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Thrombus Occurrence in Patients with Non-ST-Elevation Myocardial Infarctionand Associated Risk factors

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ABSTRACT

Background:Acute coronary syndrome (ACS) can be divided into subgroups of ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina. ACS carries significant morbidity and mortality and prompt diagnosis.Thrombus encountered in the setting of acute coronary syndromes has been correlated with acute complications during the percutaneous coronary intervention (PCI) such as no-reflow, acute coronary occlusion, and long-term complicationsthat occurs later such as stent thrombus.

Aim:To identify the electrocardiographic changes and the possible complications associated with thrombus formation in patients with Non-ST Segment Elevation Myocardial Infarction

Methods:In this sample, 66 patients were enrolled in 2 groups; Group I (n = 33) represented the low level of thrombus; Group II (n = 33) represented the high level of thrombus. The degree of stenosis and coronary flux by thrombolysis in myocardial infarction (TIMI), grade, was assessed in all patients to assess the associated high thrombus plaque disruption or formation.

Results:Class I and II have a mean age respectively 62.21±9.51 and a mean age of 66.67±9.14. The global systolic average LV (AGS) in Group I and II relative to Group III was slightly lower. Regarding the Killip class, the main difference between the groups was statistically significantwith a P-value of 0.001, regarding ECG Changes (ST depression and t wave inversion), the main difference between the groups was statistically non-significant with p values 0.726 and 0.403 respectively.

ConclusionThe quantity of the intracoronary thrombus burden is associated with a poor prognosis in patients with the acute coronary syndrome.intracoronary thrombus plaque disruption occurs as a complication in non-ST segment elevation myocardial infarction patients undergoing primary PCI.

Keywords:NSTEMI, and burden of thrombus. Percutaneous Coronary Intervention

Introduction:

ACS is simply a mismatch in the myocardial oxygen demand and myocardial oxygen consumption. While the cause of this mismatch in STEMI is nearly always coronary plaque rupture resulting in thrombosis formation occluding a coronary artery, there are several potential causes of this mismatch in NSTEMI**(1).**

There may be a flow-limiting condition such as a stable plaque, vasospasm as in Prinzmetal angina, coronary embolism, or coronary arteritis. Non-coronary injury to the heart such as cardiac contusion, myocarditis, or the presence of cardiotoxic substances can also produce NSTEMI.**(2)**.

conditions relatively unrelated to the coronary arteries or myocardium itself such as hypotension, hypertension, tachycardia, aortic stenosis, and pulmonary embolism lead to NSTEMI because the increased oxygen demand cannot be met**(3).**

Thrombus encountered in the setting of acute coronary syndromes has been correlated with acute complications during percutaneous coronary interventions such as no-reflow, acute coronary occlusion, and long term complications such as stent thrombus**(4)**

Endothelial dysfunction and atherosclerosis set the stage for coronary artery disease. Acute clinical manifestations occur from the destabilization of atherosclerotic plaques within the coronary vessels, most often secondary to intraluminal thrombus formation. Appreciating the role of thrombus formation in ACS has led to a significant evolution in the management of these challenging patients. Thrombus during percutaneous intervention poses a formidable challenge for the interventionalist both in terms of dealing with the possibility of embolization and no-reflow in the acute situation and stent thrombus acutely and in the long term**(5)**

In our research, we have studied the electrocardiographic changes and the possible complications associated with thrombus formation in patients with Non-ST Segment Elevation Myocardial Infarction that occurs after primary percutaneous coronary intervention.

Patients and Method:

The cohort study included 66 university hospitaller and PCI patients with acute NSTEMI and risk assessment. The cohort was a forward-looking cohort study. Patients were enrolled for the report after receiving written authorization and authorization from the hospital's local Ethics Committee.

The study consisted of very risky, risky, and moderate NSTEMI patients classified into two coronary angiograms (n=33 patients): patients under thrombus (low thrombus); Group II (n = 33 patients): patients under thrombosis.

The study excluded: NSTEMI patients, low risk and symptoms, histories of hemorrhage disease, liver disease history or transplantation, and anticoagulant patients.

After removing participants and those with exclusion requirements, 66 patients completed the study (this number was considered a suitable enough sample for statistical analysis with significant results and correlations).

Detailed history, including CAD risk factors, physical examination, and Killip class, Electrocardiography, and T-shaped anomalies, was found for all patients within ten minutes of initial medical contact.

Blood samples were obtained before heart catheterization. The heart catheterization has been fasting for over 12 hours. After the initial three-ml of blood had been discarded, two 3.2%

trisodium citrate tubes were collected from an antecubital vein or an occupied catheter. The serum in 2000g was 15 minutes isolated and stored for centrifugation at -70°C. Measured troponin and CKMB were extremely sensitive.

