MENTAL STRAIN, MORE IMPORTANT THAN STRESSFUL LIFE EVENTS IN MYOCARDIAL INFARCTION

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Abstract- Stressful life events may play an important role in coronary heart disease and sudden cardiac death. This study was performed to compare the frequency of stressful events and mental strain in patients with acute myocardial infarction (MI) and normal population. A case-control study was performed on 50 survivors of MI and 50 controls with no evidence of cardiovascular disease, matched by age, gender, education, race, and number of family members. A questionnaire was used to determine the number of stressful life events. Mental strain was measured by two different scoring methods: self-estimated mental strain, and inferred mental strain. Patients with MI had more stressful life events in contrast to controls but this was not statistically significant ($p = 0.08$). Self- estimated and inferred mental strain during the two preceding years were significantly greater in patients with MI ($p<0.01$, $p<0.05$, respectively). We conclude that emotional strain due to a stressful life event may complicate coronary heart disease and thus result in MI.

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Key words: Myocardial infarction, mental strain, stressful life events

INTRODUCTION

It seems that stress and its relative factors such as personal response and social support affect cardiac function through neuro-psycho-physiologic effects (1). Mental stress - induced ischemia is associated with an increased risk of subsequent cardiac problems in patients with known coronary disease and may occur even in patients with no evidence of ischemia during exercise stress testing (2). Prior to roughly one half of cases of acute myocardial infarction (MI), a precipitating factor appears to be present, such as vigorous physical exercise, emotional stress, or a medical or surgical illness (3). It seems that 20 to 40 percent of sudden cardiac deaths are precipitated by acute emotional stressors (2). Stressful life events can trigger acute MI and sudden cardiac death. Victims of natural disasters, such as earthquakes and other conditions of extreme stress should be evaluated for physical injuries as well as for cardiac disease (4). In an earthquake in Hanshin - Awaji Japan, the number of patients with acute MI during the first 4 weeks after the quake increased by about 3.5 folds, and this increase was prominent among women (5).

In a study performed by Bianchi et al., preceding stressful life events were about 2.5 times more common in MI cases (40 patients) as compared to a matched sample of 40 controls (6). Some studies on male workers have demonstrated that negative change in inferred decision latitude and self - reported job strain and low social support at work are important risk indicators in developing MI. (7-9). Even recall of personal stressful events elicited autonomic nervous system responses in acute MI patients and, therefore, events of personal

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significance are related to the onset of coronary disease (10). Coronary heart disease and MI are important causes of mortality and morbidity, and emotional stressors seem to play an important role in their development, however it is not obvious whether the frequency of stressful life events and the mental strain associated with them are important predictors. This study has been performed to compare the frequency of stressful life events and the associated mental strain in survivors of MI with healthy controls.

MATERIALS AND METHODS

This case-control study was performed on 50 survivors of acute MI (diagnosed by electrocardiographic changes and elevation in cardiac enzymes), and 50 controls (with no evidence of cardiovascular disease in history, physical exam, or ECG). These controls were matched by age, gender, education, race and number of family members with the patients group. Informed consent was obtained after the procedure had been fully explained. In our study, cigarette smoker was defined as a person who had smoked at least 3 cigarettes daily for 3 months. Hypertension was defined as a diastolic blood pressure greater than 90 mm Hg or history of antihypertensive drug consumption. Regular exercise is meant by at least half an hour of aerobic exercises or walking every other day. We have used Paykel's questionnaire (Table 1) to determine the frequency of stressful life events.

Our questionnaire evaluates about 65 stressful life events in the preceding 2 years and earlier and the associated mental strain. Four questions were added to the standard form.

This questionnaire is universal and its reliability and validity have been confirmed in our country (12). We have used two different scoring methods to measure mental strain. To measure self-estimated mental strain, the patients were first asked to score the associated mental strain of stressful life events in "Paykel's questionnaire" as "mild = 1, moderate = 2 or severe = 3.

We measured inferred mental strain by "Holmes social readjustment rating scale" (Table 2) (2).

