Redefining acute MI: the potential impact on rehabilitation services

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Abstract

Due to the new definition of acute myocardial infarction (AMI) based on the chemical marker troponin, it is predicted that more patients will be defined as having AMIs, some of whom would have been previously labelled 'unstable angina' using the World Health Organization (WHO) criteria. A prospective study was undertaken in order to assess the increase in demand on coronary rehabilitation services. The study looked at patients admitted to Ninewells, Dundee (currently using the WHO definition) with ischaemic symptoms.

Patients' ECG findings, chemical markers creatine kinase (CK), and cardiac troponin-T statistics were documented in order to compare the number of patients having had MI defined by the WHO definition with those having MI under the new ESC/ACC definition.

Included were patients admitted acutely with troponin T data and those referred as in-patients to cardiac rehabilitation.

From all 152 patients admitted to rehabilitation, 39 came from the admissions ward. Nineteen of those were defined as having had an acute MI using the new definition but not with the old WHO definition. The demand for cardiac rehabilitation services would increase by approximately 80% if the new definition were put in place.

Key words: acute myocardial infarction, troponin, cardiac rehabilitation.

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Introduction

The European Society of Cardiology (ESC)/ American College of Cardiology (ACC) joint committee has redefined myocardial infarction (MI).[1] The World Health Organisation (WHO) previously defined a patient with MI as having two out of chest discomfort, enzyme change or ECG changes. Using more sensitive techniques such as troponin level it is thought that an individual formerly diagnosed with severe, stable or unstable angina pectoris might now be diagnosed 'acute coronary syndrome (ACS) with MI'. Troponin's value in predicting risk,[2] thrombus formation[3] and optimum management,[4,5] (heparin, fragmin or glycoprotein IIb/IIIa inhibitors) has been well documented. McKenna and Forfar[6] appreciate the value of more precise risk stratification and more targeted patient management but are concerned about how the patient will feel if diagnosed with a 'heart attack' with the new inclusive definition unexplained. With greater numbers of MIs diagnosed, it is hypothesised that there will be a greater demand on cardiac rehabilitation services.

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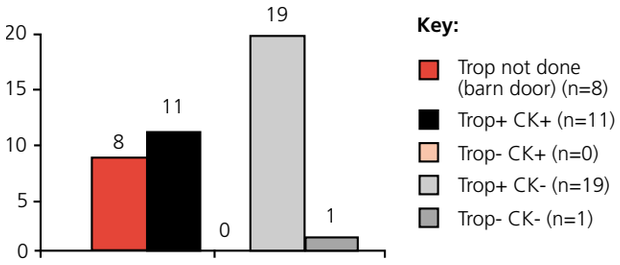
Method

In the three months between December 2001 and February 2002, the investigative results of all patients, (31 patients, mean age 71 years, range 48–88), who were admitted acutely to Ninewells Hospital, Dundee with cardiac chest pain and whose troponin status was measured, were collected prospectively. The ECG changes had to be recent to count as a statistic, creatine kinase (CK) was considered positive if twice the upper limit of normal and the cut-off level for troponin T was 0.1 µg/L.

The numbers of patients with acute MIs defined by World Health Organisation (WHO) criteria, were compared with the

Figure 1. Creatine kinase (CK) and troponin-T (Trop) status of patients with cardiac chest pain on admission: patient numbers versus investigation result



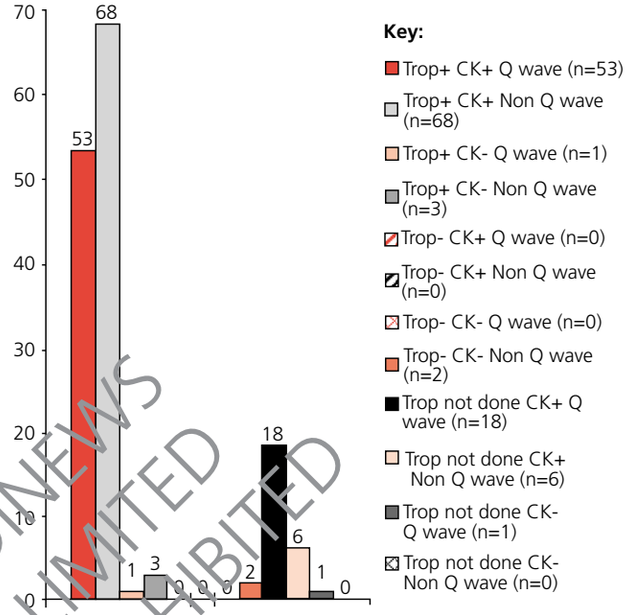
Footnote: Apart from the 'barn-door' infarcts, CK status is equivalent to a WHO MI as all other patients had chest pain and none had Q wave changes or ST-elevation on ECG

