Original Research Paper

Cardiology

TO EVALUATE THE INCIDENCE OF SILENT ARRYTHMIAS IN PATIENTS WITH ACUTE ST-ELEVATION MYOCARDIAL INFARCTION AND TO PREDICT FUTURE RISK OF SUDDEN CARDIAC DEATH

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ABSTRACT

BACKGROUND- Silent arrythmias and sudden cardiac death are common consequences of acute myocardial infarction. The purpose of this study is to detect the incidence of ventricular arrhythmias in STEMI patients by a cost effective noninvasive modality holter and to predict future risk of sudden cardiac death by follow up of these patients .

MATERIAL & METHODS. 175 patients of acute myocardial infarction were included and were subjected to 48 hour holter monitoring ,to look for any significant ventricular arrhythmias (pairs, runs, NSVT,VT). On the basis of holter finding patients were divided in two groups, one with significant ventricular arrythmias i.e. Group 2 (n=69) and other with no such findings i.e. Group 1 (n=101).Both groups were followed over a period of one year at3,6 and 12 months interval for functional class and sudden cardiac death.

RESULT: Out of 175 patients ,five of which lost to follow up ,Ventricular arrhythmias noted in 61 (34.85%) . At 12 months there were over all 2 (1.83%) SCD in group 1 and 7(11.47%) in Group 2 ,the difference between two groups when SCD was compared found to be highly significant, (pvalue < 0.01), when overall mortality between two groups were compared it was seen that there were overall more deaths in Group 2 11(18.03%) and 7(6.42%) in Group1 ,and the difference was found be highly significant,(p value < 0.03).

CONCLUSION: This study showed that incidence of ventricular arrhythmias is high in immediate post MI period .The study also showed that incidence of SCD is higher in patients ventricular arrhythmias when analysed at 12 months, so the risk stratification for patients who are likely candidates for ICD should be done early.

KEYWORDS : Assess, Quality of Life, Elderly, Old Age Homes.

BACKGROUND

Silent arrythmias and sudden cardiac death are common consequences of acute myocardial infarction.[1,2]

Sudden death (SD) in patients after myocardial infarction is generally caused by ventricular tachy-arrhythmias. Accurate identification of patients prone to develop ventricular arrhythmias (VA) by noninvasive methods is highly desirable to rationally treat the group of patients at high risk.[3]

The literature suggests most VAs after MI occur within 48 hours. Older age and higher Killip class have been consistently associated with the development of VAs after MI, although other variables such as male sex, hypertension and hypotension, conduction disturbances, location of MI, and tobacco use have also been associated with development of VA.[4]

Holter-based risk variables have been suggested to be useful for screening patients at risk for SCD among survivors of acute myocardial infarction (AMI). Early studies on the use of ambulatory ECG-recordings (48-hr Holter monitoring) in the risk stratification of patients post AMI reported that the detection of ventricular arrhythmias, most often non-sustained VT or frequent premature ventricular complexes (PVCs), is predictive of serious arrhythmic events and death. [5]

Holter monitoring is a noninvasive easy to perform test which provides information of arrythmias post AMI with an acceptable senstivity and specificity.[6]

The purpose of this study is to detect the incidence of ventricular arrhythmias in STEMI patients by a cost effective noninvasive modality holter and to predict future risk of sudden cardiac death by follow up of these patients .

STUDY DESIGN

The present study is an prospective , observational study in acute STEMI patients conducted in department of cardiology ,PGIMER Dr RML hospital New Delhi between January 2012 to June 2013.

SELECTION OF PATIENTS

The study included 175 consecutive patients who had acute STEMI between January 2012 to December 2012.

INCLUSION CRITERIA

• Patients of acute STEMI with age>18years presenting within 24 hours of index event.

EXCLUSION CRITERIA

1) Patients of NSTEMI/UA/CSA.
2) Patients with electrolyte abnormalities
3) Mentally challenged patients
4) Patients with recent or old MI.
5) Patients who refused to stay in hospital for 48 hours or more.
6) Patients who will undergo primary angioplasty for acute STEMI.
7) Patients with previous h/o PTCA or CABG.

For the purpose of analysis ,acute STEMI requires two of the following criteria

a) Chest pain: more than 30 minutes or equivalent symptoms.
b) ECG: ≥0.1 mV ST-elevation in two adjacent limb leads, and/or ≥0.2 mV ST elevation in two adjacent precordial leads, or newleft bundle branch block,or appearance of new Q-waves (≥0.03 s).