Because of the differences between Paykel's questionnaire and Holmes social readjustment rating scale, some scores were given based on our own judgment and adjusted with the life events in Paykel's questionnaire. We have used paired T test and Chi square tests to analyze the data; P values of less than 0.05 were considered significant. Linear regression test was used to determine whether those scores given to subjects in Paykel's questionnaire (self-estimated mental strain) were related to those given through Holmes social readjustment rating scale (inferred mental strain).

Table 1. Some items of Paykel's questionnaire. Items 21, 22, 40 and 49 were added to the standard Paykel's questionnaire

No	Life events	Past 2 years	before Past 2 years	Mental strain		
				Low	Moderate	Severe
2	Divorce					
5	Major change in living condition					
6	Menopause					
19	Birth of a child					
21	Addiction of a close family member					
22	Bombardment of the city					
27	Major change in financial state (a lot worse)					
30	Abortion or stillbirth					
40	Infertility					
49	Sexual dysfunction					
64	Pregnancy					

Option No 21, 22, 40 and 49 had been added to the standard Paykel's questionnaire in our form

Table 2. Some options of Holmes' social readjustment rating scale

No	Life event	Mean value
1	Death of spouse	100
2	Divorce	73
5	Death of a close family member	63
7	Marriage	50
12	Pregnancy	40
17	Death of a close friend	37
24	In-law troubles	29
32	Change in residence	20
41	Vacation	15
42	Christmas	12

Our sample size (50 patients and 50 controls) was calculated with power of 80% and confidence interval of 95%, supposing that MI survivors may have 2 more stressful life events, a score of 5 or more for self-estimated mental strain, and 60 or more for inferred mental strain.

RESULTS

The average age in the study group was 56.67 years (standard deviation= 10), and 67.7% of patients were male. Patients with MI had more stressful life events in contrast to controls but this was not statistically significant (P= 0.08) (Fig. 1).

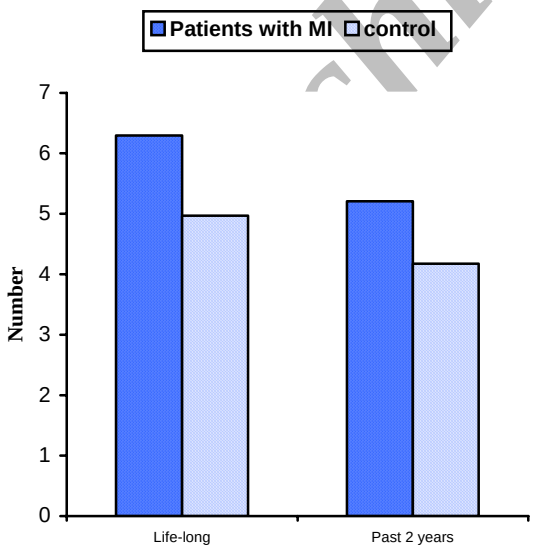

Fig. 1. Number of stressful life events in patients with myocardial infarction and controls (life-long P = 0.089, past 2 years P = 0.1214). Means are given for comparison.

Self-estimated mental strain was significantly greater in patients with MI in the preceding 2 years and earlier (Fig. 2) (P<0.01). Also, inferred mental strain was significantly greater among patients with MI in the preceding 2 years and earlier (P<0.05) (Fig. 3).

Some of the important stressful life events are shown in figure 4. Linear regression analysis showed that self-estimated mental strain measured through the response of patients to Paykel's questionnaire had a positive relationship with inferred mental strain measured by Holmes social readjustment rating scale (P<0.0001, r= 0.6).

Cigarette smoking and hypertension were also more frequent in patients with MI (P = 0.017 and P = 0.02). In our study cigarette smokers had more stressful life events and greater self-estimated and inferred mental strain in comparison to non-smokers (P<0.05), but no relation was observed between the number of family members, cups of tea consumed daily, hypertension, and regular exercise with stressful life events and mental strain. Comparing cigarette smokers with non-smokers, our study showed that smokers had more family members (P<0.05) and a greater daily consumption of tea (measured by number of cups) (P<0.005).

