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Prognostic Factors of Mortality in Post-Myocardial Infarction Patients: A 24-Hour Rhythmic Holter Observational Study

Franck Ekoba Othende, Fatima Rebbouh, Ousmane Diawara

Cardiology and Vascular Diseases Department, CHU MOHAMED VI, Marrakech, Morocco
Email: fbienv@gmail.com

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Abstract

Background: Heart dysfunction and sudden death are common complications in post-myocardial infarction. **Purpose:** This study aims to contribute to improving patient's management by determining the factors correlated to the occurrence of left ventricular dysfunction or post-infarction sudden death. **Method:** It was a transversal, descriptive and analytical study conducted from January to October 2021. **Results:** The variables studied covered epidemiological, therapeutic and electrocardiographic aspects. There were 102 patients admitted for a recent revascularized myocardial infarction or not who had received a 24-hour ECG Holter after the acute phase of coronary event. The study population was predominantly men 88% versus 12% women with a sex ratio of 0.15. The discharge prescription was 74% antiarrhythmic, 91% platelet antiaggregator and 14% anticoagulant. Electrical abnormalities consisted of supraventricular extrasystoles in 45% of cases, ventricular extrasystoles in 61%, atrial fibrillation in 19% and supraventricular tachycardias in 11% ($p < 0.05$). **Conclusion:** The prognostic factors associated with the onset of post-infarction complications were ventricular arrhythmias ($p < 0.04$), atrial fibrillation ($p = 0.01$), the side effects of antiarrhythmics ($p < 0.04$), variability and turbulence of heart rate ($p = 0.05$).

Keywords

Myocardial Infarction, Supraventricular Extrasystole (SVES), Ventricular Tachycardia (VT), Myocardial Infarction (MI)—Morocco

1. Introduction

Myocardial necrosis involves the management of three types of potential complications including a recurrence of a coronary transient ischemic accident as a

residual angor, but also the progression to left ventricular dysfunction within a variable time frame. Finally, we must not lose sight of the incidence of ventricular rhythm disorders that can be responsible for sudden death. The occurrence of ventricular rhythmic events post-infarction is closely correlated with the extent of ventricular necrosis and dysfunction. Indeed, the incidence of sudden death after an uncomplicated myocardial infarction without significant alteration of the LVEF is less than 1% to 1 year [1]. In contrast, studies in cardiac insufficiency confirm that sudden mortality accounts for 20% - 60% of all deaths. It is, therefore, clear that the problem is multifactor [2]. In order to contribute to the prevention of hemodynamic and rhythmic complications in post-myocardial infarction and reduce the occurrence of sudden death, we carried out this scientific work.

2. Patients and Method

This is a descriptive and analytical transversal study with retrospective data collections conducted from January to October 2021 at the non-invasive cardiological exploratory laboratory of Marrakech University Hospital. The inclusion criteria were patients who presented a recent revascularized or not myocardial infarction who benefited from the implementation of 24-hour ECG Holter in post-acute infarction. The ECG Holter data was extracted from Morata software and then interpreted. The clinical and epidemiological parameters of patients were collected in prospectively completed Holter register by the requesting doctor. We collected 102 patients. The data was entered into the 2010 version Excel software, the population and proportions were estimated for the qualitative and categorical variables. The mean and standard deviation were determined for comparison of quantitative variables. Pearson's KHI 2 test and Kruskal-Wallis' non-parametric test were used to compare qualitative variables. The ANOVA test compared quantitative variables. Significance threshold was set at $p < 0.05$.

3. Results

The average age was 61.4 years ± 10.8 years (extremes 43 and 84 years) with a clear male predominance. The study population included 89 men (88%) and 13 women (12%). The sex ratio was 0.15. The population of study was the average socio-economic level from peri-urban areas. The majority, benefiting from social medical coverage. The mean left ventricular ejection fraction was 51.6% with 13% of patients with LVEF between 30% - 35%. The main electrocardiographic territories were the anterior territory in 45% cases, the lower territory in 25%, the deep septal in 18% and lateral in 10%. Patients revascularized by transluminal angioplasty were 41% with the implementation of one or more active stents. The discharge prescription consisted of 74% arrhythmic antis, of which 84% were on beta-blocker, 14% on amiodarone and 2% under digitalis (**Figure 1**). Other therapies were 91% platelet antiaggregator and anticoagulants 14%. The basic ECG was in sinus rhythm in 92% of cases, 7% in FA and 1% in BAV especially

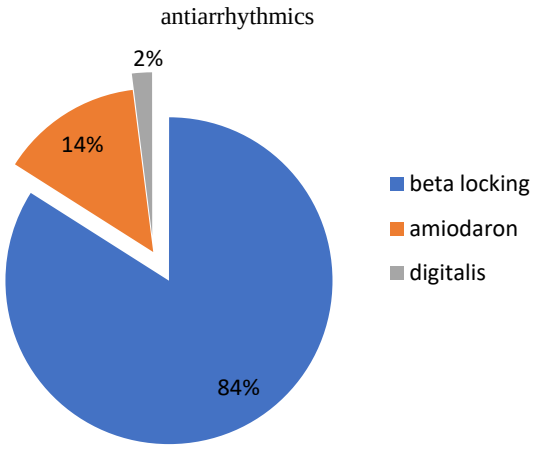

Figure 1. Representation of antiarrhythmics treatment of the patients after acute phase of myocardial infarction.

