Classification of Chest Pains after Myocardial Infarction

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Many patients who have recovered from the acute stage of myocardial infarction subsequently experience pain in the chest. The pain is most often angina pectoris, but pains of various other sorts are common, and patients recognizing more than one sort are not rare. The factors which determine whether or not a patient who has had a myocardial infarction subsequently has chest pain are not clearly understood. Before trying to define them it is necessary to classify the different kinds of pains accurately.

In a group of patients who were being followed at the Royal Melbourne Hospital for three years after their myocardial infarctions and who during that time were seen by three or four different doctors, there was often disagreement between the doctors about the nature of the pain in individual patients. This experience of difficulty in diagnosis is not unique. In a study in which subjects with chest pain were interviewed by three physicians, Rose (1962) found that if one physician diagnosed angina there was only a 55% chance that his two colleagues would agree with him.

To try to overcome this difficulty in making a symptomatic diagnosis of angina pectoris in epidemiological studies, Rose devised and validated a questionnaire. The criteria for angina in this questionnaire were restrictive, but their precision made them useful for obtaining an index of the frequency of angina in different population groups. Our needs differed from those of an epidemiological study. A restrictive definition providing an index of prevalence of angina pectoris, however accurate, was not enough. It was necessary to formulate criteria which would permit accurate classification of all patients in terms of their pain experience. A questionnaire was therefore devised, incorporating Rose's criteria, with this objective in view. Its use in survivors from myocardial infarction is described. Based on the questionnaire, a symptomatic classification of chest pain in these patients is proposed which has provided a satisfactory basis for further study of the different pain syndromes (Nestel *et al.*, 1966).

In this pain-prone group it has also been possible to estimate the extent by which Rose's criteria for angina pectoris may underestimate its prevalence in a population group.

Method

The patients studied were males with an average age of 56 admitted consecutively to a long-term controlled trial of anti-coagulant treatment (Denborough *et al.*, 1962). All had had a myocardial infarction between six months and three years previously. There were 174 consecutive patients admitted to the trial between July 1962 and February 1965. Of these, 24 had died or been withdrawn from the trial before the present study began, and in 29 of them English was not their native tongue. The remaining 121 Australian- or U.K.-born patients were nominated for questioning. The questionnaire was conducted by one of us at the routine weekly follow-up clinic, as and when time permitted, over a 12-month period. Of the 121 patients, three died before they could be questioned, one was too muddle-headed to be reliable, and 11 were missed

because their attendances happened not to coincide with a questioning session. Thus 106 were questioned.

The questionnaire is shown in the Appendix. The pain classification was determined by replies to questions 1 to 10. Questions 3, 7, 8, 9, and 10 were essentially the same as those proposed by Rose (1962) for diagnosing angina pectoris in population surveys. On the basis of their replies, patients were classified as follows:

A. Angina Pectoris

1. Effort angina by Rose's criteria, but recognizing only one type of pain.

Rose's criteria were as follows: a chest pain or discomfort with these characteristics: (1) the site must include either the sternum (any level) or the left arm and left anterior chest (defined as the anterior chest wall between the levels of clavicle and lower end of sternum); (2) it must be provoked by either hurrying or walking uphill (or by walking on the level, for those who never attempt more); (3) when it occurs on walking it must make the subject either stop or slacken pace, unless trinitrin (nitroglycerin) is taken; and (4) it must disappear on a majority of occasions in 10 minutes or less from the time when the subject stands still.

This group of patients therefore replied "Yes" to question 1, "No" to question 2, and gave appropriate answers to questions 3, 7, 8, 9, and 10.

2. Effort angina as in A1 but recognizing more than one type of pain ("Yes" to question 2).

3. Effort angina varying from these criteria. Replies were as in A1 or A2, but either the pain was felt at sites exclusive of the sternum or the left arm and left anterior chest, or it usually lasted over 10 minutes.

