One-Year Clinical Outcomes of ST Segment Elevation Myocardial Infarction Patients Treated with Emergent Percutaneous Coronary Intervention: The Impact of Thrombus Burden

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Objective: *To investigate the impact of thrombus burden on 1-year clinical outcomes in patients who underwent emergent percutaneous coronary intervention (PCI) for ST segment elevation myocardial infarction (STEMI).*
Material and Method: *Angiographic evidence of intracoronary thrombus adversely affects the outcome of PCI in STEMI. Large thrombus burden (≥2 times vessel diameter) has been shown to be a significant predictor of major adverse cardiac events (MACE). The impact of thrombus burden in Asian patients who undergo PCI in STEMI has not been described. This is an observational cohort of patients with STEMI from June 1, 2008 through May 31, 2011, who underwent emergent PCI (primary or rescue). The patients were categorized into two groups according to the angiographic thrombus burden, large thrombus burden (≥2X vessel diameter size, LTB) and small thrombus burden (<2X vessel diameter size, STB). MACE was defined as the composite of death, repeat myocardial infarction, target vessel revascularization and stent thrombosis.*
Results: *202 patients were enrolled, 72% were male and the mean age was 60 years old. 134 patients (66%) presented with an occluded infarct related artery. Primary PCI was performed in 90.6% of the patients and the remainder underwent rescue PCI. One hundred eleven (55%) patients were categorized into the STB group and 91 patients (45%) into the LTB group. The use of aspiration thrombectomy was significant higher in the LTB group (LTB 80.2% vs. STB 60.4%, p = 0.002). A higher proportion of patients in the STB group underwent direct stenting strategy (STB 32.4% vs. LTB 18.7%, p = 0.027). There were no significant differences in final TIMI grade 3 flows and procedural success between the groups. Overall, in hospital, mortality was 13.4% and there were no significant differences among the groups. At 1-year follow-up, there was no significant difference in cumulative MACE-free survival in the LTB vs. STB group (82.4% vs. 79.3%, 95% confidence interval for the difference: -8.0% to 13.8%, p = 0.59).*
Conclusion: *In the current study, large thrombus burden is not an independent predictor of 1-year cumulative MACE in STEMI patients who were treated with emergent PCI.*

Keywords: *Thrombus burden, Myocardial infarction, Acute coronary syndrome, Percutaneous coronary intervention*

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Percutaneous coronary intervention (PCI) is the preferred reperfusion strategy for the treatment of ST-segment elevation myocardial infarction (STEMI) due to the reduction in short-term death and non-fatal reinfarction when compared to fibrinolysis[1,2]. Angiographic evidence of coronary thrombus adversely affects the outcome of PCI in STEMI[3-6] due to distal embolization and microvascular obstruction resulting in sub-optimal reperfusion[5].

In 2007, Sianos et al proposed a new simplified angiographic classification[7,8] based on intracoronary thrombus size in STEMI patients who were treated with drug-eluting stent implantation. According to this new classification, large thrombus burden (>2 times vessel diameter) was a significant predictor of major adverse

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cardiac events (MACE). To the authors' knowledge, there are no data on this subject in Asian patients. The authors categorized patients that underwent emergent PCI for STEMI by the angiographic thrombus burden into large thrombus burden (≥2 times vessel size) and small thrombus burden (<2 times vessel size) groups and reported 1-year major adverse clinical events.

Material and Method

This is an observational cohort study. The authors enrolled 202 patients who presented with STEMI and underwent emergent PCI (primary or rescue) at Her Majesty Cardiac Center, Faculty of Medicine, Siriraj Hospital, Mahidol University from June 1, 2008 to May 31, 2011. Exclusion criteria were as follows 1) STEMI patients who did not undergo emergent PCI 2) STEMI patients whose coronary angiogram was unavailable for review.

All patients were pre-treated with aspirin and clopidogrel before PCI, the doses were determined by the attending physician. PCI was performed by standard practice. The choice of periprocedural medications, stents and the mechanical treatment for thrombotic lesions (including aspiration thrombectomy, distal protection device and Rheolytic thrombectomy) were at the operator's discretion.

