ORIGINAL ARTICLE

Comparison between Angiographic Severity of Lesions in Patients with Acute Myocardial Infarction with and without Thrombolytic Therapy

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Author`s Contribution

All the authors contributed equally to this work; they designed the article, did data collection, did thorough search, analyzed the data, wrote, reviewed and approved the final form of this manuscript.

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ABSTRACT

Objective: To compare angiographic severity of stenosis using Gensini and CASS score in patients undergoing angiography after receiving thrombolytic therapy for acute STEMI versus those who didn't receive thrombolytic therapy.

Methodology: All patients with and without symptoms of ischemia showing new ischemic changes on ECG, new onset pathological Q waves or regional wall motion abnormalities associated with significantly elevated cardiac markers (as defined above) were included in this study after being screened according to inclusion and exclusion criteria. All the patients were then evaluated for the suitability of thrombolytic therapy (time from symptom onset and absence of contraindications). The patients were subsequently divided into 2 subsets, those receiving thrombolytic therapy and those who did not receive thrombolytic therapy on account of either contraindications to thrombolysis or delayed presentation (>12 hours). Both these subsets were then subjected to coronary angiography with intent of performing PCI after obtaining informed consent and the angiographic stenosis severity was compared using the Gensini and CASS scores.

Results: A total of 108 patients were included (54 in each group). The mean age was 49.57 ±12.3 years, mean hemoglobin was 13.67± 2.05 g/dL and mean serum creatinine level was 1.79±0.8 mg/dL. Anterior MI was the most frequent MI location (41.7%). Maximum no. of patients had a single vessel coronary artery disease (49.1%). The mean gensini score was 14.81±10 in thrombolyzed group while it was 7.53±4 in the non thrombolyzed group (P value 0.00). The mean CASS score was 1.51±0.8 in the thrombolyzed group and 1.88±0.79 in the non thrombolyzed group (P value 0.013).

Conclusion: Thrombolytic therapy for acute MI alters significantly, the angiographic lesion severity, and hence may reduce the incidence of ischemic complications and favourably affect prognosis in patients treated at a non-primary PCI capable facility. Objective: To find out the patient satisfaction level after day case surgery under local anaesthesia at PIMS, Islamabad.

Keywords: Coronary artery disease, Myocardial Infarction, Percutaneous coronary intervention, electrocardiogram

Introduction

Ischemic heart disease takes a heavy toll on a country's economy. It is the leading cause of death in Europe and North America.[1] According to AHA estimates, the overall prevalence of CAD in USA over 1999-2006 has been 7.6% (Female 10.4% versus males 4.8%) [2]. The annual number of adults per 100 having a diagnosed heart attack or fatal coronary heart disease was reported as 125 in males and 10 in females in 55-75 years age group.[2] Approximately 0.8 million Americans sustain a new coronary event every year and approximately 5 million develop a recurrent episode.[1] One of every six deaths was caused by coronary artery disease in 2007.[1] With the advent of reperfusion and thrombolytic therapy, diminutive annual mortality rates for patients with acute MI have been noted in the Western world. Scarcity of literature reporting prevalence, annual incidence, mortality rate and economic burden exists in Pakistan but several single Centre studies are available. One such study found STEMI in 40.5% of the patients admitted to the hospital with ACS.[3] Another such study revealed that in-hospital mortality was 13.2%, the commonest cause of which was pump failure (42%).[4]

Reperfusion therapy is the primary goal of management of STEMI or new LBBB reporting to hospital within 12-24 hours after symptom onset.[1] An inverse relation between time to treatment and survival benefit has been demonstrated in multiple trials .[5, 6] Significant reduction in 30 day mortality rate (15%) after thrombolytic therapy in patients with STEMI was reported in GUSTO I trial. Associated with it were significantly higher rates of TIMI 3 flow at 90 minutes after thrombolysis [7]. Unavailability of rtPA associated with high costs (US$ 2200 per episode of MI versus 300US$ per episode of MI with streptokinase) in a resource poor country like Pakistan culminates in use of SK for thrombolytic therapy in patients with STEMI despite its proven inferiority [1]. This practice is supported by a meta-analysis examining 30-35 day mortality and major adverse events with use of different thrombolytic agents in treatment of acute MI which showed no significant difference in mortality with any of the thrombolytic agents [8]. The overall rate of intracerebral hemorrhage (0.5% versus 0.7%) or stroke (OR 1.29 versus 1.13) from any cause was also lower for SK versus tPA.[8]