1st degree. The ECG Holter parameters were as follows: the mean frequency under beta-blocker was 72 beats per minute, under amiodarone was 70 beats per minute in combination of the 2 antiarrhythmics was 71 beats per minute ($p < 0.05$). The QT measured at 70 beats per minute was greater than 470 ms in 8% cases. The SVESs were found in 45% of patients with high load in 17%, 19% had paroxysmal AF passages. For VESs, polymorphic aspects were found in 76% versus 24% of monomorphic cases, they were predominantly diurnal in 35% of night cases in 10% and homogeneous in 55% cases ($p < 0.01$). The Holter recorded Ventricular Tachycardia passes (>3 VES following 100 bpm during > 30 sec) in 7% of cases and repeated episodes of Ventricular Tachycardia No Sustained in 11% of cases.

4. Discussion

4.1. Limitation of the Study

This study has several limitations. It was based on retrospectively analyzed data from the records of patients hospitalized during the study period. This constitutes an information bias with missing data. This study is monocentric and the extended duration up to 48 hours would have detected more significant abnormalities. The number of patients is relatively small, in contrast with international registries. Nevertheless, this preliminary work will provide data in cardiology in Morocco. However, it needs to be persuaded prospectively and more extensively.

4.2. Side Effects of Antiarrhythmic

Conduction disorders and the pro arrhythmic effect are the dreaded side effects of antiarrhythmics and can be asymptomatic. The presence of a pro-arrhythmic effect requires stopping anti arrhythmic treatment and choosing another therapeutic approach. Surveillance is also intended to detect excessive transient QT elongation especially occurring in vulnerable periods, the worrying aspect of Ventricular extraystole (short coupling time or R/T phenomenon) or the detec-

tion of asymptomatic episodes of peak twists [3]. In our series, 8% of patients under anti arrhythmic had QT prolongation measured at 70 Batt/Min and the elevated presence of VESs in all nycthemera (55%) ($p < 0.01$).

4.3. Detection of Ventricular Arrhythmias in Post-Infarction

Detection of unsupported tachycardia episodes on the Holter ECG has long remained an independent predictor of high mortality [3]. The detection of episodes of Ventricular Tachycardia Sustained in the immediate early phase of a post-infarction was associated with a higher rate of sustained Ventricular Tachycardia and an increased risk of mortality [3] [4].

Other studies have shown that the detection of in hospital Tachycardia ventricular no sustained within 24 hours or 1 day post-myocardial infarction has been associated with a higher rate of sustained tachycardia ventricular and consequently an increased risk cardiac arrest and intra hospital death [4]. In our series, 7% of cases presented Ventricular tachycardia ($p < 0.04$). On the other hand, one study has shown that Ventricular Tachycardia No Sustained has a limited prognostic significance in post-infarction patients. In post-infarct patients who have had reperfusion and beta-blocker treatment, TVNS cannot be considered in isolation but in the presence of other variables including left ventricular dysfunction [5]. During our study, we found 13% of cases of severe left ventricular dysfunction. However, prolonged and rapid Ventricular Tachycardia No sustained episodes in patients with LVEF of 35% - 40% put them at risk of sudden death and warrant exploration to identify high-risk patients who may benefit from [6] [7] an implantable defibrillator. The variability of abnormal heart rate in post-infarction as a predictor of overall mortality was assessed as early as 1980, when Kleiger *et al.* demonstrated that the standard deviation of normalized R-R intervals < 50 ms was associated with a five times higher mortality compared to a deviation > 50 ms in a cohort of over 800 patients post-myocardial infarction [7]. The Carisma study reported that out of 312 patients assessed 6 weeks after myocardial infarction, a reduction in SDNN is an independent predictor of all causes of mortality and the occurrence of cardiac arrhythmias [8] [9]. The prognostic value of abnormal heart rate turbulence was first described by Schmidt *et al.* [10]. In the ATRAMI study, post-infarction abnormal heart rate turbulence based on retrospective analysis is believed to be related not only to an increase in mortality but also to a risk of severe rhythm disorders [11] (**Table 1**).

Table 1. Main characteristics of rhythmic Holter.

	N = 102
Men, n (%)	89 (88)
Meanage (years)	61.4 ± 10.8
Rythm, n (%)	
- Sinusal	94 (92)
- Atrial fibrilation	8 (8)

Continued

Electrics anomalies, n (%)	
- Supraventricular extrasystoles	46 (45)
- Ventricular extrasystoles	63 (61)
- Polymorphism	75 (76)
- Monomorphism	27 (24)
- Homogeneous	56 (55%)
- Diurnal	36 (35)
- Night	10 (10)
Episod of ventricular tachycardia n (%)	
- Sustained	8 (7%)
- No sustained	13 (11%)
- R/T phenomenon	4 (3%)

5. Conclusion

The onset of ventricular arrhythmia is one of the most common complications after myocardial necrosis, especially if it is extensive and especially if there is associated left ventricular dysfunction. The prognosis can then be put into play in the short term and the main difficulty is to screen for those at risk.

Ethics Considerations

The patients of this study have been informed and their oral and written consent has been obtained. However, we will attach the opinion for a large study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of his paper.

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