A study on survivors of acute myocardial infarction developing transient ischemia on Holter monitoring

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Abstract

Introduction: Increasing array of medical intervention available to modify the likelihood of developing recurrent episode of myocardial ischemia, it is important to identify patients of risk of provocable myocardial ischemia before discharge. Material Methods: longitudinal study carried out in a tertiary care hospital of central India, over a period of one year. During the monitoring period, the patient was once subjected for 100-meter brisk walk. Result: Out of 64 cases, 6 (9.5%) cases developed ischemia during Holter, in male it was 5(10.2%) while in female it was 1(6.67%). 6.3% of total cases suffered from sustained VT during hospitalization.42.5% of cases of anterior wall myocardial infarction were presented with sinus tachycardia, it was found to be statistically significant(χ² = 73.55, p<0.001). Conclusion: After acute myocardial infarction, pre-discharge Holter monitoring (including brisk walk) is a good non-invasive method to detect ischemia in high risk patients.

Keywords: Holter Monitoring, Myocardial Infarction, Tobacco
episode by introducing a 100- meter brisk walk during Holter monitoring. Finally, the aim of the study was to determine that with addition of 100 meter brisk walk, whether pre-discharge Holter monitoring can be taken for pre-discharge sub-maximal exercise stress test for the detection of ischemia after acute myocardial infarction in patients who are not fit for stress test, to determine the baseline characteristics of survivors of acute myocardial infarction and its correlation with transient ischemia on holter recording.

Material and Methods
The present longitudinal study was carried out in the medicine department in a tertiary care hospital of central India, during the period of July 2002 to October 2003. After the ethical committee approval all the cases during the study period fulfilling the inclusion and exclusion criteria were included in the study. The inclusion criteria was, those who had acute myocardial infarction suggested by 12 lead ECG were included in the study. Electrocardiographic diagnosis for acute myocardial infarction was made as when: - ST elevation more than 2 mm, or abnormal Q wave > 2 mm > 25% of R wave in same lead, or QS complex. Right ventricular infarction was diagnosed when: - ST elevation in V1 (>1mm) V1, R-V1, R or ST depression in V2.,50% of ST elevation in a aVF or ECG evidence of inferior wall or inferior posterior wall infarction. Electrocardiographic evidence of sub endocardial infarction were – ST depression and deep inverted T wave in mild precordial leads (symmetrically) lead I and II. Exclusion criteria were- patient that were unable to ambulate – cerebrovascular accident, cardiac failure (NYHA-IV) on the day of test or those denying a written consent for Holter monitoring or patient presenting with Left Bundle Branch Block(LBBB). After confirmation of diagnosis of acute myocardial infarction these patients were treated by Nitroglycerin, Aspirin, Heparin, clopidrogel along with conventional symptomatic drugs for pain relief etc. Thrombolytic therapy was given in appropriate cases. Before the patient were discharged all the patients were subject to 24 hours Holter monitoring after the written informed consent. The Digi track plus Holter monitoring was used; it was a battery operated solid state recorder for 24 to 48 hours of continuous recording for ambulatory patients. It was a 3 channel frequency modulated, with frequency response of 0.05 hertz to 60 hertz. Patient was given a diary in which he/she had to maintain full record of his/her symptoms, activity and time during the monitoring period. Event signal button was explained to the patient. During the monitoring period, the patient was once subjected for 100-meter brisk walk. Patient was asked to walk to his/her maximum speed and try to complete 100 meter as early as he/her could (1 to 3 minute). Patients were instructed to give up the walk if any symptoms like chest pain, palpitation, perspiration and ‘ghabrahat’ arose. After the walk patient’s vitals were examined and were kept under observation for at least one hour or more as required. All the Holter equipment performed in accordance with the American Heart Association specification with respect to the rate and frequency response necessary to record ST segment alteration reliability. The Zymed Holter Scanner for window 1810 scans a 24 hours ambulatory ECG; detect arrhythmia and ST segment changes and heart rate variability. Report include the cover page, documented electrocardiographic strips, supraventricular and ventricular arrhythmia summary, ST changes summary, heart rate variability and QRS morphology description is prepared which was then scanned manually and final reporting was done.

The collected data were entered and analyzed using Microsoft office window excel 2007 and SPSS version 16 (SPSS 16.0 for Windows, release 16.0.0. Chicago: SPSS Inc). Frequencies of all variables were taken to check frequencies. To show the association or difference for categorical data chi square test was applied. We considered the association or difference to be significant when the p value was less than 0.05.
than 90mm Hg ST segment changes during Holter monitoring and this was found to be significant ($\chi^2 = 102.7, p<0.001$). 40 out of 64 cases (62.5%) were having minimum heart rate between 41 to 60 bpm and 1 case (16.7%) whose heart rate was <40 bpm during holter monitoring developed Ischaemia. 33 out of 64 cases (51.6%) had maximum heart rate between 101-120 bpm during Holter. 8.7% cases with supraventricular premature complex developed ST segment depression during Holter monitoring ($\chi^2 = 35.55, p<0.001$). 33.3% cases with ventricular premature complex more than or equal to 10 bpm and 2 out of 12 cases (16.7%) with atrial runs developed ST segment depression during Holter monitoring ($\chi^2 = 10.55, p<0.001$). 45.3% cases achieved 65% to 74% of THR during Holter monitoring which was found to be highly significant. 21 cases (32.8%) out of 64 cases were able to attain more than equal to 75% target heart rate.