Smaller infarcts, improved hemodynamic stability, greater chances of success of procedure and improved survival are anticipated in patients undergoing angiography for PCI after receiving thrombolytic therapy. ASSENT 4 PCI which aimed to evaluate the efficacy of fibrinolysis plus PCI versus PCI alone was stopped prematurely on account of high in hospital mortality and event rates for death, shock and heart failure within 90 days [9]. FINESSE trial demonstrated a higher rate of patients having an open artery on angiography who had received fibrinolysis plus Glycoprotein IIB/IIIA inhibitors [10]. Other trials have shown that fibrinolysis prior to PCI in patients who present with acute MI results in worse outcomes [11]. Still, fibrinolysis is used as the favored strategy for achieving revascularization in non-primary PCI capable facilities in Pakistan. The current study aims to evaluate whether such an approach results in decrease in severity of stenotic lesions after STEMI in patients undergoing angiography with the intention of performing PCI.

Methodology

This analytical study was conducted in Shaheed Zulfiqar Ali Bhutto Medical University (PIMS), Islamabad in the cardiology department from August to November, 2016. All patients with and without symptoms of ischemia showing new ischemic changes on ECG, new onset pathological Q waves or regional wall motion abnormalities associated with significantly elevated cardiac markers (as defined above) were included in this study. Written informed consent was taken. The study was approved by institutional ethical review board.

Inclusion Criteria:

- Age more than 18 years
- History of typical ischemic chest pain
- ECG showing STEMI ± Q waves
- Raised cardiac markers
- Echo showing new regional wall motion abnormalities

Exclusion Criteria:

- Atypical chest pain
- Severe liver/kidney disease
- Age less than 18 or more than 80 years
- Informed consent not given.
- Previous M.I
- Oncological or hematological disorder

All the patients were then evaluated for the suitability of thrombolytic therapy (time from symptom onset and absence of contraindications). The patients were subsequently divided into 2 subsets, those receiving thrombolytic therapy and those who did not receive thrombolytic therapy on account of either

contraindications to thrombolysis or delayed presentation (>12 hours). Both these subsets were then subjected to coronary angiography with intent of performing PCI after obtaining informed consent.

Coronary angiography was performed through right femoral route by using Judkin's technique on Philips machine in catheterization laboratory of PIMS, Islamabad. This procedure was done by two experienced cardiologists. Reporting of coronary angiogram was done by a cardiologist unaware of clinical and biochemical profile of the patients. To assess the severity of atherosclerotic lesion, Gensini score was computed as described in Table I.

Table 1-Gensini score

Reopacified and normal	32 x 0.5	16
Reopacified and 25% or S	32 x 0.5 x ¼	12
Reopacified and 50% or S	32 x 0.5 x ½	8
Reopacified and 75%	32 x 0.5 x ¼	4
Reopacified and 90%	32 x 0.5 x 1/8	2
Reopacified and 99%	32 x 0.5 x 1/16	1
If 99% receiving collaterals	16 x 0.5	8

Sample Size: WHO STEPS sample size calculator was used the appropriate sample size with a 95% confidence level, 5% margin of error and a prevalence of STEMI of 7.6% and was found to be 108 patients.

Statistical Analysis: Data entry and analysis was performed using SPSS v 22.0 for windows. Quantitative data was expressed as mean ± standard deviation and qualitative variables using frequency and percentage. Comparsion of Gensini and CASS score between two groups was performed by ANOVA. A 2-tailed P value of < 0.05 was considered statistically significant.

