Mechanic Aortic Valve Replacement, MVR - Mitral Valve Replacement, SGI - Supracoronary Graft Implantation.

Table 3. Postoperative results

Postoperative results	Patient n(%)
Hospital mortality	2 (8.69%)
Pneumonia	1 (4.3%)
Congestive Heart Failure	1 (4.3%)
Postoperative complications	10 (43.4%)
Bleeding	3 (13.4%)
Pneumonia	2 (8.6%)
Low output	2 (8.6%)
Cerebrovascular Accident	1 (4.3%)
Pleural effusion	1 (4.3%)
Arrhythmia	1 (4.3%)
Late death	4 (17.3%)
COPD	2 (8.6%)
Stroke	1 (4.3%)
Cardiac Failure	1 (4.3%)
Hospital admission	
(warfarin related)	6 (26%)
Gastrointestinal Tract Bleeding	3 (13.4%)
Hematuria	1 (4.3%)
Gastrointestinal Tract Bleeding and Pleural Effusion	1 (4.3%)
High INR Level	1 (4.3%)
Postoperative NYHA Class I-II	15 (93.75%)
Postoperative NYHA Class III-IV	1 (6.25%)

COPD - Chronic Obstructive Pulmonary Disease, HYHA – New-York Heart Association.

valve size was 23 mm. Two (3.3%) patients had mitral and aortic valve replacement. For the entire group, 8 (34.78%) patients had simultaneous coronary artery bypass grafting (CABG), with a mean of 2.7±0.9 grafts per patient.

The mean bypass time was 117.8±39.6 minutes, the mean cross-clamp time was 94.6 ± 21.2 minutes, and an intraoperative intra aortic balloon pump was required in 1 (4.34%) patient whom coronary artery bypass grafting and AVR was performed due to the low cardiac output syndrome, postoperatively. The overall aortic cross-clamp and cardiopulmonary bypass times were within reasonable expectations for this procedure.

Postoperative Results

The postoperative results are summarized in Table 3. In hospital 30-day mortality (hospital mortality) was 8.69% (2 patients), respectively (Table 4). Significant postoperative complications occurred in 10 patients, with 2 patients experiencing multiple complications. Postoperative bleeding was the most common complication, occurring in 3 patients (13.04%). No complications were observed in 13 (56.52%) patients during their hospital stay.

The mean intensive care unit (ICU) stay for all patients was 1.76±1.14 (1 to 6) days. The mean hospital stay for all patients was 9.33±5.06 (5 to 22) days. Among the 13 patients with no complications, the mean hospital stay was 6.75±1.5 days, which was significantly shorter than the mean hospital stay of patients who had a complicated course (10.9±5.7) (P<0.001).

Follow-up was 100% complete for all 23 hospital survivors at a median of 33 months (1-108 months). During the mean follow-up of 35±3 months, there were 3 late deaths (Table 4). Actuarial survival among hospital survivors was 82% at 1 year, 75% at 3 years and 59% at 5 years (Figure 1). Excluding the late deaths, the other 17 hospital survivors have required a total of 6 (35.2%) hospital (warfarin related complication) admissions (Table 3). These patients were discharged following treatment with no additional complication. During follow up, no complications were observed in 11 (64.7%) patients.

No patient had a late non-fatal complication such as thromboembolic event or prosthetic valve endocarditis. Furthermore, no late reoperation was performed in this group due to valvular dysfunction or for any other reason. All survivors experienced significant improvements in NYHA functional class compared with preoperative values.

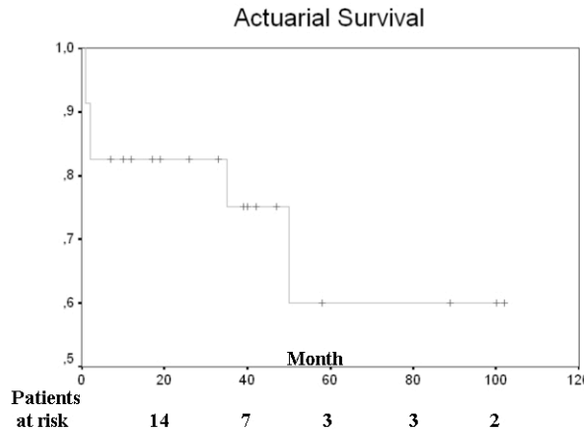


Figure 1. Kaplan-Meier curve for long-term survival for all patients

Table 4. Details of 6 patients who died before the cut off date.

	Age	Sex	Preoperative Risk Factor	Operation	X-Clamp Time (Min)	CPB Time (Min)	ICU Stay (Day)	Hospital Stay (Day)	Cause of Mortality	Time of Mortality	Hospital Mortality
Patient 1	81	M	COPD	AVR	85	117	4	20	COPD and Pneumonia	20 Days	+
Patient 2	81	M	COPD-HT	AVR+MVR	161	191	2	30	CHF	30 Days	+
Patient 3	84	M	HT	AVR	85	117	1	17	Stroke	35 Months	-
Patient 4	81	F	COPD	AVR	66	88	1	5	Sudden Death	50 Months	-
Patient 5	83	F	COPD	AVR+CABG+AAR	108	210	3	62	COPD and Pneumonia	62 Days	-
Patient 6	81	M	DM-CRF	AVR+CABG	50	83	1	5	COPD	65 Days	-