According to the recommendations of the American Echocardiography Association, measurements for lv and wall, EF, and left atrial diameter and volume were measured **(6)**

The coronary flux measurement was determined by the thrombus after restoring the antegrade flux by a guidewire or small balloon dilatation. Angiographical thrombosis burden in the Myocardial Infarction research community have been assessed through (TIMI) **(7)**

Grade 0: no evidence of thrombus, grade 1: suspected thrombus (low contrast density, haziness, irregular lesion contour, or a smooth convex meniscus at the site of occlusion)**,** grade 2: definite thrombus and the thrombus greatest dimensions _1/2 vessel diameter**,** grade 3: definite thrombus and the thrombus greatest dimension >1/2 to <2 vessel diameters**,** grade 4: definite thrombus and the thrombus greatest dimension>2 vessel diameter**,** grade 5: total thrombotic occlusion.

Any patient received telephone surveillance for stroke, reinfarction, and death, six months after acute NSTEMI.

Data analysis was conducted using version 20 of the SPSS software package. Statistical research was carried out using the Social Sciences Version 22 Statistical Package (IBM Corp., Armonk, NY, USA). As standard deviations, quantitative data are expressed.

The p-value of 0.05 was considered significant if <0.05 Correlation analysis measured the correlation intensity of two variables.

Results: The thrombus groups were divided into group I, 33 low thrombus patients, and group II, 33 high thrombus patients in group I. There was a significant difference between the two studied groups in demographic data (age, sex) and CAD risk factors. **(Table 1, Figure 1)**.

Regarding DM, in group I, there was 57.6% diabetic patients while in group II there were 75.8% diabetic patients. There was a statistically nonsignificant difference between the groups, P-value 0.117**(Table 1, Figure 1).**

Regarding hypertension, in group I, there was 60.6% hypertensive patients while in group II there were 72.7% hypertensive patients. There was a statistically non-significant difference between the groups, P-value = 0.296**(Table 1, Figure 1).**

Regarding smoking, in group I, there were 39.4% smoker patients while in group II there were 48.5% smoker patients. There was a statistically non-significant difference between the groups, P-value 0.457**(Table 1, Figure 1)**

Regarding Killip class, the main difference between the groups was statistically significant with a P-value of 0.001**(Table 2, Figure 2)**

Regarding **ECG Changes** (ST depression and t wave inversion), the main difference between the groups was statistically non-significant with p values 0.726 and 0.403 respectively**(Table 3)**

Regarding Thrombus grade, in group I there were 5 patients with G0, 10 with G1, 12 with G2, and 6 with G3 while in group II there were 11 patients with G4 and 22 with G5. The main difference between the groups was statistically significant with a P-value ≤of 0.001**(Table 4, Figure 3).**

Table (1): Demographic data and risk factors among the studied groups

Variables	Low thrombus burden (n=33)	High thrombus burden (n=33)	Test of significance	P-value
Age (years) Mean ± SD	62.21±9.51	66.67±9.14	t=1.94	0.057
Sex Male Female	 23 (69.7%) 10 (30.3%)	 19 (57.6%) 14 (42.4%)	χ^2=1.05	0.306
Smokers	13 (39.4%)	16 (48.5%)	χ^2=0.554	0.457
Dyslipidemia	16 (48.5%)	20 (60.6%)	χ^2=0.978	0.323
DM	19 (57.6%)	25 (75.8%)	χ^2=2.45	0.117
HTN	20 (60.6%)	24 (72.7%)	χ^2=1.09	0.296

