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# Non-cardiac chest pain: why was a brief intervention apparently ineffective?

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## ABSTRACT

**Background.** Patients who present with chest pain but have normal coronary angiography and who are told by their cardiologist that they do not have heart disease, have a poor symptomatic, psychological and quality of life outcome and remain concerned about a serious cause of their symptoms. They frequently complain they have not had enough information. The study aimed to test the effectiveness and acceptability of a brief psychological intervention based on cognitive behavioural principles.

**Methods.** Consecutive patients with chest pain and normal angiograms were assessed and invited to take part in a randomized controlled evaluation. The intervention consisted of an individualized information and discussion session by a specially trained cardiac nurse, together with a handout and cassette providing information and advice and telephone follow-up to discuss progress, answer questions and reiterate advice.

**Results.** The treatment proved to be unacceptable to some patients and there was no evidence of efficacy.

**Conclusions.** Implications for the preparation of patients undergoing angiography and for the timing and delivery of information and advice following a negative result are discussed.

## INTRODUCTION

Non-cardiac chest pain is a common problem. We have described in an accompanying paper a programme of research that aims to develop psychological interventions suitable for routine care based on an aetiological model of the interaction of psychological and physical causes (Mayou *et al*. 1997). This paper is concerned with the subgroup undergoing cardiac catheterization who have normal findings, 12000 cases each year in the UK. Despite an excellent physical prognosis, a substantial proportion of these patients continue to experience symptoms, worry about heart disease, restrict their activities and seek medical help (Potts & Bass, 1995). It would be valuable to offer them treatment for the symptoms and to promote return to full normal everyday life.

Treatment is accepted to be difficult (Assey, 1993), however, there is evidence that a cognitive behavioural intervention is effective in reducing symptoms and disability caused by the symptoms. Klimes and colleagues showed that cognitive behavioural intervention involving between 7 and 11 one hour sessions with a clinical psychologist was effective in treating patients recruited from general practice with persistent chest pain despite reassurance by cardiologists (Klimes *et al*. 1989). A subsequent trial, reported in an accompanying paper (Mayou *et al*. 1997), showed that the same procedures were effective in a cardiac out-patient clinic but that there were some practical problems of acceptability.

The present study derives from a consistent finding in all our research on non-cardiac chest pain, that many patients are uncertain about how to cope with their symptoms and disability and are often bewildered by apparently contradictory advice from doctors about whether they have heart disease. These findings led us to

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develop a brief intervention for patients with chest pain found to have normal coronary angiograms. The rationale for the form and content of treatment is based on three types of evidence: (1) our clinical and research experience of patients' apparent needs (Bass & Mayou, 1995); (2) general evidence that a combination of written and oral information, with the opportunity for patients to discuss their concerns, with telephone follow up, can add to the effectiveness of medical advice (Johnston & Wallace, 1990); and (3) evidence that behavioural self-help methods are helpful to patients following myocardial infarction (Lewin *et al.* 1992).

We postulated that a psychological intervention following the catheterization would be most acceptable and clinically useful if offered by a generally trained nurse on the cardiac ward as part of routine cardiac care. The present study was designed to test the effectiveness and acceptability of such an intervention.

## METHOD

### The patients

The study population included all patients on a cardiac ward over a 12-month period who were undergoing coronary angiography for the presenting symptom of chest pain, and who were found to have normal coronary arteries and who did not need further medical investigations. We excluded all those who were either admitted to a Day Case Unit, and went home once they had received the results of the angiogram, or else stayed overnight on the cardiac ward. The cardiac nurse (S.G.) was informed by the Cardiology Department of all patients with normal coronary angiography, and she described the research to the patients before they were discharged. Those who met the criteria for inclusion were then randomly allocated to Assessment Only Control (C) or Treatment (T) using envelopes prepared in a sequence generated from a table of random numbers.

