Valve Replacement in Geriatric Patients

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Valve replacement, by a suitable prosthesis, has become one of the common heart operations in the past six years. This procedure is performed on selected patients, with far advanced valvular heart disease, who are considerably incapacitated and whose prognosis without surgical correction is extremely poor. Because of the added risk in older patients, younger patients are usually selected for this procedure. The purpose of this report is to review our experience with valve replacement in patients in the age-group of 60 and above with particular emphasis on operative mortality, post-operative course, and late results. With improvement in the selection of patients, operative technique, and post-operative care, this operation can be safely offered to older patients.

SUBJECTS

Of a total of 650 patients at the University of Oregon Medical School, 91 patients, in the age-group of 60 or above, had valve replacement between January 1962 and January 1968; 56 were between 60 and 64, 28 were between 65 and 69, and 7 were between 70 and 75 years of age. The oldest patient in this series was a 75-year-old man, who is well 3 years after his aortic valve replacement. The Starr-Edwards prosthesis was used in all cases. Aortic valve replacement was done in 63 patients, mitral valve replacement in 15 patients, and multiple valve replacement in 13 patients (Fig. 1).

All patients had significant and progressive symptoms and were in the New York Heart Functional Classification III and IV. The incidence of atrial fibrillation among patients with isolated mitral valve disease was 40 per cent. Those undergoing isolated aortic valve replacement were classified in 3 different groups: (1) slow progressive disease with left ventricular failure; (2) acute pulmonary oedema; (3) emergencies admitted in severe cardiogenic shock with hypotension and oliguria (Fig. 2 and 3).

Haemodynamic studies with right and left heart catheterization were performed in most patients before operation. Selective coronary arteriography proved extremely helpful in selecting the cases for operation. In a small group of patients the symptoms were mainly due to far advanced coronary artery disease, and the valvular lesions were an incidental finding.

OPERATIVE FINDINGS

Of the patients with isolated aortic valve disease, 86 per cent had a congenital lesion, and here the valve leaflets were thickened and heavily calcified without any evidence of rheumatic valvulitis; 8 per cent had aortic root disease; and 6 per cent had rheumatic disease. Of the patients with isolated mitral valve disease, 50 per cent had a dilated annulus with normal looking leaflets and stretched chordae, the chordae being torn in 2 instances; pure mitral regurgitation with a short history of illness with rapid progression characterized this group; they were mostly in sinus rhythm; the left atrium was not enlarged and the replacement was relatively difficult. The remaining 50 per cent had mixed lesions of rheumatic aetiology. All multiple valve cases were probably rheumatic in origin (Table I).

OPERATIVE TECHNIQUE

A standard operative technique, as previously described (Starr and Edwards, 1961; Starr *et al.*, 1963, 1964; Starr, Herr, and Wood, 1966), was employed in all cases. The heart was exposed through a median sternotomy, and myocardial relaxation was achieved by cross-clamping the aorta. Coronary arteries were perfused intermittently with cold blood; more recently blood at 30°C. has been used to perfuse the heart. All valves were thoroughly examined at the time of operation; and great care was taken not to leave any significant valve defect uncorrected—this was considered very important in

Received September 27, 1968.

FIG. 1.—Valve replacement in geriatric patients.

this group of cases. Atrial and ventricular pace-maker wires were implanted in all patients who had this operation performed within the past 2 years (Friesen *et al.*, 1968). An elective tracheostomy was done in 80 per cent of the patients to assist breathing with the help of a respirator. Indications consisted of severe cardiomegaly, pulmonary hypertension, cachexia, and chronic lung disease (Starr, Herr, and Wood, 1967).

FIG. 2a.—A 66-year-old patient with pulmonary oedema who had severe aortic stenosis and low cardiac output.

Findings	Per cent
Aortic valve disease	
Calcific aortic stenosis	86
Aortic root disease	8
Rheumatic	6
Mitral valve disease	
Mixed rheumatic	50
Pure mitral regurgitation (dilated annulus)	50
Multiple valve disease	
Rheumatic	100

OPERATIVE MORTALITY

There were 16 operative deaths in 91 patients who underwent operations in this age-group, an over-all incidence of 17.5 per cent. There were 12 operative deaths out of 63 aortic valve replacements, an incidence of 19 per cent; 2 operative deaths out of 15 mitral valve replacements, an incidence of 13 per cent; and 2 operative deaths out of 13 multiple valve replacements, an incidence of 15 per cent (Table II).

Most of these fatal complications were experienced during the initial years of valve replacement surgery. Table III clearly shows the progressive reduction in the operative mortality over the past two years. There was only 1 operative death out of 31 valve replacements in 1967. This was mainly attributed to improvement in surgical skill and post-

FIG. 2b.—The same patient as Fig. 2a after emergency aortic replacement with complete clearance of the pulmonary oedema.

FIG. 3.—(a) A 62-year-old patient with aortic valve disease; (b) the same patient six months later admitted to the hospital in left ventricular failure; and (c) after emergency aortic valve replacement showing clearance of the lung field and the absence of pleural effusion.

operative management. Table IV shows the incidence of early and late mortality and the causes of death in the different types of valve replacement.