T: student t-test, χ^2: Chi-square test

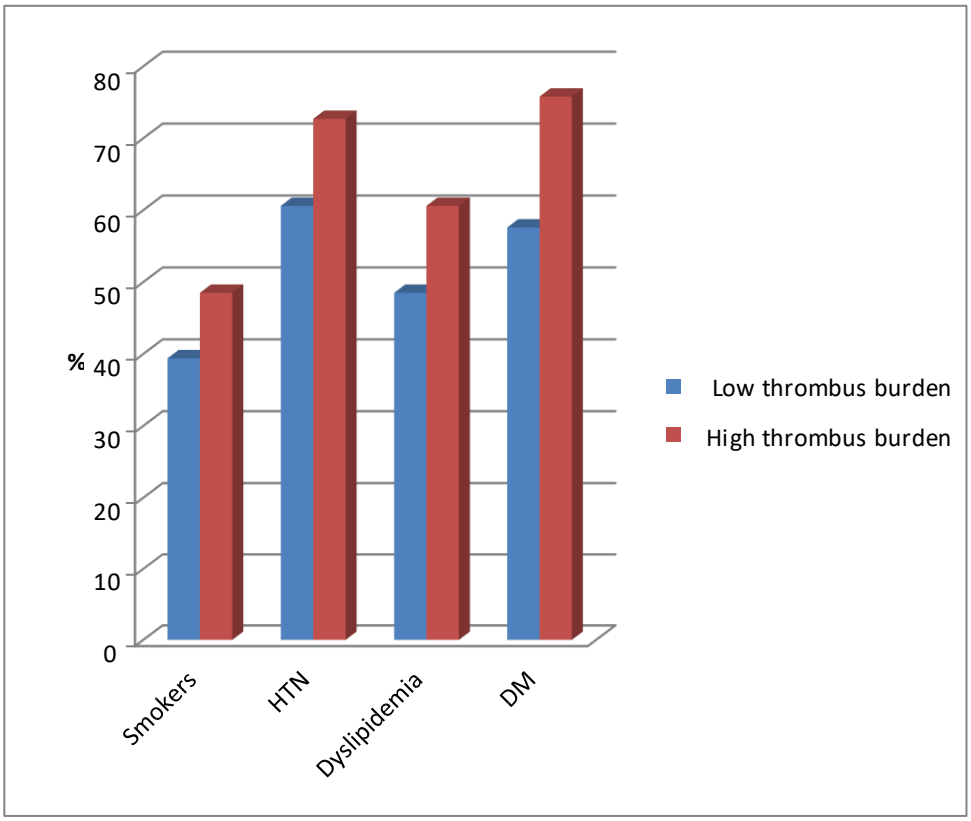

Figure (1): Risk factors among the studied groups

Table (2): Table (12): Killip class among low thrombus and high thrombus burden groups.

Killip class	Low thrombus burden (n=33)	High thrombus burden (n=33)	P value
I	28 (84.8%)	14 (42.4%) 5	0.001*
II	4 (12.1%)	(15.2%)	
III	1 (3.0%)	12 (36.4%)	
IV	0 (0%)	2 (6.1%)	

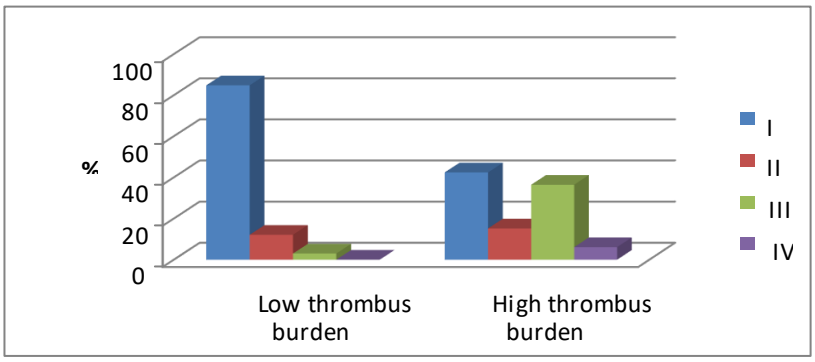

Figure (2): Killip class among the studied groups

Table (3): ECG among low thrombus and high thrombus burden groups.

ECG	Low thrombus burden (n=33)	High thrombus burden (n=33)	P value
ST dep.			
NAD	12 (36.4%)	12 (36.4%)	
Anterior	10 (30.3%)	7 (21.2%) 0	
Lateral	2 (6.1%)	(0%)	
Inferior	5 (15.2%)	8 (24.2%)	0.726
Septal	2 (6.1%)	2 (6.1%)	
Antrolateral	2 (6.1%)	2 (6.1%)	
Antroseptal v1-	0 (0%)	1 (3.0%)	
v6	0 (0%)	1 (3.0%)	
T wave			
inversion	14 (42.4%)	14 (42.4%)	
NAD	7 (21.2%) 3	7 (21.2%) 0	0.403
Anterior	(9.1%)	(0%)	
Lateral	4 (12.1%)	9 (27.3%)	
Inferior	2 (6.1%)	1 (3%)	
Septal v1-v6	3 (9.1%)	2 (6.1%)	

Table (4): Coronary angiography

Coronary angiography	Low thrombus burden (n=33)	High thrombus burden (n=33)	Test of significance	P value
IRA				
LAD	20 (60.6%)	17 (51.5%)	1.32	0.517
RCA LCX	6 (18.2%)	10 (30.3%) 6		
	7 (21.2%)	(18.2%)		
No of vessels involved: Single				
vessel	16	11	1.48	0.612
Double vessels	10	12		
Multivessel	7	10		
Thrombus grade G0				
G1	5 (15.2%)	0 (0%)		
G2	10 (30.3%)	0 (0%)	MC	≤0.001*
G3	12 (36.4%)	0 (0%)		
G4	6 (18.2%)	0 (0%)		
G5	0 (0%)	22 (66.7%)		
	0 (0%)	11 (33.3%)		

