Incidence of Major Adverse Cardiac Event in Low Risk Chest Pain Patients in Emergency Department of Rajavithi Hospital

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Background: *Acute myocardial infarction is a major problem of public healthcare in Thailand. In the emergency room, patients who present chest pain are at low risk for myocardial infarction and short term risk of adverse cardiac events. In the present study, the incidence of major adverse cardiac events among low risk chest pain patients who presented at the emergency room of Rajavithi Hospital was investigated to improve treatment in the future.*

Objective: *To evaluate incidence of major adverse cardiac events within 30 days among patients with low risk chest pain for myocardial infarction admitted to the emergency room at Rajavithi Hospital.*

Material and Method: *This prospective observational study was undertaken at emergency the room of Rajavithi Hospital. Low risk chest pain patients, classified by normal ECG, normal Troponin T level and Thrombolysis in Myocardial Infarction (TIMI) score less than 2, suspected of acute myocardial infarction, were included from October 1, 2012 to October 31, 2013. Primary endpoint was major adverse cardiac event (MACE) within 30 days after initial presentation.*

Results: *In all, 209 patients were enrolled in this study comprising females, 51.7% and mean age 54.84 ± 16.44 years. A total of 84 patients had TIMI score 1 (40.2%), 67 patients had TIMI score 2 (32.1%) and 58 patients had TIMI score 0 (27.7%). At 30 days after presenting, two patients had a major adverse cardiac event (0.9%), both of them had TIMI score 2. No significant difference was observed between TIMI score 2 and other groups of TIMI score for major adverse cardiac adverse event (p-value = 0.075). The most common of TIMI risk factor was chest pain ≥ 2 episodes within 24 hours (86 patients, 41.2%). The most common underlying disease or previous history was congestive heart failure (33 patients 15.8%) but no factors had statistical significance for major adverse cardiac events among low risk chest pain patients.*

Conclusion: *Incidence of a major adverse cardiac event within 30 days among low risk chest pain patients was low. No significant difference was observed between each group of TIMI score 0-2 for major adverse cardiac event and no significant risk factor was found for major adverse cardiac events in low risk chest pain patients.*

Keywords: *Thrombolysis in myocardial infarction score (TIMI score), Major adverse cardiac event (MACE), Electrocardiography (ECG)*

Chest pain is a common symptom present in the emergency room. The most serious cause of chest pain throughout the world is myocardial infarction. Increased severity of this disease occurs if the diagnosis is delayed or missed treatments due to disability.

Currently, much supporting evidence exists to diagnose myocardial infarction. Electrocardiography (ECG) and cardiac enzymes to diagnose myocardial infarction such as CPK, CK-MB and Troponin T are the standard methods that can be performed at the emergency room[1,2].

Patients with ECG abnormalities such as a ST-Elevation Myocardial Infarction (STEMI) or NonST-Elevation Myocardial Infarction (NSTEMI) and detected the enzyme Myocardial infarction have increased. These patients have a high incidence of complications and a high mortality rate and are usually admitted to the hospital for standard treatment.

The increasing number of myocardial infarction patients is disproportionate to the limited number of patient beds, and therefore, no patient beds are available for those waiting diagnosis.

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As a result, patients with chest pain and suspected myocardial infarction but normal initial ECG and myocardial enzymes often wait in crowded at emergency rooms for repeated laboratory tests six hours later. Therefore, the emergency room has many patients waiting for the diagnosis of their symptoms. For those reasons, the researchers chose to study the safety of permitting these patients to go home faster and shorten the waiting time at the emergency room using Thrombolysis in Myocardial Infarction (TIMI) Score to help assess risk[3,4] discharge patient sooner.

The present study selected patients with low risk of Myocardial infarction and TIMI scores 0-2 with normal electrocardiogram and cardiac enzymes at the emergency room of Rajavithi Hospital. The incidence of Major Adverse Cardiac Event (MACE) was monitored for 30 days after the patient was admitted to the emergency room in to improve and plan care at the emergency room for patients with chest pain.

Objective

The primary objective of this study was the incidence of MACE within 30 days after initial presentation. The secondary objective was to study the incidence of MACE and factors affecting the occurrence of MACE.

