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Reaserch Article

Ventricular Fibrillation in Acute Coronary Syndrome with Elevated ST Segment: Incidence and Predictive Factors.

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Abstract:

Background: Ventricular fibrillation is the principal cause of sudden cardiac death; in acute coronary syndrome (ACS) with elevated ST segment, its incidence and predictive factors, have been the subject of several international studies; however, its epidemiological data is lacking in Algeria.

Aims: The main objective of our study is the determination of the frequency of ventricular fibrillation in acute coronary syndrome with elevated ST segment, the secondary objective was the analysis of predictive factors of this arrhythmia, and related mortality.

Methods and materials: In this prospective study, conducted in the cardiology department of Hussein Dey hospital (Algiers-Algeria), 467 patients with acute coronary syndrome with elevated ST segment (87 women and 380 men) were enrolled between 28 February 2014 and 16 July 2015. The average age is 60 ± 13 years; at admission, a Holter recorder was attached for continuous ECG monitoring during 48 hours

Kruskal's ANNOVA or H tests were used for comparison of quantitative variables, $\chi 2$ test or Fisher's exact test, were used for qualitative variables, all tests were performed with 1st species risk of 5%.

Results: The frequency of ventricular fibrillation is 5.8% (27 patients), CI 95%: [3.7%-7.9%], multivariate analysis identified the following independent predictors: low diastolic blood pressure: high ST segment elevation, large diastolic left and right ventricular diameters.

The risk of mortality expressed by Hazard Ration (HR) is 12.9 (CI 95%: [4.9-34], $p < 0.001$), the predictors of mortality are right ventricular failure and failure of thrombolysis.

Conclusion: Ventricular fibrillation is the principal cause of sudden cardiac death, during acute coronary syndrome with elevated ST segment, its predictive factors according to our study are: low diastolic blood pressure: high ST segment elevation, large diastolic left and right ventricular diameters, its occurrence increases the risk of hospital mortality, this high risk is partly explained by the therapeutic strategy.

Keywords: Acute Coronary Syndrome, Ventricular Fibrillation, Thrombolysis

Introduction:

Ventricular fibrillation is the most serious complication in acute coronary syndrome with ST elevation; it's also synonymous of cardiac arrest, it often occurs early before hospitalization.

Its mechanisms are complex and multifactorial; several electrophysiological modifications occur just after coronary artery occlusion, and lead to reentry phenomena, abnormal automatism, and triggered activity.

Its incidence and predictive factors, have been the subject of several international studies; however, its epidemiological data are lacking in Algeria.

The main objective of our study is to determine the frequency of ventricular fibrillation in acute coronary syndrome with ST segment elevation, during the first 48 hours of hospitalization, while the secondary objective is the analysis of its predictive factors and the related mortality.

Methods and materials:

We prospectively studied a group of 467 consecutive patients (380 men and 87 women; mean age 60 ± 13 years) who presented acute coronary syndrome with ST segment elevation and admitted in cardiology department of Hussein-Dey hospital (Algiers, Algeria), between 28th February 2014 and 16th August 2015.

At emergency department admission, an ECG Holter recorder was attached for continuous ECG monitoring during 48 hours, the 17-leads surface ECG recorded at admission and repeated during hospitalization, Doppler Echocardiography, coronary angiography, and biological assessment were performed in the majority of patients.

The most important rhythm and conduction disorders were identified, the patients with the same type of disorder are grouped together, and the name assigned to each group is that of the disorder that characterizes it; there are overlaps between the groups, so that several disorders may exist in the same patient.

The constitution of each group of the rhythm disorder implies the constitution of the opposite group without the corresponding disorder, the latter group is used for the comparative study; each group is therefore described and then compared to the corresponding opposite group.

In this sub study, the group of patients with ventricular fibrillation was compared to the rest of patients without ventricular fibrillation.

Statistical analysis:

Data are presented as mean ± SD, median, or frequency (percentage) where appropriate. Continuous variables were compared using the ANNOVA test, or H Kruskal Wallis test.

$\chi 2$ tests and Fisher's exact test were performed to distinguish differences between categorical variables. Statistical significance was defined as $p < 0.05$. In this first step, we used EPI-info version 6.0. A multivariate Binary regression was performed to determine the predictor factors of arrhythmias, and Cox regression was performed to identify the predictor factors of mortality.

The magnitude of the relationship between ventricular fibrillation and their predictive factors is estimated by the Cramer V coefficient, a coefficient lower than 0.2 is in favor of a weak link, between 0.2 and 0.5: moderate link, greater than 0.5: strong link.

The statistical analysis was performed using SPSS Statistics (release 17).

