A picture of health—myocardial infarction patients' drawings of their hearts and subsequent disability
A longitudinal study

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Abstract

Objective: The aim of this study was to examine whether myocardial infarction (MI) patients' drawings of their hearts predict subsequent return to work, exercise, distress about symptoms and perceptions of recovery at 3 months. **Methods:** Just prior to hospital discharge, 74 consecutive patients aged under 70 admitted with an acute MI drew pictures of their hearts. Patients' recovery was assessed at 3 months by postal questionnaire. **Results:** Patients who drew damage on their heart while in the hospital perceived that their heart had recovered less at 3 months ($P = .005$), that their heart condition would last longer ($P = .01$) and had lower perceived control over their heart condition ($P = .05$) than did patients who drew no damage. The amount of damage drawn on the heart was also associated with a slower return to work ($r = .37$, $P < .05$). While patients' peak troponin-T in the hospital was associated with the amount of damage drawn ($r = .41$, $P < .001$), it was not associated with the speed of return to work or other 3-month outcomes, apart from perceived duration of heart condition ($r = .26$, $P < .05$). **Conclusion:** Patients, drawings of damage on their hearts after a MI predict recovery better than do medical indicators of damage. Drawings offer a simple starting point for doctors to assess patients' ideas when discussing their heart condition and an opportunity to counter negative illness beliefs.
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Introduction

Patients' own beliefs about their illness have an important influence on functioning in many illnesses and seem to be stronger predictors of patient disability than are objective measures of disease activity [1]. Research has shown that myocardial infarction (MI) patients' perceptions in the first few days after the event have a major influence on their later adaptation and recovery. Those patients who believed that their MI would have major consequences on their lives were slower to return to work and normal activities than were other patients, and those who believed that their illness was more controllable were more likely to attend cardiac rehabilitation classes [1,2].

The measurement of patients' perceptions of illness has relied predominantly on the use of a structured interview or patient-completed pencil-and-paper questionnaire, such as the Illness Perception Questionnaire [3]. While this scale covers the main dimensions found to underlie patients' beliefs about their illness, it may not identify specific idiosyncratic beliefs that play a critical role in determining recovery. For example, following MI, patients' ideas of what has actually happened to their heart and the extent of damage are likely to directly influence their subsequent emotions and behaviours during the recovery period, such as engagement in exercise or returning to work. Many MI patients develop erroneous beliefs that hinder their subsequent recovery, such as believing that their heart is worn out or

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has been damaged to such a degree that any exertion may bring on a further MI or even death [4]. These idiosyncratic ideas are often hard to identify with standard questionnaires.

There is some evidence to suggest that obtaining a pictorial representation of the patient's illness may be more appropriate in some illnesses, such as MI, where the patient can easily visualize the particular part of the body affected and provide their perception of what has occurred. For example, Logan [5] asked six cardiac patients presenting with seemingly inexplicable symptoms to draw their hearts to help determine the cause of their problems. In two of these cases, misconceptions about the amount of damage incurred or the location of blockages in the blood vessels could be identified from the drawings. When these misperceptions were corrected, significant reductions were made in the patients' anxiety, chest pain and disability. This preliminary work suggests that drawings may be a promising way to identify and quantify inaccurate and disabling perceptions held by patients following MI.

We explored the utility of patients' drawings in the assessment of illness perceptions in MI patients. We investigated the relationship of patients' drawings of their hearts soon after MI to clinical indices of cardiac damage and patients' subsequent recovery 3 months later.

Method

Participants

Participants were consecutive patients aged less than 70, who spoke English and who had no other serious psychiatric or medical conditions, admitted to the Coronary Care Unit of Auckland Hospital. After informed consent was obtained, the patients were enrolled in a randomised controlled trial aiming to improve the way patients and their spouses are given recovery information after a heart attack. Seventy-four patients consented and 5 declined to participate. The mean age of the sample was 55 years (S.D.=8.1) and 68 of the participants were men. Most participants (47) were European in origin, 15 were Asian, 10 Maori or Pacific Islanders and two were from other races. At the time of their MI, 39 worked full time, 10 worked part time, 11 were retired and 14 were unemployed, working in the home or on sickness payments. Fifteen participants had been diagnosed with a previous MI, of whom 5 had previously attended community cardiac rehabilitation classes. The average stay in the hospital was 9.5 (5.4) days.

Participants in the control arm received standard care, while those in the intervention group received brief individual counselling about recovery after a heart attack, in addition to standard care. We have grouped together patients in both arms of this study, as there were no significant differences in the percentage who drew hearts versus those who did not ($P=.81$), the amount of damage drawn on the heart ($P=.27$) or the number of blockages drawn ($P=.55$).

