

LONG-TERM EFFECTS OF HEART TRANSPLANTATION: THE GAP BETWEEN PHYSICAL PERFORMANCE AND EMOTIONAL WELL-BEING

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ABSTRACT. The purpose of our study was to assess physical and emotional factors in heart transplant patients. A prospective design was used to compare patients' physical symptoms, emotional complaints, and restrictions at admission to the waiting list, immediately after, and 1 and 5 years after heart transplantation. Thirty-three patients were included (30 male, 3 female) in the study. Their mean age at admission was 48 ± 10.2 years. Of these, 23 suffered from cardiomyopathy, 8 from coronary heart disease, and 2 from valvular insufficiency. At admission, the patients suffered from symptoms of cardiac insufficiency, and were restricted in sports, gardening, hobbies, sexual life, job, food-intake, and mobility. More than three-fourths rated their physical and emotional status as moderate to poor. Emotionally, they suffered from irritability, restlessness, depression, psychic lability, lowered drive, lack of social contact, low self-esteem, and anxiety. At the end of rehabilitation (4–8 weeks after the operation), all physical and emotional complaints, as well as restrictions had significantly decreased ($p < 0.0001$ to $p < 0.001$), except for trembling, numbness of hands/feet, and food-intake. One year postoperatively, patients reported even fewer physical complaints ($p < 0.01$). Three-fourths rated their physical and emotional status good or excellent. Five years postoperatively—in contrast to physical status, restrictions, and physical complaints—the emotional complaints had increased significantly ($p < 0.0001$). Patients reported excellent physical performance up to 5 years postoperatively. On the other hand, the study revealed that their emotional well-being had significantly deteriorated from 1 to 5 years postoperatively. Attention should, therefore, not only be paid to the good physical health of the survivors, but also to the worsening of their emotional status.

Key words: Heart transplantation; prospective study; emotional and physical complaints; restrictions; 5-year follow-up.

INTRODUCTION

Survival is a necessary but insufficient condition for evaluating transplantation as therapy for advanced organ failure. The quality of survival is equally important. So far, several studies—some of them with a prospective design (3, 6), most of them with retrospective design—about quality of life after heart transplantation have been published. Patient data were collected from interviews (4) or from questionnaires they had been sent. Most of the studies were performed in the USA (9, 14). Only a few were carried out in German-speaking countries (5). While some of them have focused on physical health (14, 17), others have dealt with psychological adjustment (8) or psycho-social status (for additional literature, see end of article).

Almost all the long-term studies that have been conducted to date used a retrospective, cross-sectional design with follow-ups ranging from 0.5 to 9.1 years.

Only a minority of the prospective studies conducted have an observation period exceeding 1 year: Caine et al. (6) interviewed patients immediately after acceptance to the waiting list, at 3 monthly intervals prior to heart transplantation, and at 3 months, 6 months, 1 year, and thereafter at 6 monthly intervals following surgery up to 6 years postoperatively. Highly significant improvements in general health status were evident which did not decrease over time. Their results demonstrate that heart transplantation is effective in restoring patients to a level of general health status comparable to the general population. Fisher et al. (9) examined changes in health-related quality of life and depression in 32 heart transplant recipients prior to and up to 60 months after heart transplantation using the Sickness-Impact Profile and the Beck Depression Inventory. Their results support those of Caine et al. (6): Neither long-term deterioration in quality of life nor worsening of depression was observed over 5 years, but problems remained in the patients' return to work. Chacko et al. (7) investigated