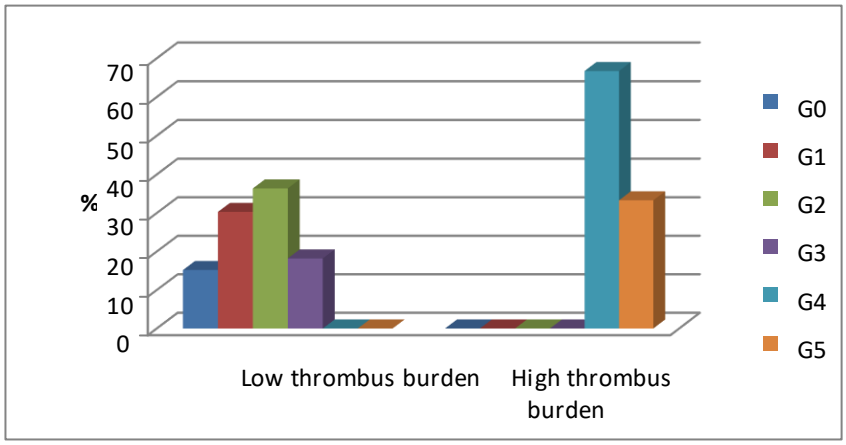

Figure (3): Thrombus grade between two groups

Discussion: Acute myocardial infarction often presents as an acute coronary syndrome, a syndrome that encompasses several distinct entities, namely MI and unstable angina, but with similar clinical signs and symptoms (e.g., chest pain. Precise management decisions can enhance patient outcomes at higher risk in the light of detailed evaluations **(8).**

It is established now that atherosclerotic plaque disruption or erosion, leading to superimposed thrombus is the immediate cause of acute coronary syndromes. .In about 70% of cases, acute coronary thrombosis occurs after a disrupted atherosclerotic plaque and in the remaining 30%, plaque erosion is the cause of acute thrombus formation.Plaque erosion is more commonly seen in females, diabetics, and patients with hypertriglyceridemia **(9).**

We have reported 66 patients in our research with acute NSTEMI, and coronary angeling has been done for these patients for the thrombus grade.

Concerning demographic data and risk factors, we found no statistically significant difference between the two groups. This disagreed with **Mirbolouk et al (10),** who discovered a substantial statistical difference in age between the groups studied (P-value <0.001) While **Bakirci et al (11)** agreed that there was a statistically insignificant difference between the studied age groups (P-value 0.129).

Satılmış and Durmuş (12) agreed on our gender findings and found a non-statistically significant gender difference among the groups with (P-value=0.72)

Barman et al (13) found a statistically significant difference in hypotension (P-value 0,004) and DM among the groups analyzed in contrast to our findings (P-value 0.009). This difference between our hypertension and DM results may be induced by small samples in our research.

There was a non-statistically significant differential regarding the serum creatinine p-value of 0.575 in our sample, compared to **Mirbolouk et al (10),** who found that the p-value of the studied groups was statistically significant. This difference between the research before and our findings is because CD patients are not included in our study.

Regarding the Killip class, the main difference between the groups was statistically significant with a P-value of 0.001. This was in agreement with **Ipek et al (14)** who study CHA2DS2-VASc Score as a Predictor of thrombus burden and No-Reflow in Patients With NST-Segment Elevation Myocardial Infarction and found that the Killip class was statistically significant with a P value <0.001.

Concerning Thrombus grade, 5 G0 patients, 10 G1 patients, 12 G2, 6 G3 patients were in Category II, 11 G4 patients, and 22 G5 patients were statistically significant P-value by 0,001. This was following the figure of **HakanDuman et al (15)** whose statistic was important with a value of P<0.001 for the difference between thrombus classes.

Limitations

A significant validation population was missing from the sample. To validate our findings, further forward-looking studies are required. Furthermore, coronary artery disease definitions were based on an angiographic view y 2D X-rays, we did not use IVUS or FFR that can conflict with coronary angiography interpretations.

Conclusion

The quantity of the intracoronary thrombus burden is associated with a poor prognosis in patients with the acute coronary syndrome. intracoronary thrombus plaque disruption occurs as a complication in non-ST segment elevation myocardial infarction patients undergoing primary PCI.

Conflict of Interest: No conflict of interest.

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