Material and Method

This prospective observational study was undertaken at the emergency room of Rajavithi Hospital. Low risk chest pain patients, classified by normal ECG, normal Troponin T level and TIMI score of 0-2, suspected of having acute myocardial infarction, were included. In all, 209 patients were enrolled from October 1, 2012 to October 31, 2013. This research protocol was reviewed and approved by the ethics committee of Rajavithi Hospital.

The researcher classified the participants and collected patients' history by a database storage form and used the results of the ECG12 lead and myocardial enzymes (Troponin) for this research.

The treatment process of the patients focused on the occurrence of MACE, within 30 days after receiving treatment at the emergency room by one of the following methods described below.

1. Tracking symptoms over the phone.

2. Reviewing patient medical appointment records and following up with a cardiologist at 15 and 30 days.

Patients with chest pain at low risk of suspected myocardial ischemia fit the criteria below.

1. TIMI Score is between 0-2 points.

2. No observed ECG characteristics of myocardial ischemia (No new ST-T change ECG or T wave inversion ECG) or ECG compared with the characteristics of the patients showing no change from the original.

3. Inspection of enzyme myocardial infarction (Cardiac Enzyme) reveals Troponin T levels at normal in the emergency room. The patients will have their blood drawn one time with angina pain after six hours or more. When the patient had chest pain at less than six hours, blood was drawn a second time[5, 6].

The TIMI Score is the scale system used to assess risk with unstable angina patients or NonST elevation Myocardial Infarction to reduce mortality or prevalence of myocardial infarction at 14 days consisting of seven questions as described below.

1. Aged ≥65 years.

2. Has risk factors for coronary artery disease (Risk factor for CAD) ≥3 restrictions.

3. Has a history aspirin taking within 7 days before onset.

4. The angina pain ≥twice within 24 hr.

5. Has observed enzymatic myocardial infarction (cardiac markers) increase.

6. ECG with ST Depression ≥0.5 mm.

7. Had coronary artery with stenosis ≥50%[2,7].

Risk factors for CAD

1. Diabetes

2. Hypertension

3. Dyslipidemia

4. Current Smoker

5. Family history of premature CAD in first degree relatives among men aged <55 years and women aged <65 years[2,8].

The ECG reveals no characteristics of myocardial infarction (No new ST-T change ECG or T wave inversion ECG).

1. ST depression of at least 0.5 mm ≥2 contagious lead (including reciprocal change)

2. Dynamic T-wave inversion

or no change in appearance from the original when compared with traditional ECGs of patients [9].

Enzyme myocardial infarction (Cardiac Enzyme) Troponin T is a normal result of Troponin. The result is negative.

MACE is described below

1. The death except for the obvious cause of death was not caused by heart disease.

2. Cardiac arrest.

3. Emergency revascularization procedure.

4. Cardiogenic shock is life-threatening if not treated.

5. Ventricular arrhythmia is life-threatening if not treated.

6. High-degree atrioventricular block is life-threatening if not treated.

7. Acute myocardial infarction is life-threatening if not treated[2,10].

Inclusion criteria

The patients were over 18 years, had chest pain for at least five minutes and received complete medical care as being suspected of having myocardial ischemia. In addition, patients had received ECG12 lead and Troponin T and had TIMI score ≤2. Regarding the results of the heart (ECG) characteristics of myocardial ischemia (No new ST-T change ECG or T wave inversion ECG) or ECG compared with the original, Patients' ECGs showed no change in appearance from the original. The results of myocardial infarction enzyme Troponin were negative.

Exclusion criteria

Patients who had TIMI Score >2 and presented a significant change of ECG or positive for Troponin T were excluded.

Statistical analysis

Continuous variables are presented as mean ± SD or median (range) and categorical variables are presented as numbers and percentages. Descriptive statistics were used to calculate incidence rates of occurrence of adverse cumulative incidence density rate and incidence rate. Statistical analyses are presented as Chi-square test and Relative risk. Statistical analysis was performed with SPSS version 17.0.