All data including baseline clinical characteristic, periprocedural details and in-hospital adverse events were prospectively collected. One-year follow-up was obtained from the patient's medical records and/or telephone contact.

All coronary angiograms were reviewed by a single investigator who was blinded to the patient's history and outcome. Intracoronary thrombus was graded as previously described[6]; in TIMI thrombus Grade 0 (G0), no cineangiographic characteristics of thrombus is present; in TIMI thrombus Grade 1 (G1), possible thrombus is present, with such angiography characteristics as reduced contrast density, haziness, irregular lesion contour, or a smooth convex "meniscus" at the site of total occlusion suggestive of, but not diagnostic of, thrombus; in TIMI thrombus Grade 2 (G2), there is definite thrombus, with greatest dimensions ≤1/2 the vessel diameter; in TIMI thrombus Grade 3 (G3), there is definite thrombus, but with greatest linear dimension >1/2 but <2 vessel diameters; in TIMI thrombus Grade 4 (G4), there is definite thrombus, with the largest dimension ≥2 vessel diameters; and in TIMI thrombus Grade 5 (G5), there is total occlusion (unable to assess thrombus burden due to total vessel occlusion). In TIMI thrombus Grade 5 (G5), we re-classified the thrombus into G0-G4, after the wire passed the lesion or small size balloon (≤1.5 mm) was dilated and coronary flow was obtained. Example of thrombus grading is demonstrated in Fig. 1.

TIMI flow grades were defined as follows. Grade 0 no perfusion: there is no antegrade flow beyond the point of occlusion. Grade 1 penetration without perfusion: contrast material passes beyond the area of obstruction but "hangs up" and fails to opacify the entire coronary bed distal to the obstruction. Grade 2 partial perfusion, contrast material passes across the obstruction and opacifies the coronary bed distal to the obstruction. However, the rate of entry of contrast material into the vessel distal to the obstruction or its rate of clearance from the distal bed (or both) are perceptibly slower than its entry into or clearance from comparable areas not perfused by the previously occluded vessel. Grade 3 complete perfusion: antegrade flow into the bed distal to the obstruction occurs as promptly as antegrade flow into the bed proximal to the obstruction, and clearance of contrast material from the involved bed is as rapid as clearance from an uninvolved bed in the same vessel or the opposite artery.

No reflow was defined as reduced antegrade flow (TIMI flow grade <2) in the absence of occlusion at the treatment site or evidence of distal embolization. Myocardial blush grades were defined as follows: Grade 0, no myocardial blush or contrast density; Grade 1, minimal myocardial blush or contrast density; Grade 2, moderate myocardial blush or contrast density but less than that obtained during angiography of a contralateral or ipsilateral non–infarct-related coronary artery; and Grade 3, normal myocardial blush or contrast density, comparable with that obtained during angiography of a contralateral or ipsilateral non-infarct-related coronary artery. Angiographic success of balloon angioplasty was defined as reduction of a minimum stenosis diameter to <50% with a final TIMI flow grade 3 without side branch loss, flow-limiting dissection, or angiographic thrombus. For coronary stenting, a successful stenting was defined as a minimum stenosis diameter of <10%. Procedural success was defined as angiographic success without associated in-hospital major clinical complications. Major adverse cardiac event (MACE) was defined as the composite of death, repeat myocardial infarction, target vessel revascularization (TVR) and stent thrombosis at 1 year.

The primary outcome was to determine the effect of the size of thrombus burden (STB <2X vessel

size and LTB ≥2X vessel diameter) on 1-year MACE.

The present study was approved by the ethics committee of Siriraj Hospital.