Operational Definitions: Myocardial Infarction: A rise and/or fall in cardiac troponin with at least one value above the 99th centile of upper normal range utilizing an assay with less than 10% coefficient of variation at the level of detection together with evidence of ischemia (defined as any symptom of ischemia, ECG changes suggestive of new ischemia, development of pathological Q waves or imaging evidence of infarction). Included in the definition was sudden cardiac death with evidence of myocardial ischemia (new ST elevations, LBBB or coronary thrombus) and biomarker elevation greater than 3 times ULN for post PCI patient and greater than 5 ULN for post CABG patients. Documented stent thrombosis is also included in this definition.[1]

Gensini Score: It is a stenosis score based on the bulk of atherosclerotic lesion. It takes into consideration the geometrical severity of lesion by angiography, the cumulative effect of multiple obstructions and significance of jeopardized myocardium. A non linear score is assigned to each lesion based on severity of stenosis as indicated by reduction of luminal diameter. A multiplier is applied to each lesion score based on its location in the coronary tree depending upon the functional significance of the area supplied by that segment. The final Gensini score is the sum of all the lesion scores. (Table I)

CASS Score: For this score each of the three major epicardial vessels with greater than 70% stenosis is assigned 1 point, stenosis of ≥50% in left main coronary arteries is considered a 2 vessel disease and is assigned 2 points. The final score is the sum of all points and is analogous to single, double and triple vessel disease in the coronary tree.

Results

After screening for inclusion and exclusion criteria, a total of 108 patients with STEMI were included in the study with 54 each in the thrombolyzed and non thrombolyzed groups. The baseline demographic parameters of the study population were as described in Table 1.

Table 1: Frequency of different co-morbid illness in the group of patients included in the study

Factor	Patient Status	Frequency	Percentage
Hypertension	No	41	38%
	Yes	67	62%
Diabetes	Non Diabetics	58	53.7%
	Diabetics	50	46.3%
Smoking	Yes	38	35.3%
	No	78	35.2%
Dyslipidemia	Yes	30	72.2%
	No	78	27.8%
Obesity	No	70	35.2%
	Yes	38	64.8%
Lifestyle	Sedentary	47	43.5%
	Active	61	56.5%
Socioeconomic status	Lower	69	63.9%
	Middle	31	21.7%
	Upper	8	7.4%

The patients had a mean age of 49.57 ±12.3 years, mean hemoglobin of 13.67± 2.05 g/dL and a mean serum creatinine level of 1.79±0.8 mg/dL.

The patient distribution according to location of MI and angiographic findings is as listed in Tables II and III.

Table 2: Patient distribution according to location of MI

Location	Frequency	Percentage
Anterior	45	41.7%
Inferior	30	27.8%
Lateral	13	12%
Posterior	7	6.5%
Extensive	13	12%

Table 3. Distribution of lesion severity in patients

Lesion severity	Frequency	Percentage
SVCAD	53	49.1%
DVCAD	34	31.5%
TVCAD	21	19.4%
TVCAD	21	19.4%

Lesion severity in both treatment groups is illustrated in figure 1

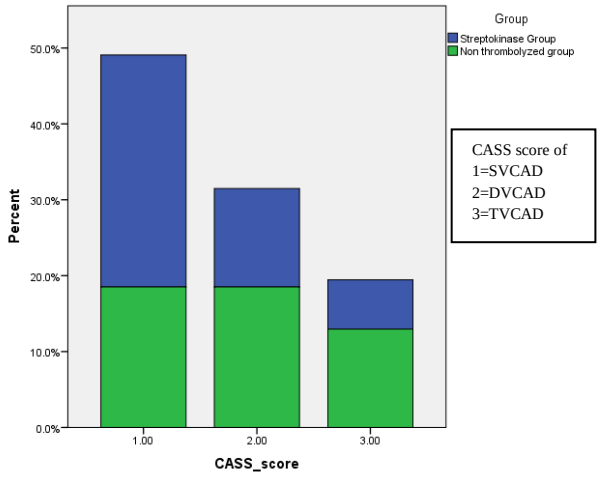

Figure 1: Comparison of lesion severity in the two treatment groups

The mean gensini score was 14.81±10 in thrombolyzed group while it was 7.53±4 in the non thrombolyzed group (P value 0.00). The mean CASS score was 1.51±0.8 in the thrombolyzed group and 1.88±0.79 in the non thrombolyzed group (P value 0.013).

