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CLINICAL FINDINGS AND RETURN TO WORK AFTER HEART VALVE REPLACEMENT

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ABSTRACT. One hundred and thirteen patients operated during the years 1971 to 1976, were re-examined at an average of 26.3 months after heart valve replacement. The functional capacity assessed by the NYHA-classification improved in about 40 % of the patients. About 80 % considered their symptoms and well-being to have improved after the operation. At the re-examination, heart size was most often enlarged in patients with mitral valve replacement. The average work load measured in bicycle ergometer test was higher in patients with aortic valve replacement compared to those with mitral valve replacement. Patients with aortic valve replacements were working more often (54 %) than those with mitral valve replacements (37 %). The mean age of patients who were working was significantly lower than in patients who were retired. There was a statistically significant relation between the physical working capacity and the working status. The employability assessed by history and clinical findings corresponded well to the actual work situation in individual patients.

Key words: Heart valve prosthesis, work capacity evaluation, exercise test, follow-up studies

Various aspects of the after-effects of heart valve replacement have been investigated in several centres. The clinical and haemodynamic state has been shown to improve considerably (3, 4, 6, 7, 10, 14, 15, 16). Rate of return to work has varied between rather low (44 %) to excellent (88 %) (3, 7, 8, 11, 13). The number of patients returning to work has been shown to be closely associated with the duration of sick leave before the operation (2, 3, 8, 11, 13). As might be expected the age of patients has been shown to be directly associated with return to work (10), while sex seems to have no effect (13). Neither do haemodynamic parametres appear to have any decisive importance.

This study aimed at investigating the long-term results of aortic and mitral valve replacement with special emphasis on working status after the operation.

MATERIAL AND METHODS

Between the years 1971 to 1976, 131 heart valve replacements using Björk-Shiley disc valves were performed at the University Central Hospital in Turku. These operations involved 81 patients with aortic valve replacement (AVR), 43 patients with mitral valve replacement (MVR) and 6 patients with combined mitral and aortic valve replacement (AVR+MVR). A coronary artery by-pass operation was performed as an additional procedure on 3 patients with AVR. The patients were followed up after the operation at the hospital outpatient department.

One hundred and thirteen patients (90 % of the total material) were re-examined by an internist at the Rehabilitation Research Centre of the Social Insurance Institution at an average of 26.3 months (9–66 months) after the operation. The follow-up period was somewhat shorter for men (24.5 months) than for women (29.3 months) (Table I). About 60 % of the patients came from an urban area.

Two of the 18 patients who were not re-examined had died. 5 patients could not be re-examined because of other diseases and 11 patients, although alive, could not be contacted personally.

The patients were interviewed with regard to their symptoms, need for rehabilitation, use of medication, functional capacity (using the NYHA classification) and working status before the operation and at present. In addition to a clinical examination, a series of laboratory and functional tests were performed.

ECG was classified according to the Minnesota Code (12). Systolic time intervals (QS2, PEP, and LVET) were measured according to methods described earlier (17).

Heart volume was determined according to Keates and Enge (5). The symptom limited or subjectively maximal exercise test was performed sitting on a bicycle ergometer (Elema E369) using the triangular method (1). The exercise test was not performed in 14 patients because of unwillingness to participate, other mainly locomotor diseases, implanted pacemaker or poor general condition.

The FVC and FEV1 were measured according to conventional methods (Godart, Expirograf).

Clinical findings and results of laboratory tests were used to assess the patients' employability in their ordinary work and this assessment was compared blindly with the patients' working status at the time of re-examination.

Table I. *Mean age and duration of follow-up in patients with aortic valve replacement (AVR), mitral valve replacement (MVR) and combined aortic and mitral valve replacement (AVR+MVR)*

	Men	Women	Total	Mean age	SD	Average time of follow-up (months)
AVR	52	17	69	47.4	±10.5	26.7±10.2
MVR	13	25	38	48.9	± 9.5	26.2±14.3
AVR+MVR	5	1	6	49.6	± 8.3	23.5±18.9

RESULTS

Symptoms and clinical findings

Before the operation, 40% of the patients were included within NYHA I and NYHA II, compared to 54% after the operation (Table II).