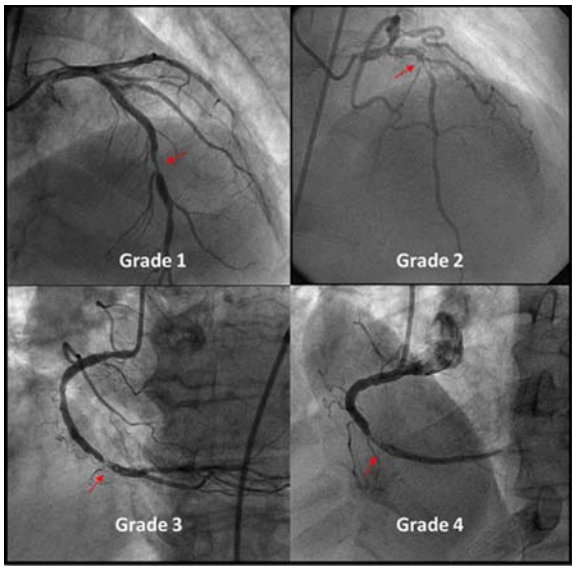
Statistical analysis

Categorical data are presented as frequencies and percentage. Continuous variables are reported as mean ± standard deviation or median and 25th and 75th percentile when there was skewed distribution. Categorical data were compared using the Chi-square or Fisher exact test and continuous data were compared with the Student's t-test (normality) or Mann-Whitney U test (non-normality). Cumulative event-free survival was estimated using the Kaplan-Meier survival curve and Log rank test was used to compare the MACE-free survival between the two groups. Multivariate Cox regression analysis was used to estimate independent predictors of MACE and presented as hazard ratio and 95% confidence interval. A p-value of less than 0.05 was considered significant. Data were analyzed with PASW Statistics V.18.0 (IBM Corporation, New York, USA).

Results

Two hundred and two patients were enrolled. Baseline characteristics are presented in Table 1. 72.3% were male and the mean age was 60.1 years.

Table 2 demonstrates the angiographic classification of thrombus burden, G5 (total occlusion) was found in one hundred and thirty-four patients (66%). After establishing flow in G5 patients, the thrombus grade was reclassified and the majority of the G5 patients were reclassified into G4 (n = 91, 44.8%). Only one patient remained categorized as G5 after reclassification and this patient was excluded from data analysis. Patients that were reclassified as G4 were categorized as the large thrombus burden group and patients G0-3 were categorized as the small thrombus burden group.



Definition of thrombus grade 1-4 as in text. Arrow indicates intracoronary thrombus

Fig. 1 TIMI thrombus grading.

Angiographic and periprocedural data are presented in Table 3. The left anterior descending artery was the most frequent infarct related artery (57.9%) in both STB and LTB group. When the right coronary artery was the infarct-related artery, LTB was significantly more frequently present. Primary PCI was performed in 90.6% of the patients and the remainder underwent rescue PCI. Initial culprit lesion stenosis was slightly but significantly greater in the LTB group. The STB group had a higher proportion of initial TIMI flow grade 3 ($p<0.001$); however, there was no significant difference in final TIMI flow grade between the two groups ($p = 0.208$). Compared to the STB burden group, the use of aspiration thrombectomy was significantly higher in LTB group, whereas direct stenting was performed significantly less often. Drug eluting stents were utilized in 39.6% of the patients. There were no significant differences in the intra-procedural complications, angiographic and procedural success between the two groups.

The in-hospital outcomes are presented in Table 4; there were no significant differences between the two groups. At 1-year, two patients were lost to follow-up. Overall 1-year cumulative MACE-free survival was 80.7%. There were no significant differences in cumulative MACE-free survival among the reclassified thrombus grade groups 0-4 (Fig. 2). The MACE-free survival rates for G0 to G4 were 76%, 83.3%, 78.6%, 80% and 82.4%, respectively ($p = 0.671$). The 1-year cumulative MACE-free survival according to thrombus burden (Fig. 3) was not significantly different (LTB 82.4% vs. STB 79.3%, 95% confidence interval for the difference: -8.0% to 13.8%, $p = 0.59$). 1-year mortality was 14.5% and the majority of deaths occurred during the index admission for STEMI. Recurrent MI at 1-year follow-up occurred in two patients (1.0%). Stent thrombosis occurred in two patients (1%); one occurred in-hospital and the other at 30 days. The rate of TVR at 1 year was 5%.