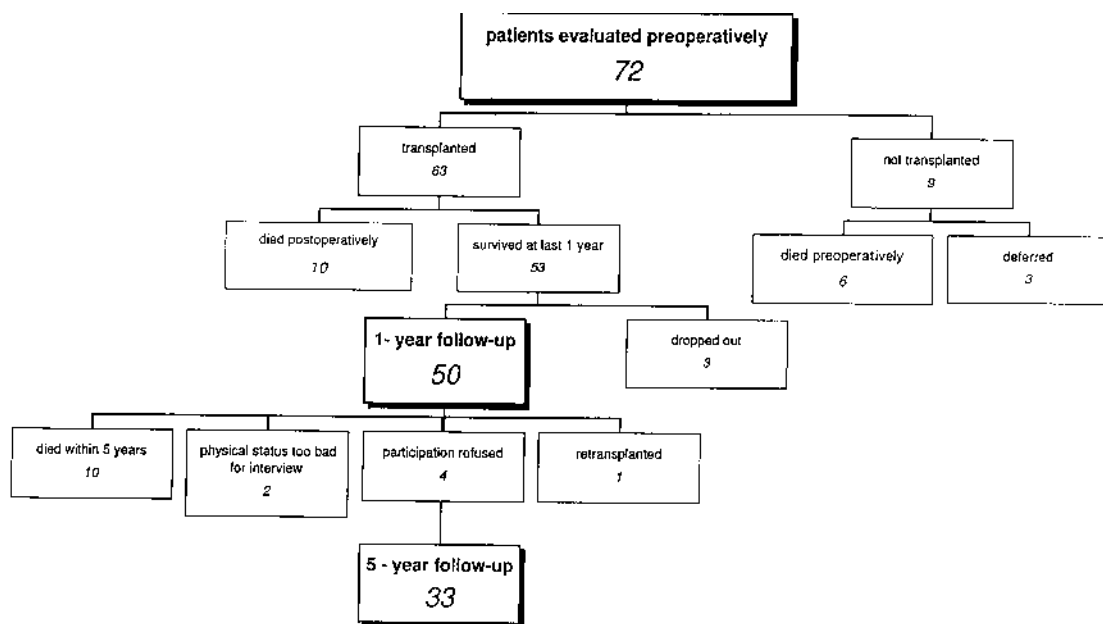


Fig. 1. Recruitment of the sample.

prospectively the relation between pre-transplant assessment of psychiatric diagnoses, coping skills, social support and outcome measures of survival and health care utilization. Follow-up ranged from 9 to 56 months after surgery. Coping and social support were the best significant predictors of survival. Molzahn et al. (15), most recently, investigated quality of life in 42 patients up to 5 years after transplantation. Various indices of quality of life, measured by the Index of Well-being, Cantril's Self-Anchoring Striving Scale and the time-tradeoff technique, were found to be considerably higher after transplantation than beforehand. Most of the variables remained high over the 5-year study period and compared favorably with the norm of the general population. On the other hand, quality of life data remained low in those patients who did not receive a transplant.

The present study was designed to combine the attempts of all former studies mentioned above: a prospective study design, an observational period of at least 5 years, and a study group consisting of Caucasian patients representative for an European population.

The purpose of the evaluation was to follow the patients for the defined 5-year period to assess the same parameters over a longer period of time. Bearing in mind the good first-year symptom scores of other studies, it was interesting to investigate whether these results could eventually be sustained or improved, or whether they

would tend to deteriorate over a longer period of time. In the discussion section, our results will be compared to the study results of other countries.

PATIENTS AND METHODS

Patients

Between 1989 and 1990, there were 72 patients referred for assessment to the Vienna heart transplant center. Transplantation was performed in 63 patients. The 10 deaths within the first postoperative year were assigned to well-known early causes of death: early graft failure, acute rejection and infection. One year postoperatively, the data of the 50 patients who had agreed to contribute to the study were recorded. In the course of the next 4 years, another 10 patients died. Fig. 1 presents the sample. The characteristics of these non-survivors in the long run are given in Table I. Thirty-three patients (33 of 50, 66%) who have lived 5 years with the same graft provided the basis for the 5-year follow-up.

Patients were primarily male (30 out of 33, 91%) with an average age at the time of admission to the waiting list of 48 ± 10.2 years (range 25–67 years). Nine patients (27%) were still working when referred to the waiting list, 12 patients (36%) were on sick leave for more than 6 months, and another 12 patients (36%) were retired. Pre-transplant cardiac diagnosis and indication for heart transplantation was dilated cardiomyopathy in 23 patients (20 men, 3 women, 70%), coronary heart disease in 8 (all male, 24%) and valvular insufficiency in 2 patients (male, 6%). The mean level of education was 11.8 ± 3.2 years (ranging from 8 to 19 years). The waiting time for the transplant ranged from 1 day up to 315 days (mean 182 ± 52.2 days). Postoperatively, all patients received triple-immunosuppressive therapy with cyclosporine, prednisone, and azathioprine.