54 patients (78%) with AVR, 31 patients (82%) with MVR and 4 out of 6 patients with combined AVR + MVR considered their symptoms and well-being to have improved after the operation. Only a few patients (2.7%) expressed the need for institutionalized rehabilitation after the operation.

All patients were on anticoagulant drugs. Patients with MVR used more often beta blockers, antiarrhythmic drugs or diuretics, while there was no difference between the groups as regards the use of digitalis.

Atrial fibrillation was recorded in 31 patients (27%) before the operation. The majority, or 26 patients, were among those with MVR. At the re-examination 21 patients had atrial fibrillation. A permanent pacemaker had been implanted in 5 patients. Although there was no history of myocardial infarction in any of the patients, 18 patients had a pathologic Q-wave (Minnesota code 1.1 and 1.2).

Table II. *Pre- and postoperative distribution of patients in New York Heart Association (NYHA) classes*

(AVR = aortic valve replacement)
(MVR = mitral valve replacement)

	AVR		MVR		AVR+MVR	
NYHA class	Pre-operative	Post-operative	Pre-operative	Post-operative	Pre-operative	Post-operative
I	7	19	–	3	–	1
II	30	25	6	11	1	2
III	25	24	25	19	4	3
IV	7	1	7	5	1	–

The majority of these patients belonged to the group with AVR.

The average heart size in women was 533±159 cm^3/m^2. Heart size was significantly smaller in women with AVR (474±132 cm^3/m^2) than in those with MVR (589±168 cm^3/m^2, $p<0.05$).

In men, the average heart size was 541±140 cm^3/m^2). In men with AVR the heart volume was 506±92 cm^3/m^2) and in those with MVR 618±200 cm^3/m^2 (NS).

In the group with combined AVR+MVR the average heart volume was 709±204.5 cm^3/m^2.

As a different X-ray examination procedure was used before the operation, no comparison with pre-operative values could be made.

The heart was considered enlarged if its volume exceeded 450 cm^3/m^2 in women and 500 cm^3/m^2 in men. According to these criteria, heart size was most often enlarged in patients with MVR (Table III).

Functional capacity measurements

The average work loads during the last minute of exercise were similar in women with MVR and AVR who were in sinus rhythm. In men, the average work load during the last minute was significantly higher in patients with AVR than in those with MVR ($p<0.05$) (Table IV).

There was no significant difference between the values recorded in patients with sinus rhythm or atrial fibrillation in the group with MVR. Statistical treatment of data was not possible in other groups due to the small number of patients with atrial fibrillation.

The physical working capacity values calculated as percentages of the age and weight corrected reference values (1) did not show significant differences between the various groups (Fig. 1).

Arrhythmias, mainly ventricular ectopic beats during the exercise test were seen in 63 patients

Table III. *Distribution of patients with normal or enlarged heart in different operative groups at re-examination*

	AVR		MVR		AVR+MVR		Total	
Heart volume	*N*	%	*N*	%	*N*	%	*N*	%
Normal	36	52	9	24	1	17	46	41
Enlarged	33	48	29	76	5	83	67	59

(64%). The ectopic beats were complex (multiform, bigeminia, paired or early) in 22 patients. In 7 patients, the number of ectopic beats increased with the increasing load and in 4 patients the exercise test had to be interrupted.

The PEP/LVET was calculated for 72 patients. In patients with AVR this index was 0.431±0.1 and in those with MVR 0.409±0.1. This difference was not statistically significant. A pathologic index (more than 0.425) was seen in 25 patients (48%) with AVR, in 7 patients (39%) with MVR and in both patients examined with combined AVR+MVR. The ventilatory capacity was reduced (vital capacity less than 70% or one-second forced expiratory volume less than 60% of the reference value) in 9 patients.

Working status

Eighty-nine patients were either working or on a few months' sick leave before the operation (Fig. 2). At the re-examination 36 of them (40%) were retired. The majority of patients who were working had returned to their pre-operative job. Only 2 patients had changed their job from heavy to light work. It is to be noted that only 2 patients out of those retired before the operation returned to work.

Patients with AVR were working more often (54%) than those with MVR (37%). The number of patients with combined AVR and MVR was too small for any statistical calculations.

The mean age of patients who were working was 43.6±9.0 years compared to those who were retired, 51.6±9.1 years ($p<0.001$). This difference was seen in patients with AVR as well as in those with MVR and combined AVR and MVR.