Using Cox regression analysis, independent

Table 1. Baseline characteristics and initial presentation

Characteristic	Total n = 202	STB n = 111	LTB n = 91	p-value
Male-n (%)	146 (72.3)	78 (70.3)	68 (74.7)	0.482
Age (years)	60.1±13.1	59.9±13.2	60.2±12.9	0.896
BMI (kg/m^2)	24.7±3.2	24.7±3.1	24.8±3.2	0.763
Medical history-n (%)				
Diabetes mellitus	73 (36.1)	40 (36.0)	33 (36.3)	0.973
Hypertension	120 (59.4)	67 (60.4)	53 (58.2)	0.760
Dyslipidemia	114 (56.4)	66 (59.5)	48 (52.7)	0.338
Current smoker	81 (40.1)	43 (38.7)	38 (41.8)	0.663
Previous MI	24 (11.9)	13 (11.7)	11 (12.1)	0.934
Previous PCI	19 (9.4)	10 (9.0)	9 (9.9)	0.831
Previous CABG	5 (2.5)	1 (0.9)	4 (4.4)	0.177
SBP (mmHg)	132.2±35.0	131.5±34.4	133.0±35.9	0.756
DBP (mmHg)	81.8±23.4	82.2±23.2	81.3±23.8	0.800
Heart rate (bpm)	81.6±23.4	83.2±23.1	79.6±23.8	0.296
Creatinine (mg/dl)	1.3±0.9	1.3±1.1	1.2±0.8	0.472
Onset to presentation time (min)	145 (70, 315)	148 (70, 330)	130 (70, 300)	0.385
Door to balloon time (min)	118 (86, 171)	106 (85, 153)	125 (86, 182)	0.296
CHF-n (%)	60 (29.7%)	31 (27.9%)	29 (31.9%)	0.542
Killip class				
1	142 (70.3%)	80 (72.1%)	62 (68.1%)	
2	15 (7.4%)	6 (5.4%)	9 (9.9%)	
3	24 (11.9%)	14 (12.6%)	10 (11.0%)	
4	21 (10.4%)	11 (9.9%)	10 (11.0%)	0.652
Cardiac arrest-n (%)	21 (10.4%)	11 (9.9%)	10 (11.0%)	0.803
Ejection fraction, (%)	51.2±13.8	52.1±14.0	50.0±13.4	0.293

Data are presented as mean ± standard deviation, number (%) of patients or median (interquartile range)
STB = small thrombus burden (Group 0, 1, 2 and 3); LTB = large thrombus burden (Group 4); BMI = body mass index; SBP = systolic blood pressure; DBP = diastolic blood pressure; MI = myocardial infarction; PCI = percutaneous coronary intervention; CABG = coronary artery bypass graft

Table 2. Angiographic classification of thrombus burden

Thrombus score grade	Reference n = 203	Reference non-G5 n = 69	G5 reclassified n = 134	Reclassified final n = 203
G5	134 (66.0%)	0 (0%)	1 (0.7%)	1 (0.5%)
G4	20 (9.9%)	20 (29.0%)	71 (53.0%)	91 (44.8%)
G3	7 (3.4%)	7 (10.1%)	33 (24.6%)	40 (19.7%)
G2	12 (5.9%)	12 (17.4%)	16 (11.9%)	28 (13.8%)
G1	6 (3.0%)	6 (8.7%)	12 (9.0%)	18 (8.9%)
G0	24 (11.8%)	24 (34.8%)	1 (0.7%)	25 (12.3%)

Definition of G0-G5 as in text. Reference column indicates the classification after initial diagnostic angiography. G5 reclassified column denotes G5 (reference) group that was reclassified into G0 to G4 after establishing flow. Only one patient remained categorized as G5 after reclassification and this patient was excluded from data analysis. Reclassified final column denotes the final reclassified thrombus grade

predictors of 1-year MACE were age (HR 1.06, 95% CI 1.02-1.09, p = 0.001), cardiogenic shock (HR 3.87, 95% CI 1.48-10.10 p = 0.006) and cardiac arrest (HR 3.95, 95% CI 1.43-10.98 p = 0.008). LTB was not an