Results

Incidence: The characteristics of the 467 patients included in our study are shown in Table 1; twenty-seven patients had presented ventricular fibrillation at admission or during hospitalization, so its frequency in this present study is 5.8 % (27 patients), CI 95% [3.7%-7.9%].

This group of patients included 4 women and 23 men. The mean age was 61.07 ± 11 years; the extreme age was 37 and 79 years.

Thirteen patients had presented VF at admission, and fourteen patients had VF during their hospitalization.

Cardiovascular risk factors, clinical characteristics, medical history, treatment and evolution are shown in Table 1.

Table 1: Characteristics of the study patients.

	Patients with VF (n = 27)	Patients without VF (n = 440)	P-value	
Mean age	61.074	60.125	0.704	NS
Females	4	83	0.787	NS
Early consultation (within 6 hours)	23	320	0.265	NS
Hypertension	15	194	0.335	NS
Diabetes	10/27	146/440	0.839	NS
Current smoking	14/27	221/440	0.972	NS
hyperlipidemia	3/27	64/437	0.434	NS
GRACE score ≥ 155	17/27	150/439	**0.004**	**S**
Cardiogenic shock	7/27	11/440	**0.000**	**S**
Left ventricular heart failure	10/27	53/440	**0.001**	**S**
Right ventricular heart failure	3/27	8/440	**0.020**	**S**
Persistence of chest pain after thrombolysis	7/25	19/381	**0.000**	**S**
Mean SBP	103.185	132.057	**0.001**	**S**
SBP ≤100 mmHg	10/27	52/440	**0.001**	**S**
Mean DBP	62.667	78.409	**0.002**	**S**
DBP ≤ 60 mmHg	11/27	71/440	**0.002**	**S**
Hospital mortality (first 48 hours)	7/27	10/440	**0.000**	**S**
Previous myocardial infraction	1/27	20/440	0.653	NS
Electrocardiogram				
Right ventricular ACS	4/27	38/440	0.216	NS
Circumferential ACS	**4/27**	**20/440**	**0.042**	**S**
Anterior ACS	3/27	41/440	0.477	NS
Inferior ACS	3/27	81/440	0.250	NS
Amplitude of the ST segment elevation ≥ 5mm	**18/27**	**149/440**	**0.001**	**S**
Persistence of ST segment elevation	**6/26**	**24/439**	**0.003**	**S**
Other associated arrhythmias				
Ventricular tachycardia	**10/27**	**7/440**	**0.000**	**S**
Atrial fibrillation	**7/27**	**21/440**	**0.000**	**S**
Complete LBBB	**3/27**	**5/440**	**0.007**	**S**
Complete RBBB	**8/27**	**43/440**	**0.005**	**S**
Polymorphic PVC	**7/18**	**44/430**	**0.001**	**S**
PVC with R on T phenomenon	**5/18**	**13/430**	**0.000**	**S**
Medication before ACS				
Beta blockers	4/27	32/439	0.1458	NS
ARB	4/27	63/439	0.5617	NS
ACE-inhibitor	3/27	32/439	0.3305	NS
Lipid-lowering drugs	3/27	30/439	0.2970	NS
Antiplatelet agents	5/27	35/439	0.0707	NS
Treatment at admission				
Thrombolysis	25/27	381/440	0.2884	NS

Primary or rescue percutaneous coronary intervention	**3/15**	**11/314**	**0.020**	**S**
Beta blockers	6/27	180/440	0.0849	NS
ACE-inhibitor	**7/27**	**254/440**	**0.0024**	**S**
Echocardiography				
Ejection fraction of left ventricle < 40	7/20	56/427	**0.013**	**S**
Left ventricular diastolic diameter ≥ 58 mm	13/20	104/410	**0.000**	**S**
Right ventricular diastolic diameter ≥ 27 mm	8/17	88/386	**0.027**	**S**
Coronary angiography				
Left main coronary artery severe lesion	0/15	12/314	0.565	NS
Left anterior descending artery lesion	11/15	198/314	0.593	NS
Left circumflex coronary artery lesion	5/15	113/314	0.954	NS
Right coronary artery lesion	8/15	131/314	0.540	NS
Multi-vessel disease	3/15	58/314	0.549	NS
TIMI flow grade 0	3/15	62/314	0.597	NS
ACS: Acute Coronary Syndrome, ACE inhibitors: Angiotensin-converting enzyme inhibitors ARB: Angiotensin receptor-blocker, DBP Diastolic blood pressure LBBB: left bundle brunch block, RBBB: PVC: Premature ventricular complexes, Right bundle brunch block SBP: Systolic blood pressure.				

The Surface ECG had shown, anterior ACS in three patients, circumferential in four patients, inferior in three patients, right ventricular in four patients.