Table I. The characteristics of non-survivors (dil. CMP = dilated cardiomyopathy, CAD = coronary artery disease)

Patient (age at Tx)	Indication for Tx	Survival	Cause of death
(1) 17 years	dil. CMP	4 years 2 months	Late acute rejection
(2) 50 years	CAD	4 years 8 months	Pneumonia (paraplegia after car accident)
(3) 56 years	CAD	4 years	Urinary bladder cancer
(4) 57 years	dil. CMP	2 years	Pancreatic cancer
(5) 55 years	dil. CMP	3 years 5 months	Late acute rejection
(6) 64 years	dil. CMP	2 years 2 months	Lung cancer
(7) 49 years	CAD	5 years 4 months	Lymphoma (post renal Tx)
(8) 39 years	dil. CMP	2 years	Colon cancer
(9) 55 years	dil. CMP	3 years 1 month	Hepatic failure (toxic?)
(10) 59 years	dil. CMP	4 years 10 months	Gastrointestinal bleeding

Methods

The patients were asked to assess physical performance and emotional well-being from their subjective point of view at four significant points of time: 1) when they were admitted to the waiting list, 2) at the end of rehabilitation period (the day before the patients were discharged and went home, about 8 weeks postoperatively), 3) 1 year postoperatively, and 4) 5 years postoperatively.

It should be mentioned that the length of hospital stay after heart transplantation varies in different countries. Whereas in the US it is reported to be usually less than 2 weeks, in our transplant center at Vienna it is much longer. Patients—at the beginning of the study as well as to date—are kept in hospital usually until the third routine biopsy (which is scheduled at the

end of the 3rd week after the operation). Afterwards, all patients enter 28 day in-hospital rehabilitation before returning home. Of our sample, only 3 patients had to stay in the surgical department more than 4 weeks because of problems in the postoperative run. The second investigation was therefore done at 64, 69, and 84 days after the operation and not at days 52 to 56 as usual.

We asked patients in detail to report on presence/absence of (a) physical complaints, (b) emotional complaints, (c) restrictions due to the disease, (d) ratings of the present physical status, and (e) ratings of the present emotional status. Statements about the physical and emotional states were assessed in a 5-step Likert rating scale (cf. Figs 4 and 6).

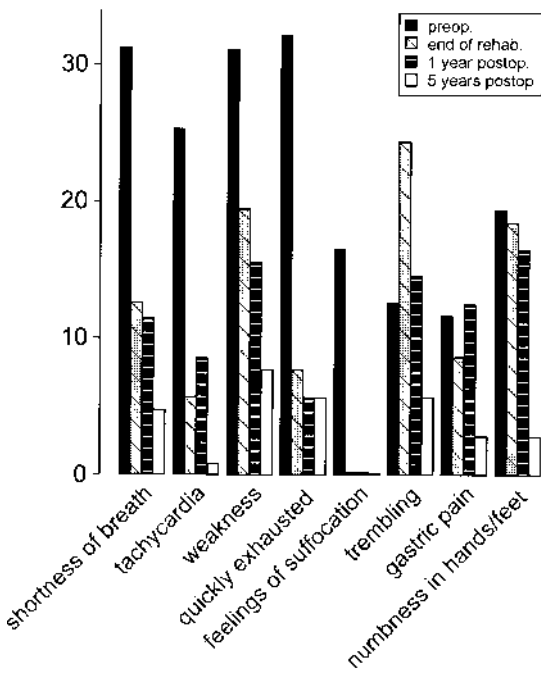


Fig. 2. Physical complaints before surgery, at end of the rehabilitation period, 1 year and 5 years after heart transplantation, identified by the patients (frequencies).