Patients were then subjected to 48 hour holter monitoring , after 48 hours holter report was analysed for irregularities such as-

1) Abnormal complexes-abnormal QRS shaped complexes with coupling interval of >80% of the preceding RR interval.
2) Ventricular extra systole-Abnormal QRS shaped beats with a coupling interval <80% of the preceding RR interval.
3) Pairs-two consecutive abnormal QRS shaped beats
4) Runs-three or more abnormal QRS shaped beats with a heart rate <120 per minute.

5) VT-three or more consecutive abnormal QRS shaped beats with a rate of >120 per minute.
6) Repititive ventricular arrythmias-pairs, runs and VT.
7) Supraventricular ectopics & runs of supraventricular tachycardia.

On the basis of holter findings the study population was divided into two groups:

One group consisted of patients showing >10 VPC"s per hour and/or runs of NSVT and the other group consisted of those patients who showed no significant findings on holter. The two groups were then observed for a period of one year by regular follow up, to look for development of any clinically significant event. The study results between the groups were then compared after one year of follow up.

STATISTICAL ANALYSIS

All the continous variable were presented as the mean and non parametric data were reported as percentage . We performed chi-square test ,which is used for testing hypothesis about nominal data .Survival analysis was done by using Kaplan meir curve .Statistical analysis was conducted with IBM SPSS 17.0 for windows and medcalc version 11.5.0 . All the comparisons were performed with two tailed P values .The results were considered significant at p value <.O5

RESULTS

Most important finding noted in this study is the detection of silent arrhythmias in acute STEMI patients .Out of 175 patients ,five of which lost to follow up ,Ventricular arrythmias noted in 61 (34.85%) which constituted Group 2 of this study. Out of these 35 (20%) had >10 VPC"S/hour,19(10.85%) had runs of NSVT on holter and 7(4%) of patient had either sustained VT or episode of ventricular fibrillation.(Table-1)

TABLE -1 SHOWING ARRYTHMIAS DETECTED BY 48 HOUR HOLTER MONITORING IN ACUTE STEMI PATIENTS

PARAMETER	TOTAL POPULATION(N=175)
>10VPC"S /HOUR	35(20%)
NSVT	19(10.85%)
VT/VF	7(4%)
TOTAL EPISODES	61(34.85%)

Figure -SHOWING PROPORTION OF VARIOUS ARRYTHMIAS DETECTED ON HOLTER
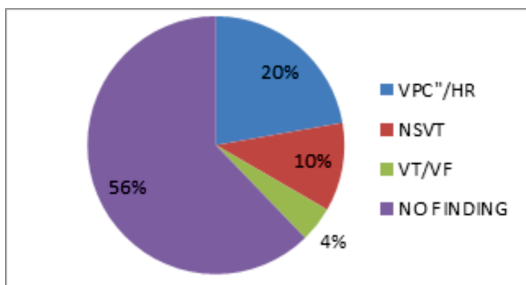
Based on the Holter findigs , patients were divided into two groups (Table-2).

Group 1: No significant finding on holter
Group 2: Presence of >10 VPC"s per hour,NSVT or sustained VT/VF on Holter
In Group 1 (No findings), there were 109(64.11%) patients; in Group 2 (positive findings),there were 61(35.89%) patients.

TABLE -2 DISTRIBUTION OF CASES IN TWO GROUPS

Groups	Number of patients	Percentage
Group 1:	109	64.11%
Group 2:	61	35.89%
TOTAL	170	100%