Results

The present study was aimed to determine the incidence of MACE among patients with chest pain at low risk of coronary disease in the emergency room at Rajavithi Hospital. Data was collected on patients with chest pain at low risk from October 1, 2012 to October 31, 2013 to track adverse effects for 30 days from the date of receiving treatment in the emergency room with a total of 218 patients were excluded from the study criteria in Nine cases were excluded from the study. The 209 enrolled patients, were mostly female, 51.7%, had an average age of 54.84±16.44 years, chest pain an average of 17 hours, 28 minutes ±23 hours, 16

minutes before hospital admission. When assessing risk of Thrombolysis in TIMI score 84 subjects (40.2%) were found to be at the first the risk level (TIMI score = 1). 67 patients (32.1%) had TIMI score = 2 and 58 patients (27.7%) had TIMI score = 0. Regarding risk, TIMI score indicated chest pain ≥2 in 24 hours, with a total of 86 patients (41.2%) and age ≥65 years with 54 patients (25.8%). Medical history or treatment history was found to be a major risk of heart attack (congestive heart failure) and cardiac arrhythmias or 33 patients (15.8%) and 31 patients (14.8%), respectively, as shown in Table 1. In the present study, the incidence of MACE in two patients with chest pain, at low risk chest pain was found (0.9%). The two cases of MACE had the TIMI score = 2 in patients with ischemic heart disease. The first patient had a diagnosis of NSTEMI with increased Troponin T level at day 3 after evidenced and the Echocardiogram showed Left Ventricular Ejection Fraction (LVEF) 15% with hypokinesia of the anterior, septal and inferior wall and Coronary Angiography diagnosis of single vessel disease. The second patient had a diagnosis of NSTEMI at day 13 after being treated at the hospital emergency room for chest pain and detected elevated Troponin T values. The results showed that the occurrence of major adverse cardiovascular risk is likely when the TIMI score equals 2 (TIMI score 2).

However, when compared with the group with TIMI score 0 and 1, it the incidence of major adverse cardiac disease was not significantly different (p-value = 0.075). When comparing risk factors for each of the TIMI score in the occurrence of major adverse cardiac event, no significant difference was found in the two groups of patients. When comparing medical history or medical history of the patients with low-risk chest pain in the emergency room regarding the occurrence of major adverse cardiac disease, the results of the study found no significant difference in patients in both groups as shown in Table 1.
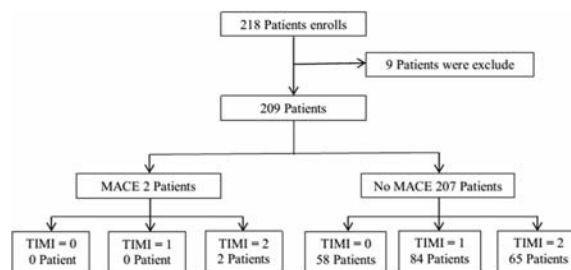

Fig. 1 Numbers of patients with chest pain.

Table 1. Baseline characteristics of patients and MACE

	MACE (2)	No MACE (n = 207) n (%)	Mean (n = 209) n (%)	*p*-value
Age mean ± SD	71.5±0.71	54.68±16.44	54.84±16.44	0.15
Female	1 (50.0%)	100 (48.3%)	101 (51.7%)	0.962
Duration of chest pain (hours)	15±12.73	17.49±23.37	17.47±23.27	0.881
TIMI score				0.075
TIMI score = 0	0	58 (28.0%)	58 (27.7%)	
TIMI score = 1	0	84 (40.6%)	84 (40.2%)	
TIMI score = 2	2 (100%)	65 (31.4%)	67 (32.1%)	
Age ≥65 years	2 (100%)	52 (25.1%)	54 (25.8%)	0.66
CAD risk ≥3	0	31 (14.9%)	31 (14.8%)	1.00
Aspirin use	0	40 (19.3%)	40 (19.1%)	1.00
Chest pain ≥2 episodes	2 (100%)	84 (40.6%)	86 (41.1%)	0.168
ST depression ≥0.5 mm	0	1 (0.5%)	1 (0.5%)	1.00
Stenosis ≥50%	0	6 (2.9%)	6 (2.9%)	1.00
CHF	0	33 (15.9%)	33 (15.8%)	1.00
AMI	1 (50.0%)	22 (10.6%)	23 (11.0%)	0.208
Stroke	0	6 (2.9%)	6 (2.9%)	1.000
Arrhythmia	1 (50.0%)	30 (14.5%)	31 (14.8%)	0.275
Revascularization	0	5 (2.4%)	5 (2.4%)	1.00
CABG	0	2 (0.9%)	2 (0.9%)	1.00