Procedures and measures

Participants were given a questionnaire to complete before discharge, which included the following instructions: "Please draw a picture of what you think your heart looked like before your heart attack and another picture of what you think has happened to your heart after your heart attack. We are not interested in your drawing ability—a simple sketch is fine. We are interested in what you think has happened to your heart." Five patients did not complete the questionnaire—one died in hospital, one pulled out of the study and three did not return the questionnaire. Of the 69 who did complete the questionnaire, 59 drew pictures of their hearts (86%). Patient's peak values of troponin-T and other medical variables were recorded from medical records, as well as age and gender. Troponin-T is an enzyme normally found in heart muscle, which is released into the blood when the heart muscle is damaged. The amount of troponin-T in the blood gives an indication of how much heart muscle has been damaged.

Three months after enrolment in the study, the participants were sent follow-up questionnaires to assess recovery. Sixty-four participants (93% of those completing the questionnaire in hospital) returned their follow-up questionnaire. Participants were asked their current employment status and the date that they returned to work following their heart attack (if they had been working prior to their heart attack). The number of days between discharge and return to work was calculated as days to full-time employment for those employed full time and days to part-time employment for those employed part time. The questionnaire also asked the participants the following: "How much do you think your heart has physically recovered from your heart attack", with a response scale from 0, *not at all*, to 10, *completely*; "How long do you think your heart condition will last", with a response scale from 0, *a very short time*, to 10, *forever*; "How distressed are you about your symptoms", with a response scale from 0, *not at all distressed*, to 10, *extremely distressed*; and "How much control do you feel you have over your heart condition", with a response scale from 0, *absolutely no control*, to 10, *extreme amount of control*. Patients were also asked how many minutes they had exercised in the past 7 days.

Data analysis

Patients' drawings were scanned and imported into NIH Image-J software [6]. The outside perimeters of the drawn heart and the part of the heart drawn as damaged were traced and their areas computed. The percentage of the heart drawn as damaged was calculated by dividing the damaged area by the total area of the heart. We also recorded the number of blocked arteries drawn by patients.

Data were analysed using SPSS Version 11.5 software. Spearman rank correlation coefficients were calculated to investigate the relationships between the percentage of the

heart drawn as damaged and clinical markers of damage, as well as recovery beliefs. Kruskall–Wallis tests were used to investigate whether those patients drawing damage differed from those who did not draw damage on time to return to work, recovery beliefs and clinical markers of damage. All analyses were nonparametric, and a 5% significance level was maintained (two tailed). Data are presented as medians, and 95% confidence intervals (CI) were calculated using a binomial method.