TABLE-3 SHOWING BASELINE CHARACTERSTICS & RISK FACTOR PATTERNS IN TWO GROUPS

PARAMETER	GROUP1(N=109)	GROUP2(N=61)	P value
AGE (in yrs mean ±SD)	58.71±12.43	60.54±13.67	0.10
MALE(%)	79(73%)	49(81%)	0.325
SMOKER (current/reformed)(%)	62(57%)	45(73%)	0.056
HYPERTENSION (%)	59(54%)	41(67%)	0.13
DIABETES MELLITUS(%)	36(33%)	24(39%)	0.53
FAMILY H/O CAD (%)	27(25%)	16(26%)	0.96
TYPE OF MI (%) AWMI IWMI LWMI KILLIP I/II KILLIPIII/IV	68(63.30%) 32(29.35%) 9(8.25%) 102(91.75%) 11(8.25%)	42(68.85%) 17(17.68%) 2(3.27%) 49(80.24%) 12(19.76%)	0.574 0.141 0.346 0.05 0.052
MEDICATION (%) THRMBOLYSED ANTIPLATLETS ATORVASTATIN B-BLOCKER ACE-INHIBITOR/ARB AMIODARONE	97(89%) 109(100%) 107(99%) 80(73%) 70(64%) 2(2%)	47(77%) 61(100%) 59(97%) 49(81%) 43(71%) 5(8%)	0.06 - 0.725 0.32 0.44 0.13
LVEF(mean ±SD)	40.76±5.9%	33.11±3.7%	.001

FOLLOW UP RESULTS

Patients were followed up over a period of 12 months . Patients were followed up at an interval 0f 3, 6 and 12 months . At each visit functional status of the patients were assessed .Any mortality which occurred was enquired telephonically and by mail.
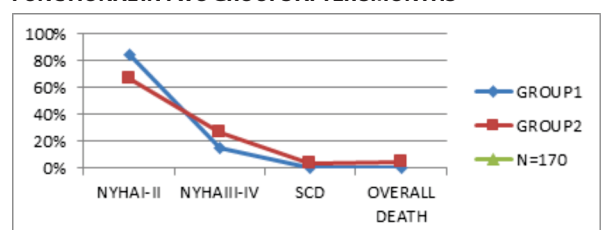
At 3 MONTHS

At 3 months it was found that 93(85.32%) patients in Group 1 and 41 (67.21%) patients were in NYHA class I-II .On the other hand patients in Group 2 were more sick ,16(26.22%) in Group 2 and 16 (14.68 %) patients in Group 1 were in NYHA classIII-IV. When deaths were compared there were no death reported in group 1 but there were 3(4.91%) death in group 2 were reported out of which 2 (3.27%) fulfilled the criterion of sudden cardiac death.(TABLE—4)

TABLE 4 SHOWING FOLLOW UP RESULTS AFTER 3 MONTHS

PARAMETER	GROUP 1(N=109)	GROUP2(N=61)	P VALUE
NHYA I-II	93(85.32%)	41(67.21%)	0.01
NYHAIII-IV	16(14.68%)	17(27.86%)	0.06
SUDDEN DEATH	0	2(3.27%)	0.24
OVERALL DEATH	O	3(4.91%)	0.08
TOTAL SURVIVED	109	58(95.08%)	0.08

FIGURE -2 SHOWING PROPORTION OF DEATHS AND FUNCTIONAL IN TWO GROUPS AFTER 3MONTHS

AT 6 MONTHS FOLLOW –UP

As was seen at 3 months relatively more number of patients in

Group 1 had better functional class when compared to Group 2 , 83 (76.14%) patients in Group 1 and 35(57.37%) in Group 2 respectively were in NYHA class I-II on the contrary more number patients had worsened heart failure symptoms and 19(31.14%) and 23(21.10%) patients were in NYHAIII-IV in Group 2 and Group 1 respectively.

There were overall 3 (2.75%) deaths in GROUP 1 out of which 1(0.91%) was reported as sudden. In Group 2 there were overall 4 deaths and when the deaths from last visit were added there were 7 (9.83%) deaths in Group 2 out of which reported as 2 (4.91%) were reported as sudden.(Table-5)

TABLE-5 SHOWING FOLLOW UP RESULTS AFTER 6MONTHS

PARAMETER	GROUP 1(N=109)	GROUP2(N=61)	P VALUE
NHYA I-II	83(76.14%)	35(57.37%)	0.01
NYHAIII-IV	23(21.10%)	19(31.14%)	0.29
SUDDEN DEATH	1(0.91%)	2+2=4(6.55%)	0.1
OVERALL DEATH	3(2.75%)	3+4=7(11.47%)	0.04
TOTAL SURVIVED	106(97.24%)	54(88.52%)	0.04