POST-OPERATIVE CARE

The post-operative course was benign in the majority of the patients. Rhythm disturbance and low cardiac output were the major problems: 9 patients developed a rhythm disturbance and 4 of them died as a result of ventricular fibrillation; low cardiac output was encountered in 15 patients and in 5 it was irreversible and proved fatal. None of the patients in this group developed myocardial infarction, which suggests that this post-operative complication may not be as prevalent in the older patients as might be expected. Use of positive pressure breathing through an elective tracheostomy, adequate potassium replacement, and maintenance of heart rate sufficiently fast to suppress an irritable ventricle with the use of atrial or ventricular

pacemaker have considerably reduced the incidence of post-operative complications and death (Friesen *et al.*, 1968; Woodson, Friesen, and Starr, 1968).

LATE MORTALITY

The over-all incidence of late deaths in this series of 91 patients was 10 per cent; 6 per cent for aortic valve replacement, 7 per cent for multiple valve replacement, and none for mitral valve replacement. In 2 out of the total of 9 late deaths, the cause was not related to heart surgery: 1 died of severe head injury in a road traffic accident, and another succumbed to Mallory Weiss syndrome.

LATE RESULTS

Out of the total of 91 patients, 65 were alive at the time of our last follow-up in January 1968, a survival rate of approximately 72 per cent. Of those surviving, 70 per cent are normally active,

TABLE II
OPERATIVE MORTALITY

Replacement	No. of patients	Operative deaths	Mortality (%)
Aortic	63	12	19
Mitral	15	2	13
Multiple	13	2	15
Totals	91	16	17

TABLE III
NUMBER OF OPERATIVE DEATHS AND MORTALITY PER CENT

Year	No. of patients	Operative deaths	Mortality (%)
1962	1	1	—
1963	2	1	50
1964	12	2	17
1965	17	5	29
1966	28	6	21
1967	31	1	3
Totals	91	16	18

TABLE IVA
MITRAL VALVE REPLACEMENT:
CAUSE OF OPERATIVE DEATHS

Cause of operative death	15 Patients
Dissecting aneurysm	1
Low output	1
Total operative deaths	2 (13%)

Note: No late deaths.

TABLE IVB
AORTIC VALVE REPLACEMENT

Cause of operative deaths	63 patients	Cause of late deaths	63 patients
Arrhythmia	2	Coronary artery embolus	1
Aortic dissection	2	Carotid artery embolus	1
Cerebrovascular accident	3	Road traffic accident	1
Damage to coronary artery	1	Rhythm disturbance	1
Low output	2	Mallory Weiss syndrome	1
Bleeding	1	No necropsy	1
Massive intestinal infarction	1		
Total operative deaths	12 (19%)	Total late deaths	6 (9%)

TABLE IVC
MULTIPLE VALVE REPLACEMENT

Cause of operative deaths	13 patients	Cause of late deaths	13 patients
Low output	2	Pacemaker failure	1
		Thrombo-embolism	2
Total operative deaths	2 (15%)	Total late deaths	3 (7%)

free of all cardiac symptoms, and taking a regular diet. Post-operative x-rays showed a dramatic reduction in heart size. Twenty per cent have had mild restriction of exercise ability, but are considerably improved and can be managed without salt restriction or diuretic medication. In 10 per cent of the patients the results of operation were not striking: patients in this group required supportive measures like salt restriction and diuretics, and chest x-rays showed a persistence of cardiac enlargement.

One patient was re-operated for ball variance. Another patient had to be re-operated for tricuspid valve replacement one year after her mitral valve replacement. At the time of her first operation the tricuspid valve had significant regurgitation—nothing was done at that time in the belief that the leak would regress in due course (Starr *et al.*, 1966)

DISCUSSION

The result of valve replacement in patients at the age of 60 and above is encouraging. This study

shows that age should not be a contraindication to valve replacement; however, the patients in this group require careful pre-operative assessment. The mechanical severity of the valve lesion must be established first, and selective coronary arteriograms are important in deciding whether a patient should undergo an operation, especially in the presence of a long history of angina.

The operative and late mortalities of 17.5 per cent and 10 per cent respectively are in the same range as that of patients in the younger age-group. Positive pressure breathing and cardiac pacing are life saving in older patients.

The high operative mortality of 19 per cent in aortic valve replacement may be attributed to aortic atherosclerosis. Two patients died after aortic dissection, and one patient bled to death from his aortotomy. The aorta must be handled very gently and the aortotomy should be closed with strips of Teflon on either side. Multiplicity of valve replacement does not increase the risk of operation. The operative mortality for multiple valve replacement (13%) was lower than the over-all mortality of 17.5 per cent. The late result is gratifying, with a survival rate of 72 per cent. Of those patients surviving the operation, 90 per cent are symptom free and are able to look after themselves; 50 per cent of the late survivors are alive more than 2 years after operation. The most common fatal complication in this series, as in younger age-group, is thrombo-embolism which has been responsible for 4 out of 16 early deaths and 6 out of 7 late deaths, but with the improvement in the design of the prosthesis there has been a remarkable reduction in the incidence of thrombo-embolic complications (Starr *et al.*, 1967; Herr *et al.*, 1968; Starr, Herr, and Wood, 1968).

SUMMARY

Ninety-one patients underwent valve replacement for acquired valve disease at the age of 60 and above from January 1962 to January 1968. The operative and late mortalities were 17.5 per cent and 10 per cent, respectively. The survival rate was 72 per cent. Of the patients who are still alive, 90 per cent have shown clinical and haemodynamic improvement.

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