The mean heart rate at admission was 87.40 ± 24.40 beats/min, the mean PR interval was 142.38 ± 26.81 msec, the mean duration of the QRS complex was 86.66 ± 27.73 msec, the mean amplitude of the ST segment elevation was 5.25 ± 2.41 mm, the mean amplitude of the ST segment depression was 1.81 ± 2.57 mm, the mean amplitude of the T wave was 8.00 ± 3.57 mm and the mean corrected QT was 426.61 ± 52.31 msec.

Six patients had persistence of the segment ST elevation during hospitalization.

Treatment at admission and during hospitalization: Metalyse (Tenecteplase) as fibrinolytics treatment were administered in 25 patients (92.59 %), 13 patients (48%) had presented ventricular fibrillation at admission before any therapy, 7 patients (26%) had presented ventricular fibrillation within 3 hours after thrombolysis, and 5 patients (18.5%) after 6h. (Figure 1)

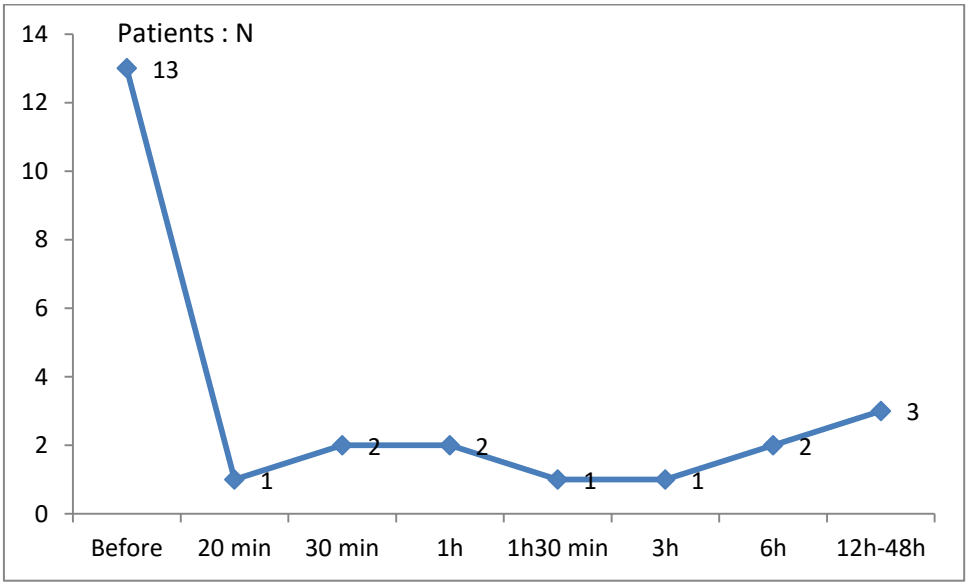

Figure 1: Ventricular Fibrillation onset delay as a Function of fibrinolytics treatment

Aspirin, Clopidogrel and Anticoagulants were administered in 27 patients, betablockers in 6 patients (22 %), ACE inhibitors in 7 patients (26 %), sympathomimetic agents in 7 patients (26 %), diuretics in 5 patients (18.5 %), external electric shock in 26 patients (96 %), amiodarone in 12 patients (44.5 %), Magnesium and Potassium supplementation at admission in 17 patients (63 %), Atropine in 3 patients (11 %), Insulin in 8 patients (29.6 %).

Thrombolysis failure: the persistence of chest pain after thrombolysis was observed in 7 patients, the persistence of ST segment elevation in 5 patients; for patients who had experienced VF during hospitalization, the persistence of chest pain was observed in 5 patients, and the persistence of ST segment elevation in 3 patients.

Doppler echocardiography was performed in 20 patients, the left ventricular fraction less than 40 % was found in 7 patients (35%), left ventricular hypertrophy in 6 patients (30%), the mean area of the left atrium: 18.40 ± 4.74 cm², that of the right atrium: 12.42 ± 2.79 cm², the mean diastolic diameter of the left ventricle: 57.90 ± 9.82 mm, the mean diastolic diameter of the right ventricle was 26.17±1.91 mm, systolic pulmonary blood pressure: 29.55 ± 5.22 mm Hg, wall akinesia in 16 patients (80%), apical thrombus in 2 patients 1(0.52%), and significant mitral insufficiency in 4 patients (14.81%).

Holter ECG was performed in 18 patients, this exam had participated in the recording of ventricular fibrillation and also showed the mode of its initiation.