Two thirds of patients with good anamnestic functional capacity (NYHA classes I to II) were working in contrast to 15% of patients belonging to NYHA III to IV ($p<0.001$) (Fig. 3).

The patients were divided into 5 groups according to the work load during the last 4 minutes of exercise (Fig. 4). There was a statistically significant relation between the physical working capacity and the working status ($p<0.01$).

Heart size and working status were not found to be significantly associated. Neither was there any

Table IV. *The average work loads in Watts (W) during the last minute of exercise in women and men with sinus rhythm or atrial fibrillation in different groups*

	Average work loads (W) during last minute of exercise					
	Sinus rhythm			Atrial fibrillation		
	N	$\bar{X}$	SD	*N*	$\bar{X}$	SD
Women						
AVR	14	79	±33.6	1	20	
MVR	10	85	±29.9	11	68	±28.6
AVR+MVR	–	–	–	1	20	
Men						
AVR	45	138	±41.6*	1	100	
MVR	10	95	±42.2*	1	50	
AVR+MVR	2	150		3	80	±20.0

* $p<0.05$.

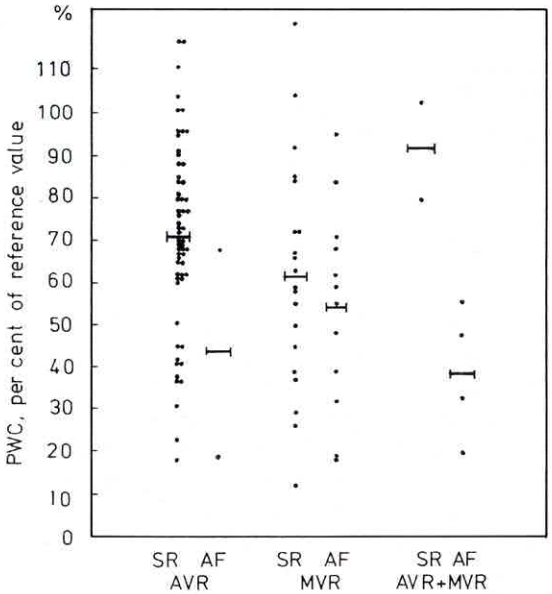

Fig. 1. Physical working capacity (PWC) expressed as percentage of the reference values in patients with sinus rhythm (SR) and atrial fibrillation (AF) in different operative groups. The differences are non-significant.

significant relation between the systolic time intervals and working status.

Relationship of assessed employability to actual employment

The employability of the patients in light, moderately heavy or heavy work was assessed by history (NYHA classification) and clinical findings (exercise test, X-ray and ECG). The result of this assessment was compared wtih the actual work situation, which was not known for the physician assessing the employability. It appeared that the assessment based on history and clinical findings corresponded well to the actual work situation in individual patients (Fig. 5).

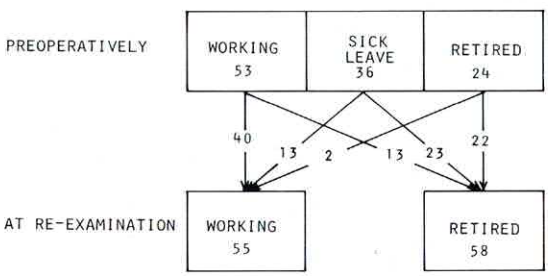

Fig. 2. Development of working status of all patients re-examined.

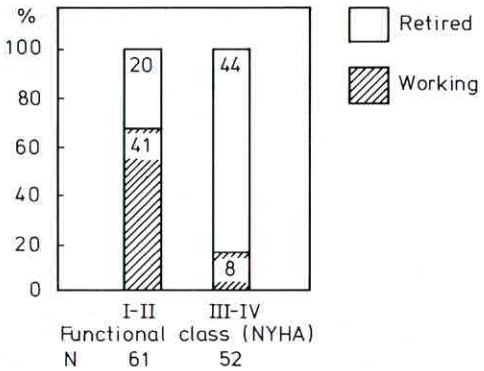

Fig. 3. Relation of functional class (NYHA classification) to working status at re-examination. Numbers of patients retired or working are shown in the columns.