B. Left Chest Pain

This was defined as a pain or discomfort whose site was indicated as the anterior part of the left chest alone or as including this site (question 3), and was not brought on by walking or hurrying (questions 7 and 8). It need not be the only pain recognized, but if the patient also had angina he was placed in group A2.

C. Other Pains

All chest pains or discomforts not fulfilling criteria for group A or B.

D. No Pain.

Those patients who replied "No" to question 1.

Each patient's classification according to the questionnaire was reviewed in the light of his follow-up clinic notes. These contained space for a routine comment on pain, which was usually indicated simply as present or absent. Additional remarks on pain rarely included enough information on which to base a definite symptomatic diagnosis, nor was such a diagnosis generally recorded. It was not possible, therefore, to compare an impression of diagnosis recorded in the notes with the questionnaire category. The purpose of the review of the notes was to modify the questionnaire category if there was evidence in the notes inconsistent with it.

In reviewing the notes account was taken of the time, in relation to any comment, when the questionnaire was administered. Reference to isolated episodes of chest pain,

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remote in time from the date of questioning, did not lead to modification of the questionnaire classification. Such episodes are discussed below.

Results

Table I shows the classification of patients by questionnaire alone, the extent of disagreement in the clinical notes, and the final classification based on both sources.

TABLE I.—Disagreement Between the Questionary Classification and Case-notes

Pain Category	Questionary Classification	Questionary and Case-notes Disagree	Final Classification
A. Angina pectoris { 1	21	0	21 (19.8%)
{ 2	10	0	10 (9.4%)
{ 3	6	0	9 (8.5%)
B. Left chest pain	10	0	10 (9.4%)
C. Other pains	13	1*	12 (11.4%)
D. No pain	46	2*	44 (41.5%)
Total	106	3	106 (100%)

* Transferred to A3.

There was no disagreement between the case-notes and the classification by questionnaire in the angina pectoris (group A) or patients with left chest pain (group B).

The case-notes of the 13 patients classified by questionnaire as having other pains (group C) showed that one patient had, in addition to his other pain, well-defined angina on walking, but the angina was felt only in the neck. He was transferred to group A3.

The case-notes of the 46 patients classified by questionnaire as having no chest pain (group D) revealed in one patient repeated episodes of angina on walking, with pain exclusively in the left shoulder, and in another patient angina on walking, with pain exclusively in the jaw. Both were transferred to group A3.

Thus in the total group of 106 patients the case records disagreed with the questionnaire classification in three.

The final classification in Table I shows that more than one-half of these patients (59%) had pain. Angina pectoris (groups A 1, 2, and 3) was the commonest sort of pain, affecting 40 (38%) of the 106 patients. Of these 40, six in group A3 would have been missed by the questionnaire if the restrictive definition of angina had been used. In five of these, pain was felt at sites in the chest other than those specified by Rose, and in one patient pain usually lasted for more than 10 minutes. The questionnaire alone, since it concerned pain felt only in the chest, would also have missed the three other cases with pain respectively in neck, jaw, and shoulder.

The next commonest single pain entity was left chest pain (group B), which 10 patients experienced as a single pain. It also occurred as a second sort of pain in some patients with angina in group A2.

The relation between the patient's memory of the time of onset of his chest pain (question 5) and his first or only heart attack is shown in Table II. Few patients with left chest pain or other pains remembered experiencing pain before their heart attack, whereas angina pectoris preceded the attack by at least one month in 40% of cases.