### Cardiac nurse

We wished to select a nurse who was: (1) relatively typical of nurses working in a cardiac setting, rather than a nurse highly trained in cognitive behavioural therapy and (2) willing to undergo training to be able to offer a brief psychological intervention, explain to patients a 'vicious circle' model of the symptoms and adapt the model to the individual patient, and teach the patient coping strategies. Our research nurse (S.G.) had worked in cardiology settings for several years. Her training, from a psychologist (D.S.), included general information about the model of chest pain and ways of coping with symptoms, how to deal with patients questions and reservations, and interviewing skills. The psychologist sat in on pilot interviews and together with C.B. and R.M. supervised the management of trial subjects.

### Assessment

Both groups were assessed by the cardiac nurse before randomization. The assessment included questions about the symptoms, degree of limitation, history of symptoms and beliefs about the symptoms. Patients completed a battery of self-report questionnaires including the Beck Depression Inventory (Beck, 1978), the State–Trait Anxiety Inventory (Spielberger *et al.* 1970), the Symptom Check List (Derogatis, 1993) and the SF-36 (Ware & Sherbourne, 1992) to measure degree of limitation and the Whitely Index (Pilowsky, 1967) to assess beliefs about the significance of physical causes.

### Intervention

As soon as possible after the cardiologist had given the result of the angiogram, the treatment group received a 1-hour intervention, which was modified to take account of individual history, circumstances and concerns. It included the following: discussion about the likely causes of symptoms and the importance of concern about physical symptoms as a maintaining factor (the discussion took account of individual worries and evidence about possible minor physical causes of pain); information about methods of coping with symptoms, including the use of controlled breathing and relaxation exercises to reduce muscular tension or hyperventilation that may maintain the symptoms; and information about graded increase in activities to encourage the patient to return to normal activities.

Subjects were given a booklet, 'Coping with Chest Pain' reinforcing the information given during the intervention and also a cassette tape with breathing and relaxation exercises. They

were asked to share this information with partners. The subjects were encouraged to discuss any concerns and reservations about the intervention.

Subjects were contacted by telephone twice after the intervention at 2-week intervals to check on their progress, discuss problems and to reinforce advice. They were invited to contact the cardiac nurse at any time for further help but none did so.

### Follow-up assessment

Both groups were contacted by telephone 3 months after the assessment by a research worker (B.B. or S.T.) blind to the treatment condition. The initial interview and self-report questionnaires were repeated.

### Analysis

Statistical analysis followed the procedures described in the accompanying paper (Mayou *et al*. 1997).

## RESULTS

### Patients

Of a total of 142 patients meeting our criteria for inclusion, 85 (60%) did not take part in the study. The reasons for exclusion are shown in Table 1. We were unable to contact 35% of potential patients since they were ready to go home immediately following receiving the results of the angiography and were unwilling or unable to return to the hospital (many had been admitted from remote health districts). Twenty-six per cent refused to take part, either being fully satisfied by the angiogram results or being disinterested in taking part in research.

Fifty-seven patients (40%) entered the study. Thirty-three were randomized into the treatment group and twenty-four into the control group.

Table 1. *Reasons for non-inclusion in the study* (%)

| | *N* | (%) |
|---|---|---|
| Satisfied by the results: wanted no further help | 22 | (15) |
| Refused to take part | 14 | (10) |
| Day cases: could not be contacted after discharge/too far to return | 49 | (35) |
| Enrolled in study | 57 | (40) |
| Treatment group | 33 | |
| Control group | 24 | |

Follow-up interviews were conducted on 50 patients (88%), 79% of the treatment group and 63% of the control group. A proportion of patients were unwilling to complete the follow-up questionnaires (Table 2). The main reasons given for refusing to be followed up were that the patients felt that the questions were too psychological and not relevant to their problems.

Characteristics of the 57 patients entering the study are shown in Table 3. There were no significant demographic differences between the Treatment and Control Groups in terms of their characteristics and assessment measures at baseline. Fifty-nine per cent of the group were only partially or not at all reassured by the results of the angiogram.