Pilot study

To define the different physical and emotional complaints as well as restrictions a pilot study with another patient group of 50 patients was performed beforehand. There, the most frequently (in more than 50% of the patients) stated physical complaints and restrictions were identified so that those elements could be compiled into eight different categories: shortness of breath, tachycardia, weakness, suffocation, trembling, gastric pain, and numbness of hands/feet. Restrictions were found in sports, gardening, hobbies, sexual life, job, food-intake, and mobility.

The patients assess their emotional well-being by describing what they feel in a defined situation (e.g. about irritability: Did you realize that you get upset more quickly about peanuts? that you criticize your next-of-kin more often? that you react more aggressively to certain situations than you used to?). This questionnaire is only available in German.

Adaptation for the present study

After the patients were interviewed, they were helped to fill in the questionnaires. This was performed by the same interviewer and usually lasted half an hour. The same procedure was completed before and up to 1 year after surgery. At the 5-year follow-up, the well-known questionnaires were mailed to the patients after they were telephoned to make sure of their participation. All patients returned the completed questionnaire. Questionnaires were mailed because patients in Austria have their transplantation done in Vienna but treatment and follow-up after the first postoperative year are usually performed at the regional centers.

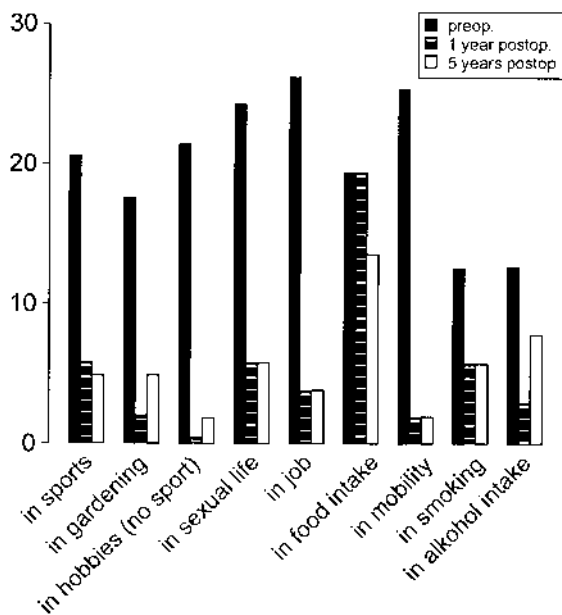


Fig. 3. Restrictions of patients due to their disease, identified by the patients (frequencies).

Statistics

Besides descriptive statistics, the differences between the four time points were assessed using Friedman's analysis of variance. To discern statistical differences between the various time points, the Kruskal-Wallis H-test was done. The calculated values were controlled by a pairwise Mann-Whitney U-test. Significance was set at $p < 0.01$ to reduce the risk of Type I error of multiple comparisons.

RESULTS

1. Physical status

Fig. 2 shows the physical complaints identified by the

patients before surgery, at the end of the rehabilitation period, 1 year and 5 years after heart transplantation. *Before the transplantation* (at the time when the patients were put on the waiting list) all the symptoms of chronic cardiac failure are of prime importance: shortness of breath as the oedema blocks the airways, then tachycardia, weakness and rapid exhaustion, that is, the drop in performance as the pumping function of the heart is impaired. *During the first postoperative year* there is significantly less physical discomfort, especially shortness of breath ($\chi^2 = 29.2, p = 0.0000$) tachycardia ($\chi^2 = 25.7, p = 0.0000$), weakness ($\chi^2 = 21.8, p = 0.0001$), and exhaustion ($\chi^2 = 38.0, p = 0.0000$). None of the patients complained of suffocation ($\chi^2 = 15.8, p = 0.0013$) postoperatively. In contrast, there is no significant difference in gastric pain ($\chi^2 = 4.4, p = 0.2200$). Whereas paraesthesia (numbness in hands and feet) worsened significantly ($\chi^2 = 13.7, p = 0.0033$) and trembling as a sign of central nervous system side effect of cyclosporine significantly increased until the end of the first year ($\chi^2 = 13.4, p = 0.0003$). *Five years postoperatively*, all complaints which were still present toward the end of the first year had improved, and there were no feelings of suffocation, just as by the end of the first postoperative year. There was no significant difference between the variables from 1 to 5 years postoperatively except for diminution of gastric pain, which is an understandable side effect of medication ($\chi^2 = 9.3, p = 0.0047$).