Table 3. Angiographic and periprocedural characteristics of the study groups

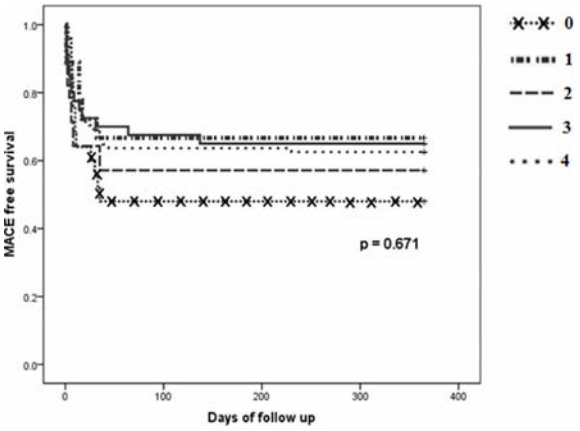
Characteristic	Total n = 202	STB n = 111	LTB n = 91	p-value
Diseased vessels-n (%)				
1	84 (41.6%)	50 (45.0%)	34 (37.4%)	
2	69 (34.2%)	36 (32.4%)	33 (36.3%)	0.541
3	49 (24.3%)	25 (22.5%)	24 (26.4%)	
Infarct related artery-n (%)				
Left main artery	0 (0%)	0 (0%)	0 (0%)	
LAD	117 (57.9%)	66 (59.5%)	51 (56.0%)	
LCX	13 (6.4%)	12 (10.8%)	1 (1.1%)	0.011
RCA	67 (33.2%)	31 (27.9%)	36 (39.6%)	
Others	5 (2.5%)	2 (1.8%)	3 (3.3%)	
Stent thrombosis-n (%)	6 (3.0%)	2 (1.8%)	4 (4.4%)	0.412
Bifurcation lesion-n (%)	23(11.4%)	17 (15.3%)	6 (6.6%)	0.052
Primary PCI	183 (90.6%)	98 (88.3%)	85 (93.4%)	0.522
Rescue PCI	19 (9.4%)	13 (11.7%)	6 (6.6%)	
Initial culprit lesion stenosis (%)	95.8±10.2	93.4±12.9	98.6±3.9	<0.001
Final culprit lesion stenosis (%)	2.6±14.2	2.9±16.5	2.1±10.9	0.661
Initial TIMI flow grade-n (%)				
0	137 (67.8%)	67 (60.4%)	70 (76.9%)	
1	19 (9.4%)	7 (6.3%)	12 (13.2%)	<0.001
2	12 (5.9%)	7 (6.3%)	5 (5.5%)	
3	34 (16.8%)	30 (27.0%)	4 (4.4%)	
Final TIMI flow grade-n (%)				
0	3 (1.5%)	3 (2.7%)	0 (0%)	
1	5 (2.5%)	1 (0.9%)	4 (4.4%)	0.208
2	7 (3.5%)	4 (3.6%)	3 (3.3%)	
3	187 (92.6%)	103 (92.8%)	84 (92.3%)	
Stent implantation-n (%)				
0	21 (10.4%)	10 (9.0%)	11 (12.1%)	
1	143 (70.8%)	81 (73.0%)	62 (68.1%)	0.703
>1	38 (18.8%)	20 (18.0%)	18 (19.8%)	
Drug eluting stent-n (%)	86 (39.6%)	21 (39.6%)	65 (39.6%)	0.986
Length of stent (mm)	26.8±12.8	26.8±12.0	26.8±13.8	0.980
Diameter of stent (mm)	3.2±0.5	3.2±0.5	3.3±0.5	0.387
Highest pressure (ATM)	13.7±2.8	13.5±2.9	14.1±2.7	0.161
Direct stenting-n (%)	53 (26.2%)	36 (32.4%)	17 (18.7%)	0.027
Aspiration thrombectomy-n (%)	140 (69.3%)	67 (60.4%)	73 (80.2%)	0.002
Distal protection device-n (%)	5 (2.5%)	3 (2.7%)	2 (2.2%)	1.000
IVUS-n (%)	20 (9.9%)	9 (8.1%)	11 (12.1%)	0.346
Pacemaker-n (%)	13 (6.4%)	4 (3.6%)	9 (9.9%)	0.070
IABP placement-n (%)	45 (22.3%)	26 (23.4%)	19 (20.9%)	0.665
Glycoprotein2b/3ainhibitor-n (%)	95 (47.0%)	47 (42.3%)	48 (52.7%)	0.140
ACT (seconds)	270.6±75.3	270.8±79.6	270.4±68.9	0.986
Intraprocedural complication-n (%)				
Major coronary dissection	2 (1.0%)	1 (0.9%)	1 (1.1%)	1.000
No reflow	8 (4.0%)	5 (4.5%)	3 (3.3%)	0.732
Perforation	1 (0.5%)	1 (0.9%)	0 (0%)	1.000
Angiographic success - n (%)	185 (91.6%)	104 (93.7%)	81 (89.0%)	0.233
Procedural success – n (%)	182 (90.1%)	101 (91.0%)	81 (89.0%)	0.639