TABLE II.—Relation Between the Patient's First Experience of Pain and his First or only Heart Attack

Pain Category	No.	Before Infarct	After Infarct
A. Angina pectoris ..	40	16	24
B. Left chest pain ..	10	2	8
C. Other pains ..	12	1	11

Changes in Pain Experience.—Patients replied to the questionnaire at times ranging from six months to three years after their myocardial infarctions. Memory of past illness is

often fallible, and transient pains are often forgotten. The case records of the patients replying "no" to question 1 were therefore examined with particular reference to the frequency with which transient pains had been mentioned. Of the records of the 44 patients replying "no" to question 1 who were finally classified in group D (no pain), 22 contained references to chest pains or discomfort of various sorts as isolated events during the early weeks after their discharge from hospital. A few of the episodes appeared from the notes to have been angina pectoris, but the majority were probably left chest or other pains. Whatever their nature, it is clear that most patients experience at least transient chest pains or discomfort during convalescence from myocardial infarction. The final classification of group D in Table I overestimates the number of patients who have had literally no experience of pain after discharge from hospital.

Supplementary Questions.—Replies to supplementary questions are not considered in detail, for they did not contribute to the classification of the various pains. About one-half of the patients in each pain category indicated that "getting upset about something" brought on the pain (question 11). About one-third of the patients with angina pectoris (group A) and left chest pain (group B) indicated that their pain had sometimes woken them at night (question 12).

Discussion

Most of the patients in this study experienced at least transient chest pains or discomfort of various sorts in the early weeks after they left hospital. Of the pains which became established, angina pectoris was the commonest symptomatic entity, occurring in 40 (38%) of the 106 patients. Of these 40 the restrictive criteria proposed and validated for the diagnosis in epidemiological studies by Rose (1962) were fulfilled in 31 (groups A1 and A2). The other nine patients, in group A3, would have been missed in a field survey depending on these criteria, mostly because their pain was felt at sites other than the sternum or left arm and left anterior chest. This is not surprising, for angina is well known to occur at other sites. Nor does it imply criticism of Rose's criteria, which were designed for population studies in which simplicity, precision, and reproducibility are of the first importance, and in which the object is to attain an index of prevalence rather than a complete case record. Our findings in this pain-prone population suggest that the restrictive criteria may underestimate the prevalence of angina pectoris by about 20%.

As in a preliminary study in other patients in this clinic (Lovell, 1964) about one-quarter of patients with angina pectoris proved to recognize more than one type of pain (group A2). An awareness of the frequency with which multiple pains occur is important for the doctor advising the patient. It is also important in relation to controlled trials of treatment in angina pectoris, for the doctor and the patient may both be confused by failure to recognize multiple pain entities.

A pain defined by replies to the questionnaire as left chest pain (group B) was the next commonest symptomatic entity after angina. It occurred, without angina, in 10 (9%) of 106 patients. This pain often seems to upset patients more than does angina pectoris, and particularly tends to bring them in a state of alarm to the casualty department between their regular clinic attendances. Observations on this pain, which resembles in many ways that found in Da Costa's syndrome, will be discussed elsewhere.

The remainder of the pains, the other pains (group C), appear to be of diverse origin, some probably gastrointestinal and some arising in the shoulder-girdle. This group would include those interesting patients with pain over the sternum induced by emotion, and not by exertion, and lasting for an hour or more. One such patient, born in Yugoslavia and so not included

in this analysis, was a 51-year-old man who had had an extensive anteroseptal infarct. Two weeks after discharge from hospital he started getting a burning type of pain in the front of the chest, lasting for two to three hours, unrelated to food or exertion but coming on when he became excited. Another patient, aged 54, who had had an anteroseptal infarct, noticed sternal pain 12 weeks after discharge from hospital. The pain was precipitated by playing chess, and would last for several hours. It is possible that these are examples of ischaemic heart pain. However, critical examination of the features of the pains in group C suggests that the number, possibly of cardiac origin, is very small. This study suggests, therefore, that answers to the precise questions concerning the relation of pain or discomfort to walking uphill or hurrying, which were formulated by Rose, will reveal the classical effort relation in practically all patients with ischaemic heart pain. This is so even though the feature of the pain which the patient himself may find most striking may not be its relation to effort. With these questions few cases will be missed, provided the criteria regarding site and duration of pain are not too restrictive.