### Outcome of treatment

Both treatment and control groups improved slightly on key outcome variables of chest pain, mood and limitation of activities. Although a high proportion of patients in both groups continued to experience symptoms, around a third of the treatment group and half or more of the control group reported that their symptoms were less frequent, severe or distressing at follow-up.

#### *Symptoms*

The main outcome measures of chest pain are shown in Table 4. Those in the control group reported their symptoms as slightly less distressing, less severe, less frequent and less limiting. One person in the treatment group reported feeling worse, the rest felt that they were unchanged.

#### *Psychological measures*

Mean values of the mood and activity self-report measures obtained from 41 patients who completed the follow-up are shown in Table 5. Analysis of variance showed significant time

Table 2. *Follow-up*

| | Treatment *N* (%) | Control *N* (%) |
|---|---|---|
| Complete follow-up | 26 (79) | 15 (63) |
| Follow-up interview but refused questionnaires | 3 (9) | 6 (25) |
| Refused follow-up | 2 (6) | 2 (8) |
| Lost to follow-up | 2 (6) | 1 (4) |

$\chi^2$ test NS.

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Table 3. *Characteristics of trial patients* (N = 57)

| | Treatment *N* (%) | Control *N* (%) | Total *N* (%) | |
|---|---|---|---|---|
| Demographic | | | | |
| Gender | | | | |
| Men | 15 (46) | 6 (25) | 26 (37) | $P = 0{\cdot}11$* |
| Women | 18 (54) | 18 (75) | 36 (63) | |
| Marital status | | | | |
| Married | 26 (79) | 21 (88) | 47 (83) | |
| Widowed/divorced | 5 (15) | 2 (8) | 7 (12) | |
| Single | 1 (3) | 1 (4) | 2 (4) | |
| Work status | | | | |
| Full-time | 14 (42) | 9 (38) | 23 (40) | |
| Part-time | 2 (6) | 3 (13) | 5 (9) | |
| Off sick | 4 (12) | 2 (8) | 6 (11) | |
| Unemployed | 1 (3) | 1 (4) | 2 (4) | |
| Retired | 6 (18) | 5 (21) | 11 (19) | |
| Home worker | 5 (15) | 4 (17) | 9 (16) | |
| Medical data from case-notes | | | | |
| History of chest pain | | | | |
| < 6 months | 10 (31) | 6 (25) | 16 (29) | |
| < 2 years | 13 (41) | 8 (33) | 221 (38) | |
| ⩾ 2 years | 9 (28) | 10 (42) | 19 (34) | |
| Anti-anginal medication in past | | | | |
| No | 2 (7) | 4 (18) | 6 (12) | |
| Yes | 27 (93) | 18 (82) | 45 (88) | |
| Previous episode of chest pain | | | | |
| No | 14 (44) | 7 (29) | 21 (38) | |
| Yes | 18 (56) | 17 (71) | 35 (62) | |
| Other non-specific symptoms | | | | |
| No | 14 (46) | 18 (75) | 32 (58) | |
| Yes | 17 (55) | 6 (25) | 23 (42) | |
| Exercise test | | | | |
| No | 10 (30) | 7 (29) | 17 (36) | |
| Yes, normal | 15 (46) | 10 (42) | 25 (44) | |
| Yes, abnormal | 8 (24) | 7 (29) | 15 (26) | |
| Model for heart disease in family | | | | |
| No | 15 (46) | 4 (17) | 19 (33) | |
| Yes | 18 (55) | 20 (83) | 38 (67) | |
| Psychiatric history | | | | |
| No | 31 (94) | 21 (88) | 52 (91) | |
| Yes | 2 (6) | 3 (12) | 5 (9) | |
| Associated symptoms | | | | |
| Palpitations | | | | |
| No | 18 (56) | 10 (42) | 28 (50) | |
| Yes | 14 (44) | 14 (58) | 28 (50) | |
| Breathlessness | | | | |
| No | 3 (9) | 7 (29) | 10 (18) | |
| Yes | 29 (91) | 17 (71) | 46 (82) | |
| Reassured by results of angiogram | | | | |
| Very reassured | 12 (38) | 11 (46) | 23 (41) | |
| Partially reassured | 17 (53) | 12 (50) | 29 (52) | |
| Not at all reassured | 3 (9) | 1 (4) | 4 (7) | |