Results

Patients varied widely in the type of pictures that they drew of what had happened to their heart following the MI (see Fig. 1). A number of patients drew clear areas of damage on their heart (Numbers 1, 2, 3, 4 and 7), while others drew blockages (Numbers 5, 6 and 7). A small number of other patients expressed emotional feelings about their MI or the causes of their MI in their drawing (Number 8). Of the 59 patients completing drawings of their heart, 27 drew damage to their hearts and 32 drew no damage. The mean amount of damage was 5.9% (S.D. = 5.2%) of the size of the heart. There was no significant correlation between the percentage of heart drawn as damaged and age or days spent in hospital following MI. The size of damage also did not differ by gender or between those patients who had a previous MI and those who had not, or whether previous MI patients had previously attended cardiac rehabilitation classes.
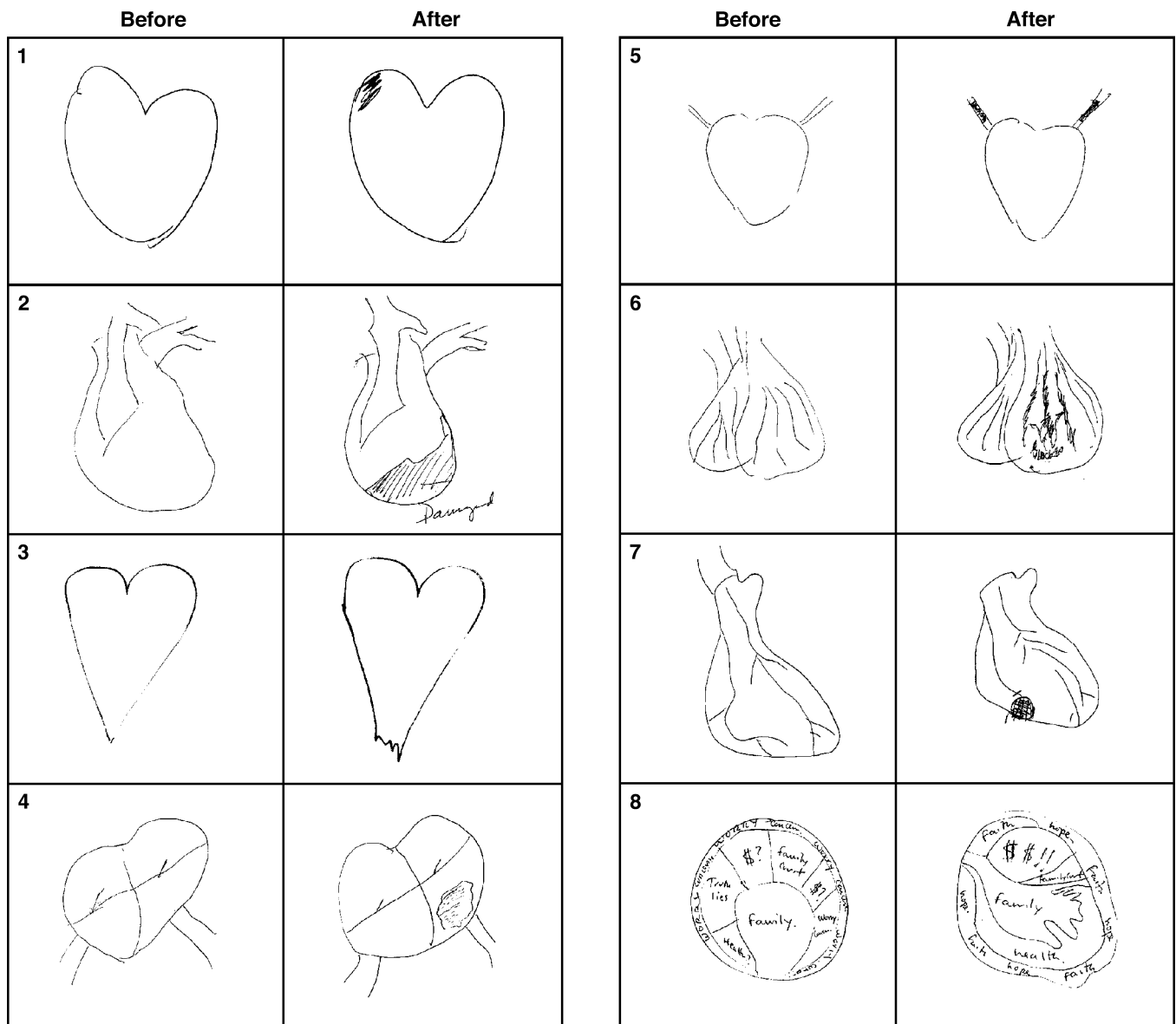

Fig. 1. Examples of heart drawings.

Table 1
Patients drawing damage on the heart *v* no damage and three month outcomes

3-Month outcome data	No damage ($n = 29$) Median (95% CI)	Damage ($n = 24$) Median (95% CI)	Significance
Days until working	21 (6 to 49)	37 (20 to 67)	.06
Perceived amount heart has recovered	9 (8 to 9)	8 (7 to 8)	.005
Perceived duration of heart condition	5 (2 to 9)	9 (8 to 10)	.01
Distress about symptoms	1 (1 to 2)	3 (1 to 5)	.10
Perceived control over heart condition	8 (7 to 9)	7 (5 to 8)	.05
Minutes spent exercising per week	47.5 (20 to 100)	120 (20 to 240)	.17

Patients were divided into those who had drawn damage on their heart ($n = 27$) and those who had drawn no damage ($n = 32$). There was a significantly higher level of peak troponin-T between patients who drew damage and those who drew no damage [median = 2.8 (95% CI 1.4 to 4.4) vs. 0.6 (0.2 to 1.7), $P = .002$]. At the 3-month follow-up, patients who had drawn damage to their heart also reported a number of significant differences in outcome and ratings about their heart condition (Table 1). Specifically, patients drawing damage saw their heart as having recovered less and reported lower perceived control over their heart condition than did patients who drew no damage. Patients who drew damage also saw their condition as lasting significantly longer, and there was a trend towards them returning to work at a slower rate and having higher levels of distress about their symptoms.