MACE = Major adverse cardiac event; TIMI score = Thrombolysis in myocardial infarction score; CAD = Cardiovascular disease; CHF = Congestive heart failure; AMI = Acute myocardial infarction; CABG = Coronary artery bypass graft

Discussion

Because of chest pain is a symptom common to the emergency room, it leads to critical and public health problems worldwide including myocardial infarction (Acute Myocardial Infarction). The patient has a chance of MACE. A study abroad previously found that the major adverse cardiac disease in patients with chest pain at low risk (TIMI score 0 results together with normal ECG and Troponin T) at the emergency room was observed at the 0.2 to 0.8% level[2,9].

The present study found that the incidence of MACE was at 0.9%, which is slightly higher due to the comprehensive study in patients with higher-risk TIMI score 0-2 and shows the results of ECG and myocardial enzyme Troponin T as normal on the risk assessment. The risk from the TIMI score at lower Level 2 to confirm that a low risk to the occurrence of major adverse cardiac event should be applied to the population admitted in the emergency room at Rajavithi Hospital. This study found that the incidence of MACE occurred in patients with a TIMI score equal to 2 (100%), compared with the study previously found that TIMI score value was greater, making the chance of adverse heart disease (adverse cardiac outcome) even higher[2].

However, when compared with the TIMI score between levels 0, 1, 2 for the incidence of major adverse cardiac event, no significant difference was found (*p*-value = 0.075). It could include patients with TIMI score 2 in the low-risk groups as well as groups with TIMI scores 0 and 1. Moreover, it agrees with previous studies that patients with TIMI scores 0-2 have low risk regarding the occurrence of adverse cardiovascular (adverse cardiac outcome), which causes an adverse period. The MACE was more likely to present in 14 days after being treated at the emergency room, similar to previous studies[2,10]. When comparing individual risk factors on the incidence of TIMI score in the occurrence of MACE, no significant difference was found, probably due to causes of Acute Myocardial Infarction. The main reason for the occurrence of adverse importance of heart disease caused by atherosclerosis, which relies on many factors in the emergence of living factors, one factor that did not affect the incidence of MACE. Moreover, because few patients enrolled with the low risk group likely to cause MACE, so no significant difference was found. When studying the treatment history of patients with congestive heart failure, Acute Myocardial Infarction, cerebrovascular occlusive

disease (stroke), Cardiac Arrhythmic, Revascularization, coronary artery bypass graft (CABG), the incidence of MACE was not significantly different. It may be because patients with a history of disease or treatment history were at such a high risk of developing myocardial ischemia. The ECG or Troponin T abnormalities including the TIMI score ≥ 3, was not considered for this study. Moreover, few patients enrolled with the low-risk group, likely causing MACE, so no significant difference was observed.

Limitation

The small sample size and need for a long time follow-up were the two limitations of the study.

Conclusion

Incidence of MACE within 30 days in low risk chest pain patients revealed few cases. No significant difference was found between each group of TIMI score 0-2 for MACE and no significant risk factors were identified for MACE among low risk chest pain patients.

Acknowledgement

Potential conflicts of interest

None.

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การศึกษาอุบัติการณ์การเกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจในผู้ป่วยที่มีอาการเจ็บแน่นหน้าอกที่มีความเสี่ยงต่ำ ที่ห้องฉุกเฉินโรงพยาบาลราชวิถี

สุมิตษิ์ตรา ปิยะณัตดิ์พูล, ธีรชัย เลิศสอมรภัทร

ภูมิหลัง: เนื่องจากโรคกล้ามเนื้อหัวใจขาดเลือดเป็นโรคที่เป็นปัญหาที่สำคัญทางสาธารณสุขของประเทศไทย พบว่าผู้ป่วยที่มีอาการเจ็บแน่นหน้าอกที่มารับการรักษาที่ห้องฉุกเฉินมีความเสี่ยงต่อการเกิดโรคกล้ามเนื้อหัวใจขาดเลือด ซึ่งอาจส่งผลให้เกิดภาวะแทรกซ้อนของโรคหัวใจได้ ดังนั้นผู้นิพนธ์จึงเลือกศึกษาหาอุบัติการณ์ของการเกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจในผู้ป่วยที่มีอาการเจ็บแน่นหน้าอกที่มีความเสี่ยงต่ำ ที่ห้องฉุกเฉินโรงพยาบาลราชวิถี เพื่อที่จะได้นำมาปรับปรุงและคัดกรองผู้ป่วยที่มาห้องฉุกเฉินด้วยอาการเจ็บแน่นหน้าอกให้มีคุณภาพการรักษาที่ดีขึ้นต่อไปในอนาคต