AAR – Ascending Aorta Replacement, AVR - Aortic Valve Replacement, CABG - Coronary Artery Bypass Grafting, CHF – Congestive Heart Failure, COPD - Chronic Obstructive Pulmonary Disease, CPB – Cardio Pulmonary Bypass, CRF – Chronic Renal Failure, DM - Diabetes Mellitus, HT – Hypertension, ICU – Intensive Care Unit, MVR - Mitral Valve Replacement, X-Clamp – Cross-Clamp,

Discussion

With a high prevalence of degenerative aortic stenosis and increasing life expectancy in octogenarians, cardiologists and surgeons will be more frequently confronted with the difficult-to-treat algorithm for this very high-risk patient population. The advent of transfemoral or transapical techniques for aortic valvular implantation is promising as an important adjunct to the treatment of aortic stenosis in those very high-risk patients presenting for surgical therapy. Several studies have shown that AVR in octogenarians can be performed with an acceptable operative mortality and morbidity.(1,2) Bioprostheses in octogenarian are widely accepted and implanted due to freedom of anticoagulant-related adverse events and a low incidence of thromboembolism and valve thrombosis.(2,3) The development of less aggressive techniques than open surgery and increasing life expectancy in octogenarians has restored the surgeon's interest in MAVR and forces us to review study the long-term results in elderly undergoing AVR and to evaluate the results of mechanical valve implants in patients at age 80 and older.

Most elderly people prefer a good quality of life to longer lifespan. Even the very old patient with AVR has shown to benefit from surgery with an improvement in heart symptoms and quality of life.(2) Recently published studies suggest that mechanical valve prostheses are a safe option in elderly patients.(1,4,5) There is a low incidence of thromboembolic complications in patients with well-managed anticoagulant therapy.(6) Several studies claim that when properly managed, elderly patients receiving warfarin appear to have no greater risk for hemorrhagic complications than do younger patients.(1,4-7) A current issue of discussion is whether one could optimize the anticoagulant therapy in elderly using lower doses of warfarin. It was observed during follow-up that 6 (35.2%) patients experienced oral anticoagulation-related complications. No mortality was observed in relation with these complications. Pre-operative functional capacity of the patients was in NYHA class 3-4. The patients' daily activities were quite limited and they depended on other people. During the postoperative period, except one patient with permanent SVO, all patients' effort capacities were in NYHA class 1-2.

Medical management alone is associated with poor outcomes with the large majority of symptomatic patients dying within three years if the structural several aortic stenosis is not treated surgically. This has been more recently shown by Varadarajan and colleagues (8), who have noted a dismal survival for 453 nonsurgically managed patients with severe aortic stenosis with a one-, five-, and ten-year survival of 62%, 32%, and 18%, respectively. Many investigators in recent decades have evaluated the feasibility and efficacy of cardiac surgical intervention in very old age.(2,8,9) Vicchio (2) reported 7.6% mortality rate for 98 octogenarian patients with mechanical heart valve. In some other studies, a mortality rate between 4.2% and 14.7% was reported for octogenarian patients who received AVR. (10,11) Our series had an acceptable rate of hospital mortality, although it was higher than that observed in younger patients. No predicting factor was observed in multivariate analysis. Therefore, we think that not only isolated mechanical AVR, but also combined procedures may be used because 56% of patient group in the present study received combined procedures, which was determined not to be risk factor for mortality.

The actuarial overall survival figures were not significantly worse in the mechanical valve group despite the imposed, and potentially dangerous, anticoagulation therapy. In the Thourani et al. study, survival estimates for this high-risk AVR (92.4% bioprosthesis) group at 1 year were 67%, 60% at 3 years, and 54% at 5 years.(1) Similarly, Thourani and colleagues (7) noted a 68% three-year and 61% five-year survival in 88 octogenarians undergoing isolated AVR (97.7 % bioprosthesis) at one institution. Vicchio and colleagues (2) reported an 91.3±0.03% actuarial survival rate at one year and 88.6±0.03% at three years, 81.6±0.05% at five years in octogenarian isolated mechanic aortic valve. In the present study survival rates for 1-year, 3-year, and 5-year periods were 82%, 75%, and 59%, respectively, for the patients 56.52% of which received combined surgery and mechanical aorta valve replacement.

The length of ICU and hospital stay of the elderly patients is longer than that of younger patients because of the functional capacity and accompanying risk factors of the elderly patients. (12.13) In two previous reports (2,14), the mean hospital stay of octogenarian patients with mechanical aorta valves was found to be 12.8 and 13.7 days, both of which were shown by multivariate analysis to be correlated with CPB duration.

Thourani and colleagues (7) noted a 2-day median ICU stay in 88 octogenarians undergoing isolated AVR at one institution. In the present study, mean ICU stay was found to be 1.76 days and mean hospital stay was found to be 9.33 days. We think that these durations are shorter than the published data because the physiotherapy program that we started to administer right after early postoperative period had a positive impact.

Limitations

The limitations of our study include the possibility of selection bias, the relatively small number of patients with a highly prev-

alent disease. We wanted to compare our patient group with bioprothesis valve replacements,Transcatheter Aortic-Valve Implantation (TAVI) and aortic valve reconstruction whereas in our clinic, we haven't performed enough number of bioprostheses valve replacement or aortic valve reconstruction for comparison. In addition, we don't perform TAVI.

Conclusion

MAVR in octogenarians is a safe procedure even in cases where concomitant additional procedure is performed. Only a few anticoagulant-related complications were reported and this may indicate that selected groups of elderly patients with significant life expectancy may benefit from mechanical implants. These results should serve as a benchmark for evaluating outcomes of aortic bioprosthesis and transcatheter aortic valve implantation.

Competing interests

The authors declare that they have no competing interests.

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