* $\chi^2$ test.

effects with both groups improving over the 3 months of the follow-up. However, there were few statistically significant differences between treatment and control groups. The general trend was for the control group to have improved slightly more than the treatment group. A separate intention to treat analysis on all 57 randomized subjects, substituting the previous score for missing data at 3 months, showed similar Time effects.

Examination of the measures of beliefs about causes of the symptoms at follow-up revealed a

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Table 4. *Summary of baseline and follow-up assessments on the principal outome variables (subjects who completed)*

| | Baseline assessment | | Follow-up | |
|---|---|---|---|---|
| | Treatment ($N = 29$) *N* (%) | Control ($N = 21$) *N* (%) | Treatment ($N = 29$) *N* (%) | Control ($N = 21$) *N* (%) |
| Chest pain | 26 (90) | 18 (86) | 21 (72) | 17 (81) |
| Experienced in last month | | | | |
| No chest pain in last month | 3 (10) | 3 (14) | 8 (28) | 4 (19) |
| Frequency | | | | |
| Daily or more | 16 (55) | 7 (33) | 7 (21) | 3 (14) |
| At least weekly | 8 (28) | 8 (38) | 12 (41) | 8 (38) |
| Less than weekly | 4 (14) | 4 (19) | 3 (10) | 8 (38) |
| No chest pain | 1 (3) | 2 (10) | 7 (24) | 2 (10) |
| Symptoms less frequent at follow-up | | | 18 (62) | 16 (76) |
| Limitation | | | | |
| Moderately or very Limiting to daily life | 19 (68) | 15 (71) | 9 (31) | 4 (19) |
| Symptoms less limiting at follow-up | | | 8 (28) | 11 (52) |
| Distress | | | | |
| Moderately to very Distressing | 16 (55) | 15 (71) | 8 (28) | 7 (35) |
| Symptoms less distressing at follow-up | | | 15 (52) | 17 (81) |
| Severity | | | | |
| Moderately to very severe | 24 (83) | 17 (81) | 13 (45) | 12 (57) |
| Symptoms less severe at follow-up | | | 17 (59) | 13 (62) |
| Associated symptoms | | | | |
| Palpitations | 12 (41) | 12 (57) | 7 (24) | 1 (5) |
| Breathlessness | 26 (90) | 14 (67)* | 17 (59) | 11 (52) |

* $\chi^2$ test $P < 0{\cdot}05$ (Treatment *v.* Controls at baseline).

slight increase in attribution of the symptoms to heart disease in both groups, and a slight decrease in attribution of the symptoms to stress in the treatment group but not the controls.

### *Social outcome*

There were modest improvements in subscores on the SF36 measure of social functioning (see Table 5). Changes were small and functioning was less good than reported for general population samples.

## Patterns of outcome

Detailed examination of patterns of outcome indicates considerable variance within the two groups. Within the group of treated patients there was a broad distinction between those who were open to alternative explanations of their symptoms and those who remained worried about heart disease. The six treated subjects who reported no symptoms at follow-up found the outcome of angiography reassuring, consistently described a possible non-organic cause of the pain and reported having made active use of the treatment methods.

In contrast, those who reported that they felt worse at follow-up had been less reassured initially and had a stronger belief in there being an organic cause. These subjects were especially likely to be upset at having to answer psychological questionnaires and of the psychological content of the intervention. They often reported that they had made no attempt to use the behavioural techniques. However, there were a number of patients who reported little improvement in symptoms who were none the less very positive about the treatment and particularly about the relaxation tape.