Data are presented as mean ± standard deviation, number (%) of patients or median (interquartile range)
STB = small thrombus burden (Group 0, 1, 2 and 3); LTB = large thrombus burden (Group 4); LAD = left anterior descending artery; LCX = left circumflex artery; RCA = right coronary artery; IVUS = intravascular ultrasound; IABP = intraaortic balloon pump; ACT = activated clotting time

Table 4. In-hospital outcomes

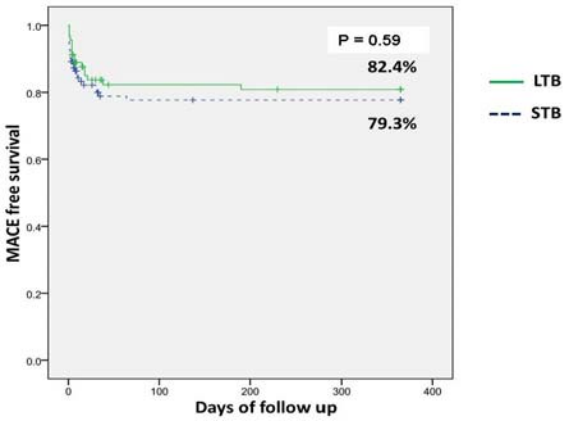
Outcomes	Total population n = 202	STB n = 111	LTB n = 91	p-value
CHF, n (%)	51 (25.2)	29 (26.1)	22 (24.2)	0.751
Stroke, n (%)	5 (2.5)	2 (1.8)	3 (3.3)	0.659
Major bleeding, n (%)	18 (8.9)	11 (9.9)	7 (7.7)	0.582
Reinfarction, n (%)	1 (0.5)	1 (0.9)	0 (0)	1.000
CABG, n (%)	6 (3.0)	3 (2.7)	3 (3.3)	1.000
Death, n (%)	27 (13.4)	16 (14.4)	11 (12.1)	0.629

CHF = congestive heart failure; VT = ventricular tachycardia; AV = atrioventricular block; CABG = coronary artery bypass graft



MACE = death, recurrent myocardial infarction, target vessel revascularization and stent thrombosis

Fig. 2 1-year cumulative MACE-free survival rates according to the reclassified thrombus grades.



MACE = death, recurrent myocardial infarction, target vessel revascularization and stent thrombosis; LTB = large thrombus burden; STB = small thrombus burden

Fig. 3 1-year cumulative MACE-free survival rates according to thrombus burden.

independent predictor of 1-year MACE.

Discussion

In the present study, in STEMI patients who were treated with emergent PCI, 1-year MACE was high 19.3%. There were no significant differences in cumulative 1-year MACE-free survival rate between the LTB and STB groups. Independent factors that were associated with 1-year MACE were age, cardiogenic shock and cardiac arrest whereas large thrombus burden was not an independent predictor of 1-year MACE.