วัตถุประสงค์: เพื่อศึกษาอุบัติการณ์การเกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจในผู้ป่วยที่มีอาการเจ็บแน่นหน้าอกที่มีความเสี่ยงต่ำที่ห้องฉุกเฉินโรงพยาบาลราชวิถี

วัสดุและวิธีการ: การศึกษานี้เป็นแบบ prospective observational study ที่ห้องฉุกเฉินโรงพยาบาลราชวิถีโดยผู้ป่วย ที่มาด้วยอาการเจ็บแน่นหน้าอกและมีความเสี่ยงต่ำจากการประเมินด้วยการตรวจคลื่นไฟฟ้าหัวใจ (ECG) การตรวจเอนไซม์กล้ามเนื้อหัวใจ Troponin T ร่วมกับการใช้ thrombolysis in myocardial infarction (TIMI) score จำนวน 209 ราย ตั้งแต่ วันที่ 1 ตุลาคม พ.ศ. 2555 ถึง วันที่ 31 ตุลาคม พ.ศ. 2556 ทำการหาอุบัติการณ์การเกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจภายในระยะเวลา 30 วันหลังมารับการรักษาที่ห้องฉุกเฉิน

ผลการศึกษา: จากการศึกษาผู้ป่วยทั้งหมด 209 ราย พบเป็นผู้หญิง 51.7% อายุเฉลี่ย 54.84±16.44 ปี มีความเสี่ยง TIMI score ระดับ 1 ทั้งหมด 84 ราย (40.2%) TIMI score ระดับ 2 ทั้งหมด 67 ราย (32.1%) และ TIMI score ระดับ 0 ทั้งหมด 58 ราย (27.7%) มีผู้ป่วย 2 ราย (0.9%) เกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจโดยทั้ง 2 ราย มี TIMI score ระดับ 2 แต่เมื่อเปรียบเทียบกับกลุ่มที่มี TIMI score ระดับ 0 และ 1 แล้วไม่พบความแตกต่างในการเกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจอย่างมีนัยสำคัญทางสถิติ (p-value = 0.075) ปัจจัยเสี่ยง TIMI score ที่พบมากที่สุดคือ มีอาการเจ็บแน่นหน้าอก ≥2 ครั้งใน 24 ชั่วโมง มีผู้ป่วย 86 ราย (41.2%) ส่วนประวัติโรคประจำตัวหรือประวัติการรักษาเดิมที่พบมากที่สุดคือภาวะหัวใจวาย (congestive heart failure) มีผู้ป่วย 33 ราย (15.8%) แต่เมื่อนำปัจจัยเสี่ยงประวัติโรคประจำตัวและประวัติการรักษาเดิมทั้งหมดมาศึกษาการเกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจในผู้ป่วยที่มาด้วยอาการเจ็บแน่นหน้าอกและมีความเสี่ยงการเกิดโรคต่ำ ผลจากการศึกษาไม่พบว่ามีปัจจัยที่มีนัยสำคัญทางสถิติ

สรุป: อุบัติการณ์ของภาวะไม่พึงประสงค์ที่สำคัญของโรคเส้นเลือดหัวใจในผู้ป่วยที่มีอาการเจ็บแน่นหน้าอกที่มีความเสี่ยงต่ำที่ห้องฉุกเฉิน โรงพยาบาลราชวิถี พบได้น้อยหลัง 30 วัน ไม่พบความแตกต่างระหว่างกลุ่มที่มีความเสี่ยงของ TIMI score ระดับ 0 ระดับ 1 และ ระดับ 2 ไม่พบว่ามีปัจจัยเสี่ยงของประวัติโรคประจำตัวหรือประวัติการรักษาเดิมที่จะส่งผลให้เกิดภาวะไม่พึงประสงค์ที่สำคัญของโรคหัวใจอย่างมีนัยสำคัญทางสถิติ