There was a similar pattern of improved and unimproved patients among the control group.

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Table 5. *Self-report outcome measures*: *mean values* (*includes only those subjects with complete follow up*, *i.e. interviews and questionnaires at baseline and follow-up*)

| | Baseline assessment | | Follow-up | |
|---|---|---|---|---|
| | Treatment ($N = 26$) | Control ($N = 15$) | Treatment ($N = 26$) | Control ($N = 15$) |
| Mood and mental state | | | | |
| BDI | 9·73 | 9·21 | 8·57 | 8·28 |
| STAI-T | 40·31 | 42·67 | 40·53 | 38·27 |
| Whitely Index | 5·23 | 6·40 | 4·35 | 5·20** |
| SCL-90 | | | | |
| Anxiety | 0·81 | 0·72 | 0·62 | 0·43** |
| Depression | 1·02 | 0·90 | 0·75 | 0·63** |
| Somatization | 1·11 | 0·97 | 0·97 | 0·77** |
| Global Severity | 0·78 | 0·72 | 0·62 | 0·53** |
| SF-36 (Higher score = better functioning) | | | | |
| General health perception | 62·83 | 57·80 | 63·96 | 54·87 |
| Mental health | 60·80 | 59·73 | 69·44 | 71·47** |
| Physical functioning | 61·92 | 60·00 | 70·77 | 63·33** |
| Bodily pain | 54·70 | 47·41 | 57·27 | 66·67*** |
| Role limitation – emotional | 55·57 | 38·10 | 70·83 | 83·33*** |
| Role limitation – physical | 30·21 | 36·54 | 71·88 | 59·62** |
| Social functioning | 69·66 | 57·04 | 82·05 | 79·26** |
| Vitality | 53·09 | 54·33 | 48·65 | 51·33 |
| Belief in causation: probability ratings | | | | |
| Heart disease | 4·2% | 11·0% | 14·6% | 13·0% |
| Other physical cause | 31·5% | 22·3% | 28·2% | 15·0% |
| Stress | 61·7% | 34·0% | 44·6% | 43·3% |
| Other causes | 6·4% | 32·7%* | 11·9% | 15·3% |

* Significant difference between groups.
** MANOVAR: significant time effect but not significant group by time effect.
*** MANOVAR: significant time and group by time effect.

There was a trend for those who had felt reassured by the angiogram and who were not worried about heart disease to report a less good outcome than similar patients in the treatment group.

## DISCUSSION

We had a number of reasons to suppose that the brief intervention would be effective in reducing symptoms and associated distress following negative angiography, particularly those without associated psychological disorder. However, our results indicate that a brief intervention based on cognitive behavioural principles, delivered by a cardiac nurse, was neither particularly acceptable to patients nor particularly effective. While numbers are too small for definite conclusions, it would appear that patients who were reassured by the angiogram and who were not at baseline concerned about heart disease generally found the treatment appropriate and helpful. On the other hand, patients who were unconvinced by the angiogram remained worried about heart disease and were critical of the treatment. It seems that those who had a good prognosis welcomed the opportunity to talk but that those most in need of extra help found our intervention inappropriate or inadequate.

It is necessary to consider four types of explanation for our findings: (1) the high dropout rate and relatively small sample size mean the study may have lacked the power to draw clear conclusions; (2) the particular form of the brief intervention may have been less than optimal; (3) the timing and circumstances of the intervention between the result of the negative investigation and leaving hospital may have been such as to prevent treatment being acceptable and effective; and (4) the nature of the follow-up assessment.

### Methodological issues

Methodological issues limit the certainty of conclusions about the efficacy of our treatment. Larger numbers would be required to take

account of the improvement in the control group, possible effects of assessment only and the practical problems in the intervention and follow-up assessment discussed below. It cannot be concluded that brief early intervention is definitely ineffective; a modified intervention might be shown to be effective in a larger study. However, it is very clear to us that there will inevitably be very substantial clinical difficulties in providing psychological interventions within a medical setting in the brief period between invasive medical investigation and discharge.