In nine patients, initiation of VF had begun with PVC with R on T phenomenon, which induced polymorphic VT, and rapidly degenerated into VF. (Figure 2)

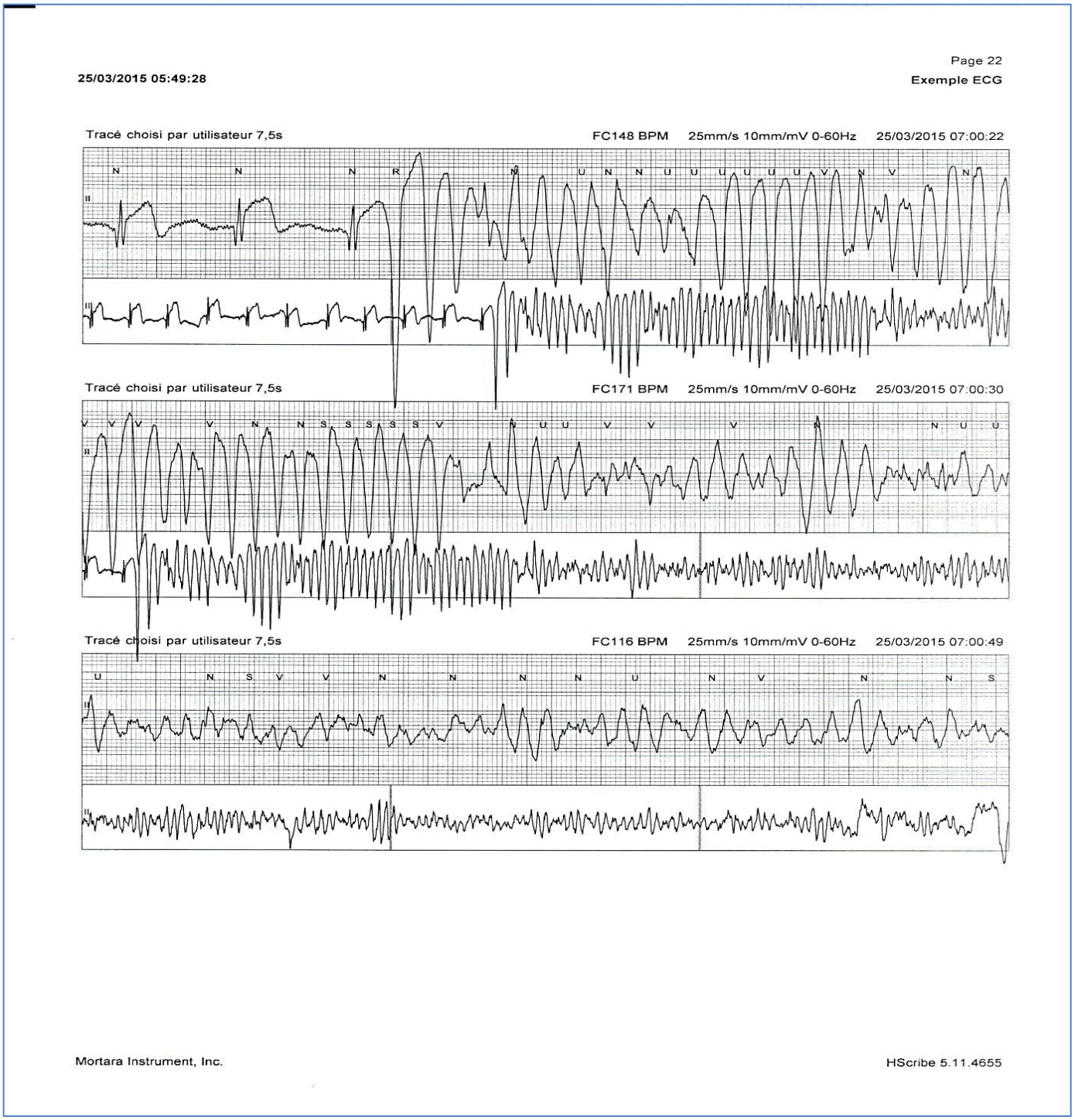

Figure 2: Initiation of ventricular fibrillation

An R on T extra systole induce polymorphic ventricular tachycardia which degenerate into ventricular fibrillation

Several arrhythmias were associated with VF, sustained ventricular tachycardias (SVT) had occurred in 10 patients (37%), non-sustained ventricular tachycardia (NSVT) in 11 patients (40%), atrial fibrillation in 7 patients (26 %), complete atrio ventricular block in 2 patients (7.4%), complete left bundle branch block in 3 patients (11%) and complete right bundle branch block in 8 patients (29.6 %), bursts of atrial premature beats were found in 7 patients (39 %), bursts of ventricular premature beats in 10 patients (55.5%), accelerated idioventricular rhythm in 2 patients (11 %), polymorphic ventricular premature beats in 7 patients (39 %).