Fig. 3 shows restrictions of patients due to their disease, as perceived by the patients. Only changes 1 and 5 years after transplantation are shown as no statements could be made before the end of rehabilitation.

Pre-operative restrictions mostly apply to mobility, job, sexual life, food intake, hobbies, and gardening. Less than 50% of the patients felt restricted in their

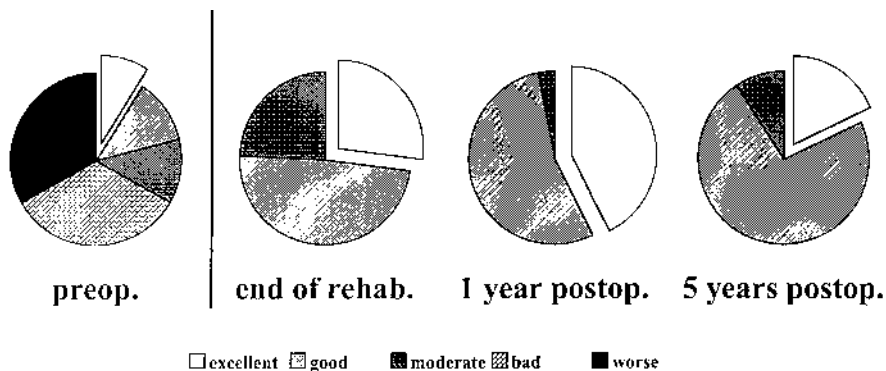


Fig. 4. Self-ratings of physical status of patients (5-step Likert-scale ratings).

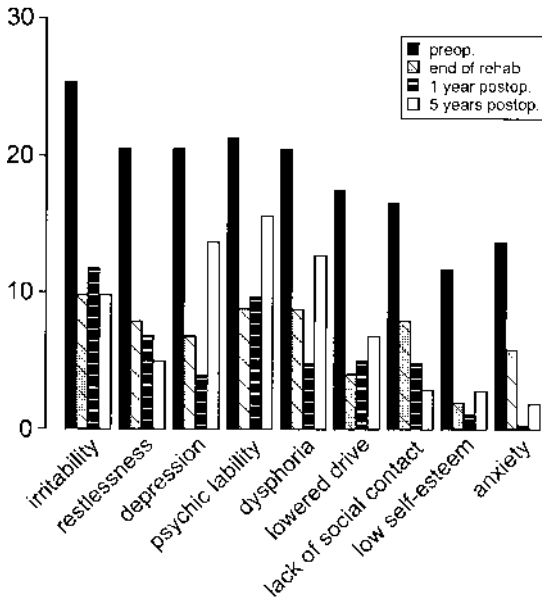


Fig. 5. Emotional complaints before surgery, at end of the rehabilitation period, 1 year and 5 years after heart transplantation, identified by the patients (frequencies).

smoking habits or alcohol intake. *One year postoperatively* restriction decreased for almost all variables. This was true for sports ($\chi^2 = 10.9, p = 0.0042$), gardening ($\chi^2 = 9.9, p = 0.0072$), hobbies ($\chi^2 = 20.2, p = 0.0000$), sexual life ($\chi^2 = 16.4, p = 0.0003$), job ($\chi^2 = 24.1, p = 0.0000$), and mobility ($\chi^2 = 26.2, p = 0.0000$). Only restriction in food intake did not decrease ($\chi^2 = 1.6, p = 0.4412$) and despite information and recommendation to quit, smoking habits did not change either ($\chi^2 = 2.2, p = 0.3284$). Yet *5 years postoperatively*, while restrictions in food intake were decreased, restrictions in alcohol intake increased. Significant differences between all three observation points were seen in sports, garden-

ing, hobbies, sexual life, job, and mobility. No significant differences could be found in food intake, and again in smoking habits and alcohol intake. Fig. 4 shows measures of physical status of patients at different points of time based on a self-report questionnaire.