### The nature of the intervention

There were two possible reasons for the lack of effectiveness of our patient intervention: lack of coordination with cardiologists and deficiencies in the content or delivery of the treatment. While we made efforts to integrate the intervention with routine care, in practice the research nurse worked rather separately from the doctors on the ward or undertaking the angiography. More active endorsement of the intervention from the cardiologists might have improved the outcome by both making the treatment more acceptable and promoting use of the behavioural advice.

It is possible that the cardiac nurse was not sufficiently trained in psychological treatment and that the intervention was insufficiently individualized. However, discussion of treatment sessions suggests these were not major reasons. However, there were indications that further help after discharge might have been useful for some subjects, for example those who reported little change in their symptoms but were appreciative of the intervention, especially the breathing and relaxation exercises.

### Timing and circumstances of the intervention

Although previous studies have indicated that patients want more early information and advice, there is no evidence from our research that the majority of patients want, or are able, to take up the offer of immediate further help. Only 40% of our population of potential patients agreed to be randomized into the trial. This was partly due to difficulties in finding an opportunity to speak to patients in the brief period between recovery from a catheter and discharge, and partly due to changes in clinical practice during the early stages of the study, which meant that patients were discharged within a few hours. However, a quarter of subjects refused because they saw the intervention as unnecessary or inappropriate.

An intervention concerned with 'stress' and worry so soon after coronary angiography may have been counterproductive for some patients. Many patients had previously been told that they had heart disease and had been treated with cardiac drugs. Coronary artery surgery had often been mentioned as a possible treatment. These patients were often bewildered, upset and even angry about a sudden change in diagnosis or continuing advice. Nearly 60% were not totally satisfied by the negative result of the angiography. They were often not in a receptive state of mind to consider a non-cardiac explanation for treatment. One patient commented, 'It is hard to be reassured after living with a death sentence'. In retrospect, we believe it may be more helpful for patients to have some time to absorb the results of the tests, discuss the findings with family or the general practitioner, and then be offered an individualized intervention at a later stage, perhaps 2 to 4 weeks later.

### The nature of the follow-up assessment

One further reason for the failure to find benefits of the intervention relates to the design of the evaluation. A number of subjects were unhappy about the questionnaires we used, finding them too psychological and implying that their problems were 'all in the mind': a quarter of the control group refused to complete the questionnaires at follow-up. This reinforced concern about the sudden changes from a cardiac diagnosis and undermined our efforts to design an acceptable, practical intervention.

## CONCLUSION

Although our particular form of brief intervention was apparently ineffective and there were practical difficulties in delivery, we conclude that chest pain patients require better preparation before angiography and more information and discussion of the results immediately afterwards. It may well be that rather simple changes in routine care based on the intervention described in this paper, including greater coordination with cardiologists, would be of

significant benefit. Even so, it is evident there is also a need for well-organized follow-up to offer consistent advice, promote compliance with simple behavioural techniques and to identify those needing specialist care. We, therefore, recommend a 'stepped' approach to the intervention, as follows.

*Preparation* Our subjects were clearly ill prepared for the possibility of negative findings. Patients should be given a fuller explanation before admission about the reasons for angiography and the possibility and meaning of a negative outcome.

*Pre-discharge information* It would be helpful for patients to have a fuller opportunity for discussion with cardiologists before discharge, perhaps accompanied by a brief information sheet.

*Follow-up* Patients should not be abruptly discharged from specialist care but offered a follow-up appointment to review the findings and the implications of further treatment. It is important that this discussion should convey that the investigation has been helpful in evaluating an important and common clinical problem and that it will be possible to plan symptomatic treatment and return to fuller activities. A proportion of patients will require specialist psychological intervention as discussed in an accompanying paper, which reports on evaluation of cognitive behavioural treatment for out-patients (Mayou *et al.* 1997).

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