Evolution and complications: Recurrent or shock-resistant ventricular fibrillation was observed in thirteen patients (48%), persistence of chest pain in 8 patients (29.62%), stroke in 1 patient (3.7%), aneurysm in 1 patient (3.7%), and hypotension with vasovagal syncope in 1 patient (3.7%).

Coronary angiography was performed in 15 patients, severe lesions were found in 7 patients (46.66%), severe stenosis of the left anterior descending artery in 11 patients (73.33%), circumflex artery in 5 patients (33.33%), right coronary artery in 8 patients

(53.33%), two-vessel coronary artery lesions in 8 patients (53.33%), three vessel coronary artery lesions in 3 patients (20%), TIMI flow grade 0 in 3 patients (20%), primary angioplasty was performed in 1 patient, and rescue angioplasty in 2 patients.
Mortality: seven patients died during the first 48 hours of their hospitalization; five patients died during the first 12 hours.
Biology: the average blood glucose: 1.82 1.10 g/l, average serum potassium 4 ± 0.6 mmol/l, average blood urea: 0.36 ± 0.15 g/l, blood creatinine: 12.00 ± 3.53 mg/l; High-Sensitivity Troponin (hs-Trop) above or equal 5 ng/ml in 10 patients (58.82%).
Predictive factors : According to the univariate study, several variables had a statistically significant association with the occurrence of ventricular fibrillation.: Cardiogenic shock, left heart failure, right heart failure, Sustained ventricular tachycardia, Atrial fibrillation, Complete right or left bundle brunch block, Mean amplitude of the ST segment elevation ≥ 5 mm, Mean diastolic diameter of the left ventricle ≥ 58 mm, Mean diastolic diameter of the right ventricle ≥ 27 mm, Persistence of ST segment elevation after thrombolysis, Mean systolic blood pressure ≤ 100 mm Hg, Mean diastolic blood pressure ≤ 60 mm Hg etc. (Table 2)

Table 2: Univariate study: variables associated with ventricular fibrillation

Variables	RR	CI 95%	P
Cardiogenic shock	8.73	4.25-17.94	0.00002
Left heart failure	3.77	1.81-7.86	0.001
Right heart failure	5.18	1.83-14.67	0.02
Persistence of Chet pain	6.60	3.17-13.73	0.00006
GRACE Score ≥ 155	3.04	1.43-6.49	0.004
Mean systolic blood pressure ≤ 100 mm Hg	3.84	1.84-8.01	0.001
Mean diastolic blood pressure ≤ 60 mm Hg	3.23	1.56-6.70	0.002
Sustained ventricular tachycardia	15.57	8.44-28.74	10^{-7}
Atrial fibrillation	5.49	2.54-11.87	0.0005
Complete right bundle brunch block	3.43	1.59-7.44	0.005
Complete left bundle brunch block	7.17	2.70-19.03	0.007
Polymorphic premature ventricular beat	4.95	2.01-12.20	0.001
R on T Ventricular extrasystole	9.19	3.67-22.99	0.0003
Persistence of ST segment elevation	4.35	1.89-10.02	0.003
Mean amplitude of the ST segment elevation ≥ 5 mm	3.59	1.65-7.82	0.001
QRS complex duration ≥ 100 msec	2.65	1.21-5.80	0.02
Mean diastolic diameter of the left ventricle ≥ 58 mm	4.97	2.03-12.15	0.0002
Mean diastolic diameter of the right ventricle ≥ 27 mm	2.84	1.13-7.16	0.02
Persistence of chest pain after thrombolysis	5.68	2.61-12.37	0.0004
Persistence of ST segment elevation after thrombolysis	3.67	1.49-9.08	0.01
Persistence of chest pain after thrombolysis in patients who had experienced VF during hospitalization	10.44	3.56-30.64	0.0004
Persistence of ST segment elevation after thrombolysis in patients who had experienced VF during hospitalization	5.24	1.47-18.61	0.03

But after the multivariate analysis using binary logistic regression, four predictive factors were identified: diastolic blood pressure ≤ 60 mm Hg, amplitude of the ST segment elevation ≥ 5 mm, diastolic diameter of the left ventricle ≥ 58 mm, diastolic diameter of the right ventricle ≥ 27 mm. (Table 3) (Figure 3)

Table 3: Predictive factors of ventricular fibrillation

Predictive factors	**OR**	**CI 95%**	**P**
Diastolic blood pressure ≤ 60 mm Hg	6.584	2.130-20.353	0.001
Amplitude of the ST segment elevation ≥ 5 mm	4.405	1.464-13.256	0.008
Diastolic diameter of the left ventricle ≥ 58 mm	4.345	1.528-12.354	0.006
Diastolic diameter of the right ventricle ≥ 27 mm.	3.4	1.2-9.753	0.021