In 12 patients assessed fit enough to be working but who were retired, the following reasons for not working were found: 3 patients were retired because of diseases not connected with heart valve replacement and 6 patients were retired because of age. One patient was undergoing re-schooling for a new job. For 2 housewives no clear reason for retirement was found.

Four patients among those assessed as unfit for work were actually working. One of them was clearly in need of re-schooling for a physically less demanding occupation.

DISCUSSION

The patient material in the study was rather heterogenous as regards the severity of the disease at the time of operation. Many patients had advanced disease of the myocardium. Since the study was not planned as a prospective one, but merely a cross-sectional follow-up examination, it was not possible to compare all findings at the re-examination to those obtained preoperatively. The main emphasis was therefore on studying clinical findings and aspects of return to work after the operation.

79% of all subjects experienced subjective improvement after the operation. 54% of the patients were classified in NYHA classes I and II. This percentage is smaller than that reported in some other studies (7, 11).

Return to work has varied considerably in different studies (3, 7, 8, 11). This study showed a rather

modest rate of return to work, as only 49% of patients were working at the time of re-examination.

Only 2 of the 24 patients who were retired before the operation returned to work. This corresponds well with results of a previous study (7). It appears that heart valve replacement cannot be expected to result in return to work in patients retired before the operation, apparently because of the advanced stage of the disease.

The highest percentage of patients working after the operation was among those who were working until the operation. The percentage was clearly lower in those who were on sick leave preoperatively. From the point of view of returning to work after heart valve replacement, it seems important to operate on patients at an early stage of the disease before any sick leave becomes necessary.

The most important single factor predicting return to work has been revealed as the duration of sick leave or retirement before the operation (2, 3, 8, 11). Data about the duration of the preoperative sick leave were not available in this study. It was, however, discovered that out of 36 patients who were on sick leave before the operation only 13 returned to work. This may be taken as an indication of a rather advanced cardiac disease necessitating sick leave, or the untoward effect of the sick leave on the attitudes of the patient. The former explanation is supported by findings at the re-examination, which showed that return to work was low in patients belonging to NYHA classes III and IV and in those with poor physical working capacity, measured in an exercise test. Age, as well, was

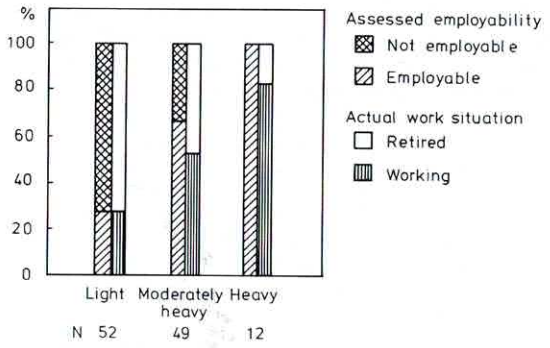

Fig. 5. Assessed employability and actual work situation at re-examination in patients.

significantly related to return to work both in patients with MVR and in those with AVR. No relation between sex and return to work was found in this material.

Being employed was closely related to the assessed employability based on clinical findings and functional tests. This indicates that medical aspects had been the decisive ones in determining the patients' ability to work. There were only a few patients requiring additional examinations to determine their ability to work. Only two patients were found to be in need of vocational retraining.

The majority of the patients did not consider any institutionalized rehabilitation measures to be required after the operation. In spite of these opinions, it would be interesting to study the effects of an active rehabilitation period started promptly after the operation. The results have been shown to be positive e.g. in patients after myocardial infarction (9).

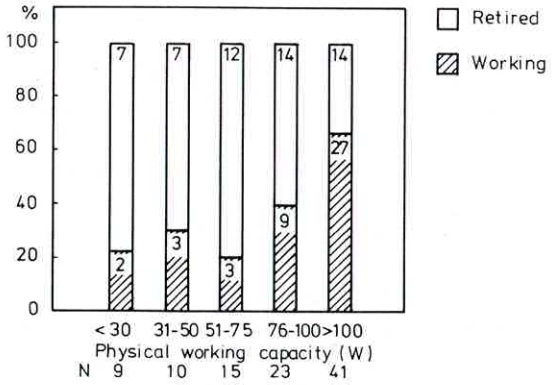

Fig. 4. Physical working capacity in Watts (W) related to working status at re-examination. Numbers of patients retired or working are shown in the columns.

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