Table 1. A table of rehabilitation data, comparing troponin status with CK and ECG findings

Troponin status	CK status	ECG change	Number of patients
Trop+	CK+	Q wave	53
Trop+	CK+	Non Q wave	68
Trop+	CK-	Q wave	1
Trop+	CK-	Non Q wave	3
Trop-	CK+	Q wave	0
Trop-	CK+	Non Q wave	0
Trop-	CK-	Q wave	0
Trop-	CK-	Non Q wave	2
Trop not done	CK+	Q wave	18
Trop not done	CK+	Non Q wave	6
Trop not done	CK-	Q wave	1
Trop not done	CK-	Non Q wave	0
TOTAL			**152**

Key: Trop = troponin; CK = creatine kinase

Figure 2. Cardiac rehabilitation data: patient numbers (n=152) versus investigations



Key: Trop = troponin; CK = creatine kinase

numbers of patients defined with acute MIs under the new ESC/ACC definition using troponin. It was found out how many of these patients went to cardiac rehabilitation services. Cardiac rehabilitation cardiac investigation results were then collected using patient lists and the Tayside database 'fountain'.

Results

Figure 1 shows the statistics for 'WHO MIs' (with CK rises) and those defined by ESC/ACC (positive troponin T). There were no 'WHO MIs' that were not also 'troponin-T MIs'. None of those who were measured for troponin-T status had ECG changes indicative of MI under the WHO definition. None had ST-segment elevation, five had inverted T waves, five had ST-segment depression but none had both inverted T waves and ST-segment depression. A recent splitting of unstable angina class IIIB to incorporate troponin-positive and troponin-negative gives us two different definitions of 19 patients with no ECG changes, CK-negative and troponin-T positive: acute MI according to ESC/ACC,[1] or angina class $IIIBT_{pos}$ according to Hamm *et al*.[7] Two of these patients were in fact referred to rehabilitation.

In the three months between December 2001 and February 2002, a total of 152 patients were referred as inpatients to Cardiac Rehabilitation Services, Ninewells. A total of 149 were diagnosed with MI and three with angina. Table 1 and figure 2 shows the distribution of investigation results for patients referred to cardiac rehabilitation in those three months.

Discussion

The only entrance criterion for cardiac rehabilitation services is a diagnosis of MI, mainly using the WHO definition. It is not clear what the optimum group of patients referred to cardiac rehabilitation services might be: patients with MI as defined by the WHO, patients with positive troponin, or even those with stable angina. It is proposed that if the consensus definition were used the rehabilitation service would have seen an additional 17 patients who had chest pain and positive troponin-T levels but whose chest pain was not defined as an MI under WHO criteria. This would be an increase of 21 to 38 (81%) people referred from the admissions ward over three months. This includes the

Key messages

- Cardiac troponin is a very sensitive and selective measure of myocardial cell death. It forms the basis of the new definition of acute MI
- This study shows an 80% increase in patients diagnosed with acute MI using troponin, compared with the old WHO definition
- An increase in demand for cardiac rehabilitation services and secondary prevention comes at a time when there are moves towards specialist nurse clinics in the primary care setting

'barn door' infarcts with Q waves and CK rises and takes into account the two patients with positive troponin results but a diagnosis of angina. Extrapolating an 81% increase over the total cardiac rehabilitation service would increase the workload from 152 patients in three months to 275 patients in three months. This approximates to an increase from 50 patients per month to 90 patients per month in Tayside.

Cardiac rehabilitation in Dundee offers advice, exercise tolerance tests and exercise classes. It seems that if troponin-T positive patients were included, there might be a shift in demand to advice and patient education. A healthier group also suggests a longer follow-up period, depending on how long it would be appropriate to keep a patient on the rehabilitation list.

Conclusion

The current study confirms that there is a significant group of patients with a positive troponin T but in whom all other relevant biochemical or ECG findings are negative. If patients in this group were defined as having had an MI, as they would using the ESC/ACC definition, and the entrance criterion for coronary rehabilitation services remained 'all patients with MI', the demand for rehabilitation services would increase by approximately 80%. The additional patients who would be referred to cardiac rehabilitation may have a better prognosis than the patients with MI defined by WHO criteria. The extra patients might live for longer, perhaps increasing demand for follow-up, possibly teamed with specialist nurse-led primary care secondary prevention clinics.

This study demonstrates an emerging need for reorganisation and further resource allocation for cardiac management and rehabilitation pending further research and larger studies of this kind.

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