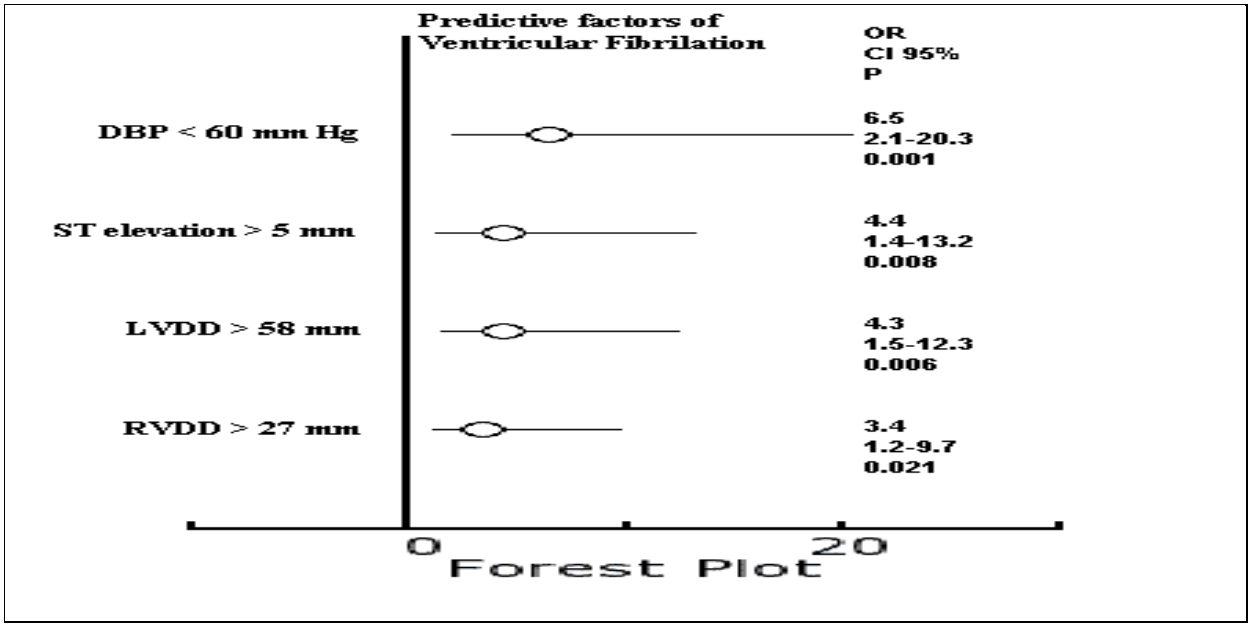

Figure 3: Predictive factors of ventricular fibrillation

The magnitude of the relationship between ventricular fibrillation and its predictive factors is low; the Cramer V coefficient does not exceed 0.2. (Table 4)

Table 4: Magnitude of the relationship between ventricular fibrillation and its predictive factors		
Predictive factors of ventricular fibrillation	**Cramer V Coefficient**	**P**
Diastolic blood pressure ≤ 60 mm Hg	0.151	0.001
Amplitude of the ST segment elevation ≥ 5 mm	0.160	0.001
Diastolic diameter of the left ventricle ≥ 58 mm	0.183	0.000
Diastolic diameter of the right ventricle ≥ 27 mm.	0.114	0.022

Mortality:

Hospital mortality (first 48 hours), in the ventricular fibrillation group is 25.92% while it does not exceed 2.27% in the group without VF, p = 0.00001. (HR at 12.9, CI 95% [4.9-34], p = 0.000. (Figure 4)