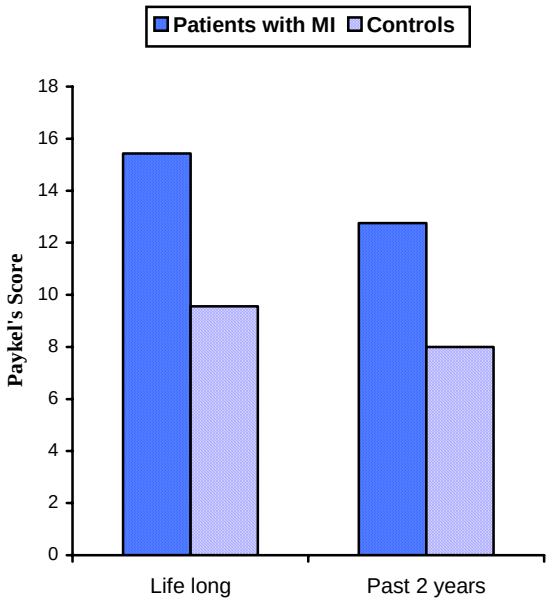

Fig. 2. Self-estimated mental strain in patients with MI in contrast to controls (P<0.05). Self estimated mental strain had been determined by Paykel's questionnaire. Means are given for comparison

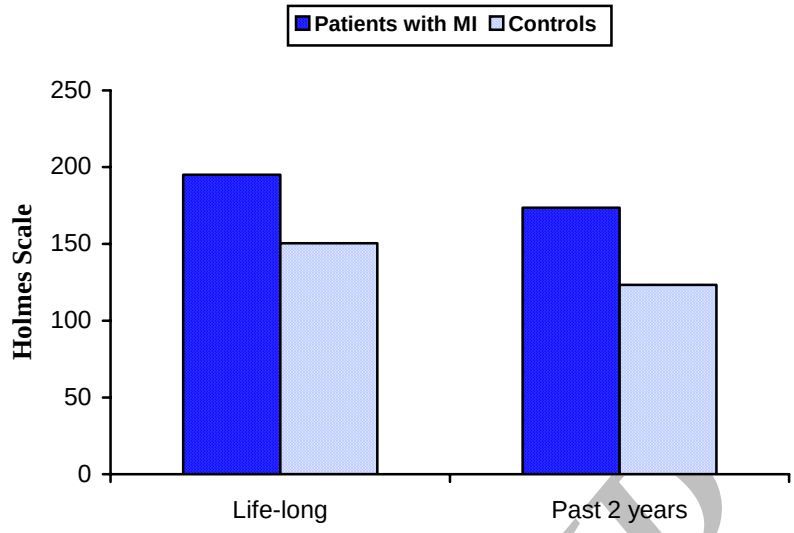

Fig. 3. Inferred mental strain in patients with MI in contrast to controls (P<0.05). Inferred mental strain was scored using Holmes social readjustment scale. Means are given for comparison