**Fig.1 Age and gender wise distribution of cases**

![Age and gender wise distribution of cases](image-url)

**Table No 1: Association of type of myocardial infarction with ischemia recoded during Holter monitoring**

| Type of MI                  | Total(n=64) | Ischemia during Holter monitoring |
|-----------------------------|-------------|----------------------------------|
|                            | No. | %   | No. | %   |
| AWMI                        | 40  | 6.25| 4   | 10  |
| IWMI                        | 16  | 12.5| 1   | 6.25|
| combined (AWMI + IWMI)      | 8   | 12.5| 1   | 6.25|
| **Total**                   | 64  | 9.4 | 6   | 9.4 |

Table No. 1 shows AWMI had significant number of cases 4(66.7%) developed ischemia on holter ($\chi^2 = 17.55, p<0.001$). 33.3% of cases who had CCF during hospitalization developed ST segment change during holter monitoring ($\chi^2 = 35.9, p<0.001$)

**Table No: 2 Distribution of cases according to complication during hospitalization and their relationship with ischemia during Holter monitoring.**

| Complication during hospitalization | Total(n=64) | Ischaemia detected Holter monitoring |
|------------------------------------|-------------|-------------------------------------|
|                                    | No. | %  | No. | %  |
| LVF                                | 24  | 37.5| 4   | 16.7|
| CCF                                | 3   | 4.7 | 1   | 33.3|
| Cardiogenic shock                   | 2   | 3.1 | 0   | 0   |
| Pericarditis                        | 2   | 3.1 | 0   | 0   |

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6.3% of total cases suffered from sustained VT during hospitalization. 42.5% of cases of anterior wall myocardial infarction were presented with sinus tachycardia, it was found to be statistically significant ($x^2 = 73.55$, $p<0.001$).

Table No: 3 Distribution of cases according to Arrhythmia during hospitalization and ST change during Holter monitoring.

| Arrhythmia during Hospitalization | Total(n=64) | Ischaemia detected Holter monitoring |
|----------------------------------|------------|-------------------------------------|
|                                 | No.   | %   | No.   | %   |
| Ventricular tachycardia          | 4     | 6.3 | 1     | 25  |
| PSVT                             | 1     | 1.6 | 0     | 0   |
| Atrial fibrillation              | 1     | 1.6 | 1     | 100 |
| isorhythmic Dissociation         | 1     | 1.6 | 1     | 100 |

14.28% of cases whose heart rate at admission was more than equal to 100 bpm developed ST segment depression in Holter monitoring ($x^2 = 13.4$, $p<0.001$).

**Discussion**

Ischemia following acute myocardial infarction is a known phenomenon. It may be symptomatic or asymptomatic. With the technical development in ambulatory ECG (Holter), for the measurement of ST segment alteration it is possible to detect episodes of ischemia more accurately. It is well known fact that excersise stress ECG, thallium scintigraphy, radionuclide ventriculography or echocardiography are methods for detecting ischemia in post infarction patients. Present study consisted of 64 cases of acute myocardial infarction admitted in medicine department of tertiary care institute of central India. Out of 64 cases, ischemia was recorded in 6 cases (9.4%). Out of these 6 cases, 4 cases were of AWMI (66.6%) and 1 (16.7%) each of IWMI and combined MI (AWMI + IWMI). Similarly Astrallet al [9] reported MI in 14% of their patients and in another study Curie P[10] also reported 14%. During hospitalization 37.5%(24 out of 64) cases developed LVF, two out of 64 (3.1%) cases developed cardiogenic shock and 3 out of 64 (4.7%) developed CCF and 2 out of 64 (3.1%) cases developed pericarditis. In the present study, 33.3% (1 out of 3) cases who had CCF during hospitalization developed ischemia during Holter monitoring. Mickley (1993) [13] who found in 22% cases. Two out of 4 (50%) cases of hypotension developed ischemia during holter monitoring while 4 of 50 (8%) normotensive cases developed ischemia. This shows that the patients who present with hypotension at admission have more chances of developing ischemia in post infarction period. One out of 6 (16.7%) cases whose minimum heart rate during holter monitoring was less than 40 bpm recorded ischemia during holter monitoring. SVPC was the most common arrhythmia recorded in 57 out of 64 (89%) with equal distribution in anterior wall myocardial infarction, inferior wall myocardial infarction and combined infarction as compared to Cristal et al (1975)[14] who
recorded them in 36%. Atrial pair was found in 28% and atrial run in 18.18%, none of the case had atrial flutter or fibrillation. Berisso et al (1990)[15] found SV tachyarrrhythmia in 13% of the cases. After acute myocardial infarction, while predischarge holter monitoring, if patients is put on exertion (noy on TMT) like brisk waking he can achieve heart rate, while is comparable to heart rate achieved during submaximal exercise test. In these cases, who had achieved THR more than or equal to 75% it can be taken that their submaximal stress testing has been done. In such patients while analyzing holter record, heart r-te and ST segment changes could be evaluated.

Conclusion

After acute myocardial infarction, pre-discharge Holter monitoring (including brisk walk) is a good non-invasive method to detect ischemia in high risk patients who had suffered from sustained ventricular tachycardia, congestive cardiac failure, cardiogenic shock during hospitalization and are not suitable for submaximal exercise stress test. By addition of 100-meter brisk walk during holter monitoring, patients who can achieve THR of more than 75% need not carry out submaximal stress test.

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