FIGURE-3 SHOWING PROPORTION OF DEATHS AND FUNCTIONAL IN TWO GROUPS AFTER 6 MONTHS
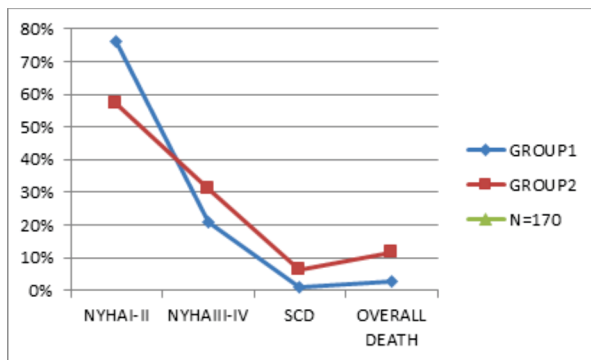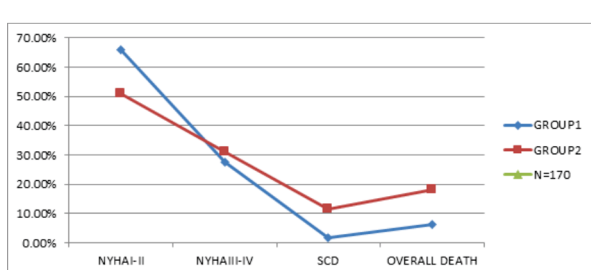

AT 12 MONTHS

After 12 months of follow up 72 (66.06%) and 31(50.81%) were in NYHA class I-II in Group 1 & 2 respectively.30 (27.52%) patients in Group 1 and 19(31.14%) patients in Group 2 were in NYHA class III-IV. When deaths were compared there was rise in mortality in both groups.There were overall 7 (6.42%) deaths at 12months out of which 2(6.42%) deaths were sudden.In Group 2 there were overall 11 (18.03%) and out of this significant amount of deaths were sudden cardiac deaths i.e 7(11.47%).(Table-6)

TABLE -6 SHOWING FOLLOW UP RESULTS AFTER 12 MONTHS

PARAMETER	GROUP 1(N=109)	GROUP2(N=61)	P VALUE
NHYA I-II	72(66.05%)	31(50.81%)	0.05
NYHA III-IV	30(27.52%)	19(31.14%)	0.74
SUDDEN DEATH	1+1=2(1.83%)	4+3=7(11.47%)	0.01
OVERALL DEATH	3+4=7(6.42%)	7+4=11(18.03%)	0.03
TOTAL SURVIVED	102(93.57%)	50(81.96%)	0.037

FIGURE-4 SHOWING PROPORTION OF DEATHS AND FUNCTIONAL CLASS IN TWO GROUPS AFTER 12 MONTHS

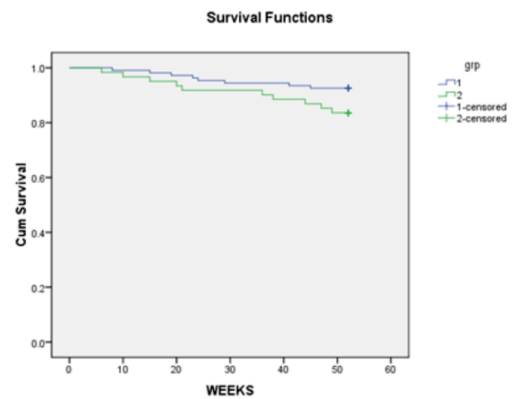**SURVIVAL ANALYSIS AT 12 MONTHS**

Fig 5 -Kaplan–Meier Estimates of the Cumulative Risk of Death from Any Cause, According to Study Group. After 52 weeks

In subgroup analysis it was also found that LVEF is the most important determinant for survival at 1year.

It was observed that at 1 year only 3(3.15%) deaths were reported in patients with LVEF > 40% and 15 (17.33%) deaths were reported in patients with LVEF <40% , the difference was found to be highly significant.

OUTCOME	GROUP A (N=103) EF<40%	GROUP B (N=67) EF>40%	P VALUE
DEATH	15(14.56%)	3(4.47%)	0.04
SURVIVED	88(85.14%)	64(95.53%)	0.04

DISCUSSION

The present study was done in the patients of Dr Ram Manohar Lohia Hospital &PGIMER from 1/1/2012 to 1/6/2013 to assess the risk of silent arrhythmias ,associated risk factor and outcome of these high risk patients at 1 year. Dr RML hospital is a tertiary care hospital and referral center catering to a wide urban and rural population.