We examined further the relationship between the amount of heart damage drawn by patients, peak troponin-T and the 3-month outcomes using Spearman correlations (Table 2). These data show that the time that patients took to return to work was significantly associated with the amount of damage that patients drew, but not with their peak troponin-T level. Controlling for peak troponin-T, the relationship between damage drawn and time to return to work was maintained ($r = .37$, $P = .04$). The size of damage was also significantly related to a number of other variables at 3 months, including a lower belief that the heart had recovered, lower feelings of control over their heart condition and a greater perceived time that their heart

condition would last. While peak troponin-T level was also related to the perceived length of time that the heart condition would last, it was unrelated to any of the other outcome variables at 3 months.

A number of patients drew blocked arteries going into the heart (e.g., Number 5 in Fig. 1) or on the heart (Number 6). We classified the patients into those who drew no blockages in their arteries ($n = 20$), those who drew one blocked artery ($n = 23$) and patients who drew two or three blocked arteries ($n = 16$). We found no differences in the outcomes at 3 months between these groups or when patients were classified into those who drew blockages or no blockages.

Discussion

These results show that patient drawings of their heart following MI offer a valuable insight into their future recovery. While the drawings of damage are, to some degree, related to objective markers of damage, such as peak troponin-T, they seem to bring together in a summative way how patients think about the effect of their MI, and we found this perception to be related to future recovery. Our results show that the amount of damage drawn on the heart is a strong predictor of later beliefs about how much the heart has recovered and the speed of return to work. Patients' early ideas about how much their heart has been damaged seem to set the patient's trajectory for a return to

Table 2
Spearman correlations between heart damage drawn, troponin-T and 3-month outcomes

	1	2	3	4	5	6	7
Hospital data							
(1) Damage drawn (%)							
(2) Peak troponin-T	.41***						
3-Month data							
(3) Days to return to work	.37*	.05					
(4) Perceived amount heart has recovered	−.45***	−.22	.03				
(5) Perceived duration of heart condition	.38**	.26*	−.02	−.38**			
(6) Distress about symptoms	.26	−.06	.15	−.59***	.23		
(7) Perceived control over heart condition	−.33*	.01	−.03	.67***	−.35**	−.39***	
(8) Minutes spent exercising per week	.20	−.04	.13	.12	.18	−.29*	−.11

* $P < .05$.
** $P < .01$.
*** $P < .001$.

normal activities. A limitation of this study is the short follow-up period, which may not have been long enough for some lifestyle changes or other significant outcomes to occur.

The results are consistent with previous research showing that negative patient perceptions of their MI are related to a slower recovery and return to work [1,7]. The results also support recent work showing erroneous beliefs about the heart leading to poorer long-term functioning and quality of life [8]. Given the significant relationship between peak troponin-T and damage drawing, clearly, patients base their ideas about what has happened to their heart, to some degree, on the information that they are given or that they pick up from staff in hospital. However, patients' heart drawings do not just represent what they have been told in hospital and, probably, also include an integration of previous knowledge and exposure to MI patients, as well as self-protective biases. It is of significance that when patients draw damage on the heart, it typically only covers a relatively small area, and a large number of patients do not see that their heart has been damaged at all. These patients may filter out information that they receive about damage because it threatens their healthy self-perceptions, preferring to see their MI as a temporary illness. Interestingly, patients who thought that their heart had recovered little 3 months after the MI reported higher levels of distress than did those who had more positive recovery beliefs. This suggests that perceptions of permanent damage may contribute to depression, which has been linked to both poorer recovery and higher mortality after MI [9,10].

While the severity of MI measured by clinical indicators is clearly important, patients' own ideas about what has happened to their heart seem to strongly influence the recovery phase after hospital discharge. In this study, time to return to work was predicted by damage drawn but not by troponin-T, which suggests that cognitions of damage, rather than actual damage, drive behaviour. In many cases, hospital staff will be unaware of how patients make sense of what has happened to their heart following MI. Generally, such information is not volunteered, and patients are rarely asked about their personal beliefs about their illness. In many cases, the clinical information about severity and likely prognosis does not accurately match patient perceptions.

Patient drawings offer a potential method for improving the assessment of MI patients. There was a high level of acceptance by patients when asked to draw what they thought had happened to their heart. The heart seems to be easily visualized by most patients, and although many drawings are simple outlines, they seem to be an accurate reflection of patients' illness perceptions. Drawings offer a new low-cost, noninvasive imaging technique for cardiology, which could provide a method of identifying maladaptive beliefs about illness before patients leave hospital and offer a starting point for intervention or patient education. Previous research has shown that a brief hospital-based psychological intervention after MI can successfully change illness perceptions and improve recovery [11].

Acknowledgments

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