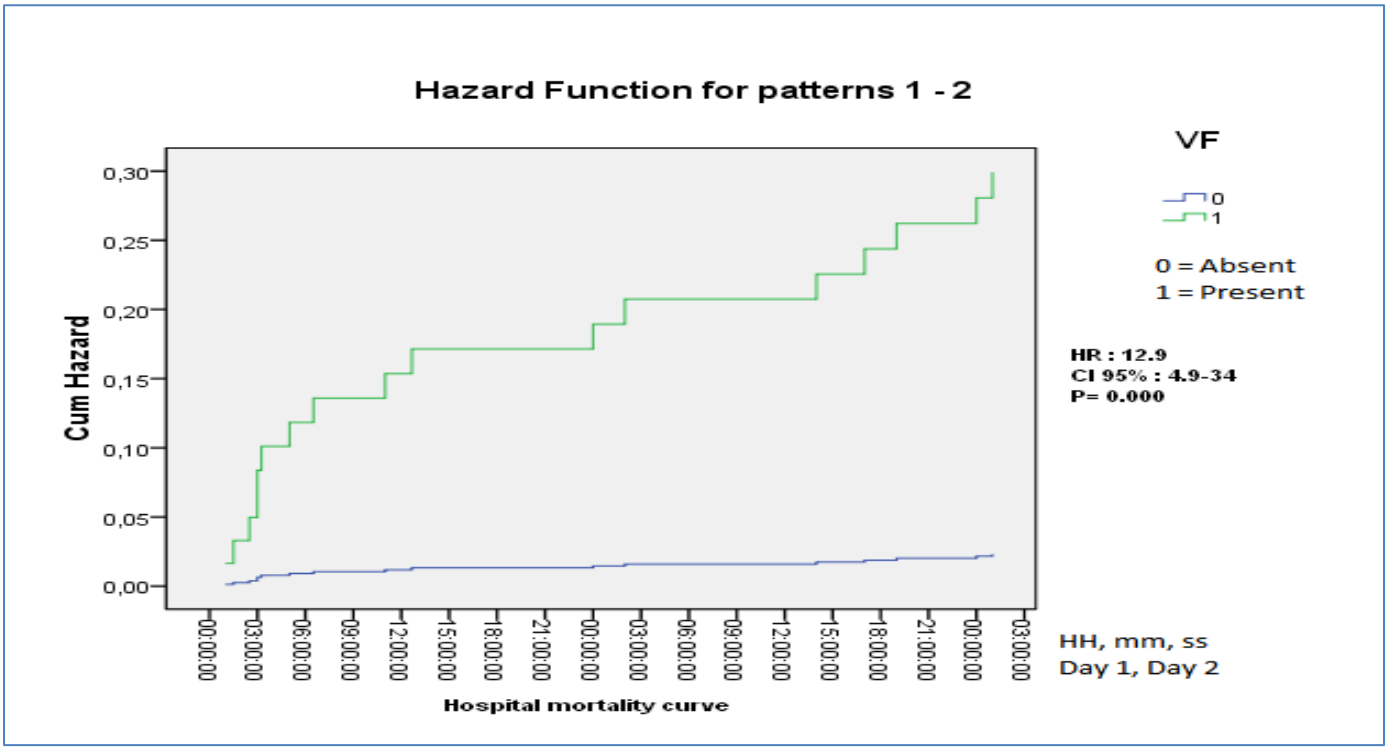

Figure 4: Hospital mortality curve (48h) in ventricular fibrillation group versus group without ventricular fibrillation.

Cox regression was used for univariate and multivariate studies of mortality predictors.

According to the univariate study, some factors have a statistically significant association with the occurrence of mortality in the ventricular fibrillation group. (Tableau 5)

Table 5: Univariate analysis, Factors related to mortality in group of ventricular fibrillations			
Factors	**OR**	**IC95%**	**P**
Feminine sex	5.2	1.9-13.8	0.001
Age ≥ 65 years	8.9	2.5-31	0.001
Right heart failure	57.7	19.1-174.6	0.000
Left heart failure	3.6	1.3-10	0.013
Cardiogenic shock	180	47-687	0.000
Right ventricle acute coronary syndrome	4.5	1.6-12.3	0.003
Persistence of ST segment elevation after thrombolysis	33.6	11.3-100	0.000
Persistence of chest pain	19.4	6.8-55.2	0.000
Systolic blood pressure ≤ 100 mm Hg	6.5	2.3-18.3	0.000
Blood creatinine ≥ 17 mg/l	8	2.6-24.7	0.000
GRACE Score	5.8	1.6-20.9	0.007

According to multivariate analysis, two predictive factors of mortality were identified: right heat failure and persistence of ST segment elevation after thrombolysis. (Table 6)

Table 6: Predictive factors of mortality in ventricular fibrillation group			
Predictive factors of mortality in ventricular fibrillation group	**OR**	**CI95%**	**P**
Right heart failure	19.65	5.28-73.1	0.000
Persistence of ST segment elevation after thrombolysis	15.7	4.58-53.75	0.000

The magnitude of the relationship between mortality and its predictive factors was strong in the ventricular fibrillation group, the Cramer V coefficient greater than 0.5 for right heart failure, and greater than 0.6 for the persistence of ST segment elevation after thrombolysis. (Table 7)

Table 7: The magnitude of the relationship between mortality and its predictive factors		
Predictive factors of mortality in ventricular fibrillation group	**Cramer V Coefficient**	**P**
Right heart failure	0.598	0.002
Persistence of ST segment elevation after thrombolysis	0.659	0.001

Discussion

Ventricular fibrillation is the most serious complication during acute coronary syndrome with ST segment elevation, it often occurs early before hospitalization and responsible of sudden cardiac death.