While 25 of 33 patients (76%) described their physical condition as good or excellent after rehabilitation, 32 patients (97%) did so 1 year postoperatively, and 30 patients (91%) did so 5 years postoperatively. A significant overall change was discernible by the Kruskal-Wallis H-test ($\chi^2 = 48.30, p = 0.0000$). In detail, a significant amelioration between the preoperative ratings and the time after the completion of the rehabilitation was shown (preoperatively/end of rehabilitation $z = 4.98, p = 0.000$). During the first year postoperatively, patients did not report a significant change in their physical condition (end of rehabilitation/1 year postoperatively $z = 2.08, p = 0.5780$). From 1 to 5 years after the transplantation, a significant deterioration is discernible (1 year/5 years postoperatively $z = 2.23, p = 0.0257$), i.e. perception of their physical condition becomes more realistic.

2. Emotional status

Fig. 5 shows the emotional complaints before surgery, at the end of the rehabilitation period, 1 year and 5 years after heart transplantation, as identified by the patients. Preoperatively, irritability, restlessness, psychic lability and dysphoria combined with depression and lower drive are the main emotional complaints. All emotional complaints differ significantly at different points of observation: Shortly after successful transplantation fewer complaints are reported. Thereby, there is a decrease in the following symptoms: irritability ($\chi^2 = 26.8, p = 0.0000$ for all the following), restlessness

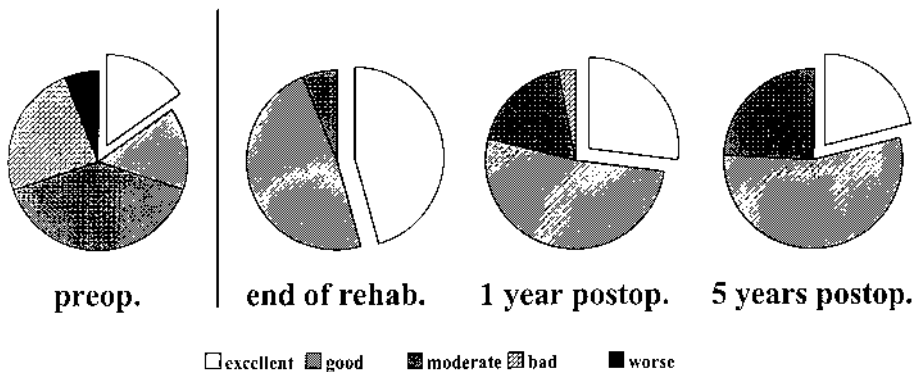


Fig. 6. Self-ratings of emotional status of patients (5-step Likert-scale ratings).

($\chi^2 = 32.9$), depression ($\chi^2 = 39.8$), psychic lability ($\chi^2 = 28.0$), dysphoria ($\chi^2 = 34.9$), lower drive ($\chi^2 = 40.2$), lack of social contact ($\chi^2 = 34.5$), low self-esteem ($\chi^2 = 48.2$), and anxiety ($\chi^2 = 45.0$). Nevertheless, 5 years after transplantation patients report a significant increase in depression, lability, dysphoria and lack of drive.

Figure 6 shows self-report measures of emotional status at different points of observation. Preoperatively, 10 patients (30%) still rate their emotional status as excellent or good, whereas 23 (70%) report moderate to bad emotional well-being. At the end of rehabilitation, their status changes dramatically: 31 patients (94%) report excellent or good emotional status. These positive self-appraisals decrease during the time after transplantation: One year postoperatively 27 patients (82%) report moderate to good emotional well-being, compared to 25 patients (76%) five years postoperatively. Again in the statistical analysis an overall difference between the four time points of assessment is calculated ($\chi^2 = 26.06$, $p = 0.0000$). In detail, a significant amelioration between the preoperative ratings and the assessment after the rehabilitation period is striking (pairwise Mann-Whitney's U-test: $z = 4.72$, $p = 0.0000$). Patients did not report between 1 and 5 years of follow-up any significant change in their psychological condition (end of rehabilitation/1 year postoperatively $z = 1.96$, $p = 0.0497$, 1 year/5 years postoperatively $z = 0.48$, $p = 0.6317$).