INCIDENCE

Out of which 4% patients had complex ventricular arrhythmias ,whereas Henkel etal reported complex ventricular arrhythmias in 4.3% patients [53] and Mehta etal reported complex ventricular arrhythmias in 3.6% [52] in their respective studies.Thus,the incidence of complex ventricular arrhythmias in our study were comparable to previous studies but our study had more incidence of overall ventricular arrhythmias(34.81%) than previous studies.One reason for that may be that as our hospital is tertiary care hospital,where majority of patients reach hospital late due to referral and did not receive any reperfusion therapy.Secondly ,those who were thrombolysed also reached late, and had failed thrombolysis and were more likely candidates for primary PCI.7,8

In our study smokers were found to had more tendency for silent arrhythmia ,and it was found to be statistically significant 73% of patients in Group2 Vs 57% of patients in Group1 were smokers (p <.050) and when we compare it with previous studies there were 46% smokers in haghzoo etal ,60% in makikallo etal and 38% in kuchar etal study respectively.5,9.

Mean LVEF in patients who developed ventricular arrhythmias in our study was 33% and that who did not have ventricular arryhtmias were 40% ,the difference was highly significant pvalue <.001 .The probability of ventricular arrhythmias occurrence in patients with LVEF 15% is 81% while in patients with LVEF 50% was merely 4%.

At 12 months there were over all 2 (1.83%)SCD in group 1 and

7(11.47%) in Group 2 ,the difference between two groups when SCD was compared found to highly significant, (pvalue 0.01).When overall mortality between two groups were compared it was seen that there were overall more death in Group 2 11(18.03%) and 7(6.42%) in Group1 ,and the difference was found be highly significant,(p value 0.03)

Our study was comparable to other previous studies but there is slightly higher mortality rate observed in our study ,emphasising the role of early reperfusion therapy in preserving LVEF.

Haghzoo etal in a study of 137 patients post MI with complex ventricular arrhythmias when followed up over a period of one year there were 13 deaths (9.5%) out of which 9 deaths (6.6%) were reported sudden[6], so overall there was increased overall mortality but incidence of SCD were almost similar

Olson HG etal patients with complicated VEDs at discharge (2 weeks after AMI) or during the first 4 weeks after discharge (3 to 6 weeks after AMI) were significantly more likely to have sudden death at follow-up compared to patients without complicated VEDs. Of the six sudden death patients, four (66%) had complicated VEDs at discharge compared to 18 of 68 survivors (26%) (p less than 0.05). One of three patients who died of recurrent AMI had complicated VEDs.[10]

In subgroup analysis it was also found that LVEF is the most important determinant for survival at 1year.

It was observed that at 1 year only 3(3.15%) deaths were reported in patients with LVEF > 40% and 15 (17.33%) deaths were reported in patients with LVEF <40% , the difference was found to be highly significant.

Reduced left ventricular ejection fraction in most of the studies proved to be the most
consistent independent risk factor for cardiac death in multivariate analyses.[11]

CONCLUSION
This study showed that incidence of ventricular arrhythmias is high in immediate post MI period .

Incidence of ventricular arrhythmias was slightly higher in our study because substantial amount of patients did not received any reperfusion therapy,thus early reperfusion is of utmost importance in STEMI patients.

Although our study did not included those patients ,who underwent PCI but literature shows that there is substantial evidence that incidence of ventricualar arrhythmias is less in patients who undergo primary PCI rather than thrombolysis.
The study also showed that holter is an acceptable ,costeffective and non-invasive modality to detect ventricular arrhythmias in STEMI patients.

The present study confirms the predictive value of NSVT /VPCs in the modern treatment era. It predicted both SCD and non-SCD in the present analysis.

This study showed that incidence of SCD is higher in patients ventricular arrhythmias when analysed at 12 months so the risk stratification for patients who are likely candidates for ICD should be done early.

The study also showed that LVEF is also strong independent predictor of SCD in this subset of population of patients and thus combining the two modalities holter and LV function assessment for future risk stratification of these high risk patients can be helful in limiting both morbidity and mortality in this group of patients.

STUDY LIMITATIONS
Our study included only those patients who were either thrombolysed or were presented late and did not included PCI patients so there is no head to head comparison between such patients in our study,especially when primary PCI has raised as treatment of choice in the recent past.

Holter although costeffective and non invasive modality for detecting arrhythmias but its use is limited by its low sensitivity .

Newer holter variable such as Post ectopic turbulence slope and SAECG and EP studies although invasive but more specific and sensitive to detect arrhythmias.

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