Its mechanisms have been extensively studied, the period after the coronary artery occlusion is divided into three phases, the first phase between 2 and 10 min mainly involves electrophysiological changes and the phenomenon of reentry based on a functional substratum, the second phase between 10 and 30 min, involves the accumulation of catecholamines and the increase of automatism, and the third phase between 30 minutes and 72 hours with a peak of arrhythmias between 12-24 hours, this phase involves abnormal automatism within Purkinje fibers, propagation of the activity triggered from these fibers or re-entry into the ischemia zone and Purkinje fibers, occurrence of ventricular arrhythmias after 72 hours, is related to re-entry based on an anatomical substratum. [1]

In the literature the frequency of ventricular fibrillation is reported with that of ventricular tachycardia; in the GRACE register, the frequency of both arrhythmias is 10%, in the Thai register: 19.4%, in the Swedish register: 7%, in the APEX-AMI study: 5.7%, in the PAMI study: 4.3%, in the Swiss study: 8.7%, and in the Saudi Arabia register: 2.45%. [2-8]

The frequency of ventricular fibrillation in our study was 5.8%% (27 patients), CI 95% [3.7%-7.9%],

Our results were closer to those reported in studies that exclusively use primary angioplasty, which proves that fibrinolytics are as effective as primary angioplasty in preventing this deadly arrhythmia, unless thrombolysis fails.

According to the Thai registry, predictive factors for ventricular arrhythmias are cardiogenic shock, tobacco, and elevated troponin levels [3]

For the PAMI study, the predictors of ventricular fibrillation and ventricular tachycardia are tobacco, TIMI flow 0, the right territory of the ACS, early consultation time, and non-administration of betablockers early on admission [6]

While according to another meta-analysis conducted in 2006, the predictors of primary ventricular fibrillation are the following: early hospitalization, male patient, smoking, lack of history of angina pectoris, low heart rate at admission, atrioventricular block before ventricular fibrillation, and low potassium level. [9]

In another study published in 2012, the predictive factors of ventricular fibrillation and ventricular tachycardia are the following: tobacco, taking betablockers, digitalis and significant left main coronary artery disease [10]

In our study, predictive factors for ventricular fibrillation and ventricular tachycardia were studied separately.

After multivariate analysis using binary logistic regression, the following predictive factors of ventricular fibrillation are: Low diastolic blood pressure, High ST segment elevation, left ventricular diastolic diameter greater than 58 mm and right ventricular diastolic diameter greater than 27 mm

The low diastolic blood pressure reflects all other factors that reflect an altered hemodynamic status: cardiogenic shock, left or right ventricular failure, low systolic blood pressure, and high GRACE score.

The high amplitude of ST segment elevation, the wide diameters of the left and right ventricles, reflect the importance of electrophysiological changes and tissue

damage.

In the literature, hospital mortality related to ventricular tachycardia and ventricular fibrillation were regrouped together and reported as hospital mortality related to severe ventricular arrhythmias.

According to the GRACE registry, the hospital mortality rate in patients with ventricular arrhythmias is 52% while it does not exceed 1.6% in patients without rhythmic disorders. [11]

In the Thai Registry (TACSR), the hospital mortality rate in patients with ventricular arrhythmia is 48%. [3]

In the VALIANT register, sustained ventricular tachycardia and ventricular fibrillation are a major predictor of hospital mortality (Relative Risk: 4.18). [12]

According to the Swedish primary angioplasty register published in 2012, hospital mortality rate is 16.5% in patients with ventricular fibrillation or tachycardia, while it is 1.5% in patients without ventricular arrhythmias; in the same register, Hospital mortality rate is higher and reaches 17.6% if ventricular arrhythmia (VF/VT) occurs after angioplasty, while it is 11.3% if this arrhythmia occurs before angioplasty. [4]

In our study, hospital mortality (first 48 hours), in the ventricular fibrillation (VF) group is about 26 %, this rate is lower than that reported by the GRACE and Thai registry, but higher than that of the Swedish registry, this difference is probably linked to the therapeutic strategy of revascularization and resuscitation.

two predictive factors of mortality were identified: right heart failure, and persistence of ST segment elevation after thrombolysis, the first pejorative factor is related to the low flow associated with the extension of necrosis to the right ventricle, and the second one, is related to the extensive necrosis and severity of myocardial damage; hospital mortality is therefore linked to hemodynamic instability and thrombolysis failure.

Conclusion:

Ventricular fibrillation is the principal cause of sudden cardiac death, during acute coronary syndrome with elevated ST segment, its predictive factors according to our study are: low diastolic blood pressure: high ST segment elevation, large diastolic left and right ventricular diameters, its occurrence increases the risk of hospital mortality, this high risk is partly explained by the therapeutic strategy.

To our knowledge the low diastolic blood pressure and high elevation of ST segment as predictors of ventricular fibrillation were reported for the first time.

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