The basis for this investigation was the need to classify patients accurately in order to study factors involved in causing different types of pain. If the classification is valid the patients in the various groups should be distinguishable when relevant factors are measured. This has proved to be the case. Responses to a standard mental stress which have been measured in samples of these patients from the angina, left chest pain, other pain, and no pain groups, show that there are significant differences between the groups, notably in the urinary excretion of 3-methoxy-4-hydroxy mandelic acid, which is the major urinary metabolite of adrenaline and noradrenaline (Nestel *et al.*, 1966), and in changes in the psychogalvanic reflex (Verghese, personal observations). We have also found that these groups differ significantly in their neuroticism scores as measured by the Eysenck Personality Inventory.

Summary

A questionnaire is described with which experience of chest pain was examined in 106 men who had had an acute myocardial infarction between six months and three years previously. Replies were evaluated by reference to clinical notes. Criteria were laid down for classification of patients into the following groups: angina pectoris, left chest pain, other pains, and no pain.

Pains fulfilling the criteria for angina pectoris were the commonest (38% of patients), and those fulfilling the criteria for left chest pain (9% of patients) were the next commonest entities. Patients often recognized more than one type of pain.

The value in the diagnosis of chest pains of carefully formulated standard questions is emphasized.

Restrictive criteria proposed for estimating the prevalence of angina pectoris in population studies may possibly underestimate it by about 20%.

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Appendix : Post-infarction Chest Pain Study

Name
 Age
 Unit No.
 Date
 Date admitted to trial
 Where born

Diagnostic Section

- Since you left hospital in after your heart attack, have you had any pain or discomfort in the chest? Yes No
 If yes:
- Do you recognize more than one type of pain or discomfort?
 Yes No How many types?
- (a) Show me where you feel the pain (or pains)

Pain (a)	Pain (b)
Sternum, upper and middle	Sternum, upper and middle
Sternum, lower	Sternum, lower
Left ant. chest	Left ant. chest
Right ant. chest	Right ant. chest
Left arm	Left arm
Other	Other

 (b) Do you feel it anywhere else?
 Pain (a) Pain (b)
- How would you describe the pain?
 Pain (a) Pain (b)
- For how long have you had the pain?
 Pain (a) Before heart attack After heart attack
 Pain (b) Before heart attack After heart attack
- Do the different chest pains occur at the same time?
- Do you get the pain when you walk uphill or hurry?
 Pain (a) Yes No Never walks uphill or hurries
 Pain (b) Yes No Never walks uphill or hurries
- Do you get the pain when you walk at an ordinary pace on the level?
 Pain (a) Yes No Pain (b) Yes No
- What do you do if you get it while you are walking?
 Pain (a) Pain (b)
 Stop or slow down... Carry on... Stop or slow down... Carry on...
- (a) If you stand still what happens to it?
 Pain (a) Relieved Not relieved
 Pain (b) Relieved Not relieved
 (b) How soon is it relieved?

Pain (a)	Pain (b)
10 min or less... Over 10 min....	10 min. or less... Over 10 min....

 (c) If pain is unrelated to walking: How long does it last?
 Pain (a) Pain (b)

Supplementary questions

- Do any of these things bring on the pain or discomfort?

Pain (a)	Yes	No	Pain (b)	Yes	No
Getting upset about something			Getting upset about something		
Stooping			Stooping		
Eating a meal			Eating a meal		
Taking a deep breath			Taking a deep breath		
Moving left arm			Moving left arm		
Lifting			Lifting		
- Does your pain ever wake you at night?
 Pain (a) Yes..... No..... Pain (b) Yes..... No.....
- Do you take antacids for the pain?
 Pain (a) Yes..... No..... If yes, do they relieve it?.....
 Pain (b) Yes... .. No..... If yes, do they relieve it?.....
- How often do you get the pain?
 Pain (a) Pain (b)
- What do you think the pain is due to?
 Pain (a) Pain (b)
 Subjective estimation of patient's reliability :
 Conclusion :
 Pain (a)
 Pain (b)