DISCUSSION

In 1985 McAleer et al. (13) reported a lack of prospective long-term observational studies about quality of life in heart transplantation: "The patient population has yet to be studied intensely to identify how these problems evolve during prolonged survival, one to five years after heart transplantation. Are these latter problems the same as those experienced during that first postoperative year?" ((13), p. 233). Grady et al. (11) did so as well in 1996, more than 10 years later, in discussing the limitations of her study: "The longitudinal study of quality of life should include comparisons of multiple time periods both before and through at least 5 years after transplantation" ((11), p. 757). To date, only limited research work has been done along these lines.

This prospective study following 33 cardiac transplanted patients over a period of 5 years after transplantation shows that 5 years after transplantation there is a definite gap between excellent physical condition and worsening emotional well-being.

Physical status

Before to 1 year after transplantation. Our results show that physical symptoms of terminal heart failure nearly all disappeared from before to 1 year postoperatively. This was true for shortness of breath and feelings of suffocation, tachycardia, weakness, fatigue, and exhaustion which all decreased dramatically after the operation. Similar results have been reported by other authors (16, 20). Jalowiec et al. (12) found that fatigue is a clue symptom. Despite a significant drop of over 26% after the operation, they noted that fatigue (even though significantly less) was still a problem in 63% of the patients shortly after the operation and remained so even for up to 3 months after transplantation. However, our patients seem to represent an Austrian mean, since a survey performed by a big newspaper revealed that more than half of the Austrian population (53.5%) suffered from more or less severe fatigue.

In our study, gastric pain which is either an indicator of distress (e.g. dyspeptic symptoms as cited by Jalowiec et al. (12)) or a side effect of steroids and azathioprine on the other hand was slightly reduced, but did not change significantly after the operation. Numbness in the hands and feet did not change either. Preoperatively, numbness could merely have been an effect of heart insufficiency (known as nutritional impairments of nerves because of vascular changes), whereas after the operation the symptom can be ascribed to the medication (e.g. azathioprine or cyclosporine). Moreover, trembling, which could have been explained in relation to anxiety and sympathetic drive before the operation, worsened over the first year after transplantation and was particularly induced by cyclosporine medication.

These findings are in line with previous research. Limitations due to disease almost disappear after transplantation and do not return over the whole period of observation. Jalowiec et al. (12) recently showed that patients' physical symptoms disappeared completely within 3 months after transplantation. In accordance with other groups, our patients are also in much better physical condition 1 year after transplantation compared with their pre-transplant condition. In their study, Caine et al. (6) found highly significant improvements in general health status in all six dimensions of the Nottingham Health Profile for the 122 patients when comparing those pre-transplant scores nearest to the time of operation with those at 3 months afterwards.

One year to 5 years postoperatively. Only few studies (6, 12) focus—as did ours—on the longer term

quality of life. In our sample, patients retained their gain in physical performance even up to 5 years postoperatively. Shortness of breath, tachycardia, weakness, and exhaustion decreased further until year 5, and suffocation was not reported over time. Yet in the subjective ratings of patients from 1 to 5 years after the transplantation, a significant deterioration is discernible. This is probably due to a more realistic perception of their physical condition. Most of these findings are in accordance with Caine et al.'s (6). In our patients also trembling, a well-known side effect of cyclosporine, has the lowest incidence at 5 years postoperatively, which might be ascribed to a stepwise decrease in cyclosporine dosages over time or to a shift in attention away from this symptom. Gastric pain and numbness in hands and feet also significantly decreased in patients after the first year, which again seems to be due to the stepwise reduction of immunosuppressive therapy. These results show the stability of the good physical status of transplanted patients even in long-term follow-up.

Restrictions due to disease

In our sample, restrictions due to disease were very evident before the transplantation which clearly is the result of terminal heart failure. Patients were limited in sports, gardening, hobbies, sexual life, job, and mobility. This completely changed for 5 years thereafter. Interestingly, this is not true for food intake, which was experienced as unchanged despite a clear physiological explanation suggesting a lower food-intake as a result of cardiac insufficiency before the operation. Neither did they change smoking and drinking habits over time, since there was no significant reduction that lasted over 5 years' time.