Angiographic evidence of coronary thrombus adversely affects the outcome of PCI in STEMI[3-6]. Sianos et al[7,8] proposed a new, simplified angiographic thrombus burden classification in STEMI patients who underwent treatment with drug-eluting stent implantation. After establishing flow in the infarct-related artery, they categorized intracoronary thrombus size ≥2 times vessel diameter as large thrombus burden. Large thrombus burden was a significant independent predictor of mortality and MACE in patients who underwent PCI for STEMI.

When compared to previous studies[7,8], there are differences in the patient and procedural characteristics that could explain these different results. In the present study, patients presented earlier (2.5 hours vs. 4.5 hours) after symptom onset and had a higher proportion of diabetics (36% vs. 10%). Drug-eluting stents were utilized in 39.6% of the patients in the present study whereas all patients in the previous study had drug-eluting stent implantation. Aspiration thrombectomy was performed in 80% of the patients in the LTB group and was significantly higher than in the STB group (60.4%), whereas this technique was not utilized in the previous study. Direct stenting was performed in only 18.7% in the LTB and 32.4% in the

STB whereas the previous study used direct stenting in up to 55.8% of the patients. It is plausible that aggressive use of aspiration thrombectomy and cautious use of direct stenting in patients with LTB may result in more favorable outcomes. These findings may support the routine use of aspiration thrombectomy in primary PCI as recommended in international guidelines[2, 9]. The present study provides important insights in the current limitation of the treatment of STEMI patients with emergent PCI and supports the need of novel therapeutic strategies regardless of the angiographic thrombus burden.

Study limitations

First, the small number of patients enrolled may be insufficient to detect a difference in 1-year cumulative MACE between the two groups of thrombus burden. Second, the present study is an observational study; nevertheless, the patients enrolled were consecutive patients representing a real-world clinical setting. Third, all coronary angiograms were reviewed by a single investigator.

Conclusion

At 1-year, in STEMI patients who were treated with emergent PCI, there were no significant differences in MACE between the LTB and STB groups. Independent factors that predicted 1-year MACE were age, cardiogenic shock and cardiac arrest.

Acknowledgement

This study was funded by the Siriraj grant for research development. The authors express their sincere gratitude to Rungtiwa Pongakasira for her secretarial assistance.

What is already known on this topic?

Angiographic evidence of large thrombus burden adversely affects the outcome of PCI in STEMI.

What this study adds?

This is the first study to evaluate the presence and impact of thrombus burden in Asian patients with STEMI.

Potential conflicts of interest

None.

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ผลของขนาดลิ่มเลือดในหลอดเลือดหัวใจ ต่อผลลัพท์ทางคลินิกในผู้ป่วยภาวะหัวใจขาดเลือด ฉับพลันชนิด ST-segment ยก ที่ได้รับการรักษาฉุกเฉินด้วยการถ่างขยายหลอดเลือด

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วัตถุประสงค์: เพื่อศึกษาผลของขนาดลิ่มเลือดในหลอดเลือดหัวใจ ต่อผลลัพท์ทางคลินิกที่ 1 ปี ในผู้ป่วย ภาวะหลอดเลือดหัวใจขาดเลือดฉับพลันชนิด ST-segment ยก (STEMI) ที่รักษาเป็นกรณีฉุกเฉินด้วยการถ่างขยายหลอดเลือด (Percutaneous coronary intervention, PCI)

ภูมิหลัง: การพบลิ่มเลือดขนาดใหญ่ในหลอดเลือดหัวใจ (ได้แก่ขนาดมากกว่าหรือเท่ากับ 2 เท่าของขนาดเส้นผ่าศูนย์กลางของหลอดเลือด) ในผู้ป่วย STEMI ที่รักษาอย่างฉุกเฉินด้วยการถ่างขยายหลอดเลือดนั้นจะทำให้เกิดผลลัพท์ทางหัวใจที่ไม่ดี (Major adverse cardiac events, MACE) อย่างไรก็ตามยังไม่มีข้อมูลสำหรับผลของขนาดลิ่มเลือดในผู้ป่วยเชื้อชาติเอเชีย