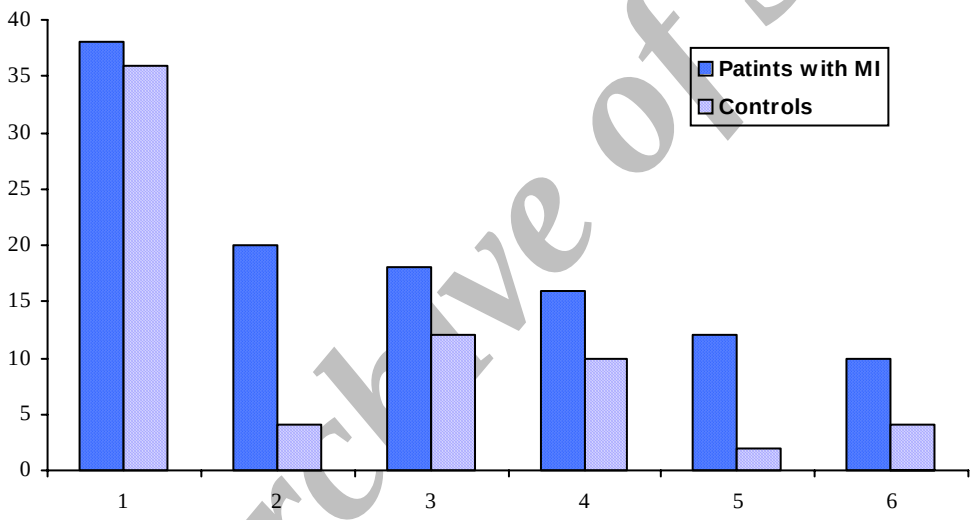

Fig. 4. Some important stressors in our study

1. Income insufficiency or increase in life expense
2. Death of a close family member
3. Argument with spouse
4. Major change in responsibilities in house work
5. Argument with a close friend
6. Summon to the court

DISCUSSION

Patients with MI suffered more mental strain than controls, but stressful life events were not statistically more frequent in these patients. This issue shows that the experienced mental strain is much more important than the number of stressors. Byrne et al. compared 120 patients with unequivocal MI, and 40 patients admitted to coronary care but rapidly discharged without a diagnosis of MI or other serious illness; life event frequency, magnitude

estimation scales of life change and distress, or individual impact scales of life change were not significantly different in the two groups. Individual impact scales of emotional distress did, however, distinguish between the two groups at a statistically significant level, suggesting that patients with MI have interpreted their life event exposure in the year prior to illness onset as being particularly emotionally distressing (12). In our study, cigarette smokers had more stressful life events and greater self-estimated and inferred mental strain in contrast to non- smokers ($P<0.05$). Subjects with more stressful life events and greater mental strain may smoke more cigarettes, and this may lead to atherosclerosis, myocardial ischemia or MI. However, this hypothesis needs to be confirmed by further studies.

Type A behavior pattern has been associated with the onset of MI. Byrne stated that significant correlations were indeed found between a measure of Type A behavior and both reported frequency of life events and estimates of their emotional impact, for a sample of 120 survivors of MI (13). We can presume that patients with MI may suffer more mental strain from the same stressful life events, because of their type A behavior. Welin et al. stated that in addition to known somatic predictors of prognosis after MI, prognosis was strongly influenced by depression and lack of social support, but not to a series of other psychosocial factors (14). Appropriate social support is very important in coping with stress and avoiding its adverse effects. In a study on patients with angiographically proved coronary heart disease, social support had a reverse relationship with coronary heart disease (15). So it seems that social support (9), psychotherapy, teaching patients how to relax (7), teaching them appropriate defense mechanisms and even pharmacotherapy may play a great role in decreasing MI through decreasing mental strain and anxiety. Some investigators believe that stressful life events are so complex that they can be identified only by skilled interviewers, and that self-administered scales are of questionable validity (2). So we have measured self-estimated mental strain and also inferred mental strain by Holmes social readjustment rating scale. Positive strong relationship between these two mental strain scoring systems seems to emphasize on the validity of Holmes social readjustment rating scale in our subjects.

Recall of stressful events is influenced by the problem of retrospective distortion: patients forget, disavow, deny and regress. As a result, when patients are asked to retrospectively report life events, they tend to forget events that are shrouded in the past (3), Therefore the events that occurred in the preceding 2 years seemed to be more important in our study. Another problem is that illnesses such as Ml usually become evident only after long-standing coronary artery disease (3). But we can suppose that emotional strain due to a stressful event of life may complicate coronary heart disease and so develop into catastrophes such as MI and sudden cardiac death. In conclusion, patients with MI suffered more mental strain than controls but patients did not have more stressful life events. So mental strain experienced by subjects may be much more important than the number of stressors. Social support (9), psychotherapy, teaching patients how to relax (7), teaching them appropriate defense mechanisms and even pharmacotherapy may play a greater role in decreasing MI through decreasing mental strain and anxiety.

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