Emotional status

Before to one year postoperatively. Parallel to physical symptoms, transplantation also brings a clear improvement in emotional well-being. As such, irritability, restlessness, depression, psychic lability, dysphoria, decrease in drive, lack of social contact, low self-esteem, and anxiety, all significantly improved after the operation. This has been found by others as well. In patients awaiting heart transplantation Walden et al. (20) as well as Muirhead et al. (16) found positive psychological and social adjustment, although dis-

satisfied with quality of life. Moreover, most patients felt even better than a matched population out of a general practice. In the work of Caine et al. (6) a general improvement in emotional status after transplantation was evident and was later confirmed by Jalowiec (12). Grady et al. (11) found that 68% of patients preoperatively complained of restlessness, whereas Jalowiec et al. (12) found that only 14% of their sample complained of this symptom after transplantation. Bohachick et al. (2) also reported a decrease in anxiety after the operation. An interesting finding was reported by Riether et al. (18), who discovered the lowest level of anxiety 3 months after transplantation. They found small and insignificant increases 6 and 12 months after the operation. An explanation for this is that patients often have high expectations for their recovery and become disappointed and anxious when recovering is not forthcoming.

In the case of depression, most authors have reported results in line with ours that the rate of depressive symptoms dramatically decreases after transplantation. Jalowiec et al. (12) found a difference of 17% between pre- and post-transplant levels, and that 39% of the patients suffered from problems in this respect. On the other hand, Fisher et al. (9) only reported moderate depression levels before transplantation.

One to five years postoperatively. Five years postoperatively, there was a distinct deterioration of emotional well-being in the long run: Patients reported significantly more problems with depression, psychic lability and dysphoria than in the early phase after transplantation. Thus, a definite gap between excellent physical condition and worsening emotional well-being was perceived. These findings confirm the work of Baumann et al. (1) and Bohachick et al. (2), who suggested that although quality of life improved for the majority at post-transplantation, recipients continue to experience serious emotional problems. Depression might, at least in part, be explained by effects of steroids which have to be taken in consideration. These secondary effects are dose-dependent and might explain psychic lability as well.

Limitations of the study

The data used in our study were based on face-to-face interviews individually scheduled by the same interviewer. This is true for the time points before the operation, after rehabilitation, and one year postopera-

tively. However, because of logistics, the patients' reevaluation in year 5 could only be done by phoning them, and mailing them the respective questionnaires that they had been familiar with. This fact could, at least partially, influence the way the questions were answered. However, as is shown in our results, an effect of socially desirable response tendency must not have been important: most of the answers of the patients could not be regarded as desirable when they stated a deterioration of their situation (mainly in terms of their emotional well-being).

Another issue might be the indicators used in this study for assessment purposes. Despite the fact that Grady et al. (10) published their Heart Transplant Symptom Checklist in the USA which we still regard as a standard in the evaluation of heart transplant patients, we were unable to include it in our study.

Care implications

The results of our investigation may have several implications for the continuing care of transplant patients. Detailed information should be collected about their emotional and psychological well-being even when physical condition seems quite normal, as has been shown to be the case in the long-term of transplant recipients. In addition, patients should also be asked about marital problems, job-satisfaction and other psychosocial issues which are all particularly influenced when patients feel depressed, dysphoric or irritable. The most important issue, however, is the fact that when patients feel physically well and fit, this does not necessarily imply emotional or psychological well-being.

Summary

We conclude that there are outweighing improvements in physical health due to cardiac transplantation 1 year and 5 years after surgery. On the other hand, there is a distinct deterioration in emotional status in the long run, which might affect the quality of life of transplanted patients. As survival rates continuously increase after cardiac transplantation, more efforts should be placed on the psychological care for long-term survivors. Our study has shown that these patients have to cope with a reality which may be gratifying, but which seemingly often discourages them and impairs their quality of life. Rodgers (19) expresses this point very well: "Heart transplant recipients' struggle for life may be won, but

the struggle to live well and fully continues". This work provides a solid basis for developing interventions to assist cardiac transplanted patients to improve their quality of life in the long term.

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Please note that a comprehensive literature list can be obtained on request from the authors.

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