These findings are illustrated in Figures 3 and 4

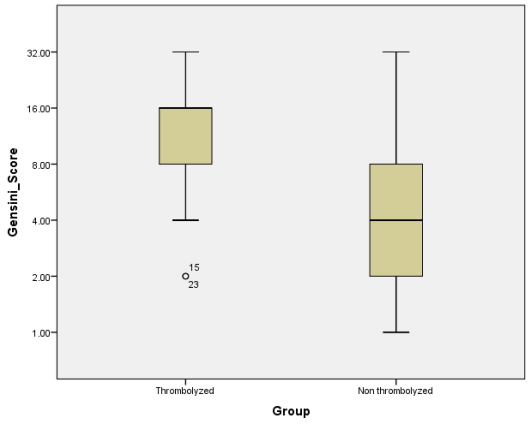

Figure 3: Box plot showing distribution of Gensini score in the two groups

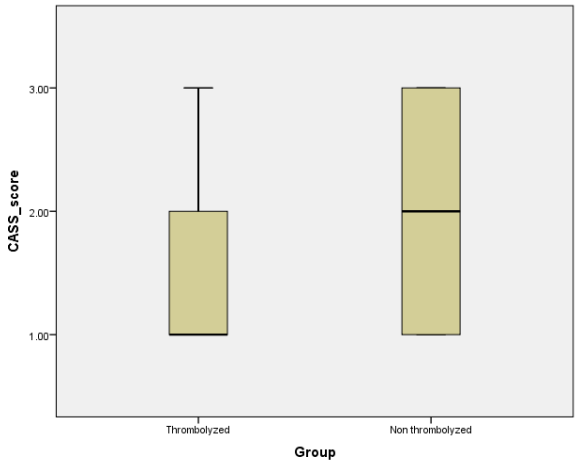

Figure 4: Box plot showing distribution of CASS score in the two groups

Discussion

The use of thrombolytic therapy as a means of revascularization in patients with acute myocardial infarction is still widely prevalent especially in centres not offering primary PCI. Extensive data on utility and benefit conferred by PCI has cast shadows on the risk-benefit balance for patients receiving thrombolytic therapy. Further added to this is the fact that streptokinase is still the standard of care in almost all non PCI capable facilities despite the availability of newer agents with proven superiority. This necessitated the need for comparison of stenotic severity of culprit vessel lesions after thrombolytic therapy to objectify its clinical utility.

Previously published literature in this regard has failed to determine any objective benefit in stenosis severity after the use of thrombolytic agents. One landmark trial in this regard was the APRICOT trial[12] which showed no significant differences in culprit lesion morphology with respect to stenosis severity and location of MI but no such comparisons were made with patients who were given no thrombolytic therapy. ASSENT 4 PCI[9] enrolled 4000 patients with the aim of comparing PCI with thrombolytic therapy alone but an early cessation of the trial was warranted owing to a higher in-hospital mortality (6 vs 3%), strokes (1.8 v.s 0%), reinfarction (6 v.s 4%) and target vessel revascularization (7 vs 3%) were documented in the thrombolytic therapy group. The plausibility of this stark contrast in our findings with data published in literature may be based on the fact that the current study aimed to make a comparison based on culprit lesion severity and not the outcome in terms of mortality, need for revascularization and non cardiac complications like stroke and emboli. Furthermore, once the acute phase has abated, thrombolytic therapy may

result in higher rates of reocclusion after an initial recanalization as was demonstrated by the results of Serruys *et al.*[13] However, to support the authors' findings, FINESSE[10] trial a favourable trend with facilitated reperfusion after use of thrombolytic therapy only in patients with anterior wall MI especially those with higher Killip scores hinting at the use if such a strategy in high risk patients only. Further collective studies are however mandatory, especially on long term outcomes on patients undergoing thrombolytic therapy to extrapolate these benefits in larger population group and modify clinica; practices in this light.

Conclusion

Thrombolytic therapy for acute MI alters significantly, the angiographic lesion severity, and hence may reduce the incidence of ischemic complications and favourably affect prognosis in patients treated at a non-primary PCI capable facility.

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