วัสดุและวิธีการ: การศึกษานี้เป็นการศึกษาแบบติดตามผู้ป่วยภาวะ STEMI ที่รักษาอย่างฉุกเฉินด้วยการถ่างขยายหลอดเลือดตั้งแต่ วันที่ 1 มิถุนายน พ.ศ. 2551 ถึง 31 พฤษภาคม พ.ศ. 2554 มีการแบ่งผู้ป่วยเป็น 2 กลุ่ม ตามขนาดของลิ่มเลือดหัวใจ เป็นกลุ่มลิ่มเลือดขนาดใหญ่ (≥2 เท่าของขนาดเส้นผ่าศูนย์กลางหลอดเลือด) และลิ่มเลือดขนาดเล็ก (<2 เท่าของขนาดเส้นผ่าศูนย์กลางหลอดเลือด) ผลลัพท์ทางหัวใจที่ไม่ดี (MACE) ได้แก่ องค์ประกอบรวมของการเสียชีวิต การเกิดหัวใจขาดเลือดซ้ำ การต้องมาขยายหลอดเลือดซ้ำ และภาวะมีลิ่มเลือดอุดขดลวดค้ำยัน

ผลการศึกษา: มีผู้ป่วยทั้งหมด 202 ราย โดยเป็นผู้ชาย 72% และอายุเฉลี่ย 60 ปี ผู้ป่วย 134 ราย (66%) พบว่ามีหลอดเลือดหัวใจตันร้อยละ 90.6 ของผู้ป่วยได้รับการรักษาเปิดหลอดเลือดด้วยการถ่างขยายหลอดเลือด (primary PCI) ส่วนที่เหลือได้รับการถ่างขยายหลอดเลือดกรณีฉุกเฉินหลังจากยาละลายลิ่มเลือดไม่สามารถเปิดหลอดเลือดหัวใจ (rescue PCI) มีผู้ป่วย 111 ราย (55%) ที่มีลิ่มเลือดขนาดเล็กและ 91 ราย (45%) ที่มีลิ่มเลือดขนาดใหญ่ กลุ่มผู้ป่วยที่มีลิ่มเลือดขนาดใหญ่ได้รับการรักษาร่วมด้วยการดูดลิ่มเลือดถึงร้อยละ 80.2 ซึ่งมากกว่ากลุ่มที่มีลิ่มเลือดขนาดล็ก (80.2% vs. 60.4%, p = 0.002) ผู้ป่วยกลุ่มลิ่มเลือดขนาดเล็กได้รับการวางขดลวดโดยตรงมากกว่ากลุ่มลิ่มเลือดขนาดใหญ่ (32.4% vs. 18.7%, p = 0.027) ผลของการถ่างขยายเส้นเลือดและ TIMI grade 3 flow ไม่มีความแตกต่างกันระหว่างทั้ง 2 กลุ่ม อัตราเสียชีวิตในโรงพยาบาลร้อยละ 13.4 และไม่มีความแตกต่างกันระหว่างทั้ง 2 กลุ่ม เมื่อติดตามผู้ป่วยเป็นเวลา 1 ปี พบว่าไม่มีความแตกต่างที่มีนัยสำคัญทางสถิติ สำหรับผลลัพท์ทางคลินิกที่ไม่ดี (MACE) ระหว่างกลุ่มลิ่มเลือดขนาดใหญ่และขนาดเล็ก (82.4% vs. 79.3%, p = 0.59)

สรุป: ในการศึกษานี้ในผู้ป่วยภาวะหลอดเลือดหัวใจขาดเลือดฉับพลันชนิด ST-segment ยก ที่รักษาอย่างฉุกเฉินด้วยการถ่างขยายหลอดเลือดนั้น พบว่าขนาดของลิ่มเลือดในหลอดเลือดหัวใจไม่มีผลต่อผลลัพท์ทางคลินิกที่ 1 ปี