Original Article

Door to Needle Time and its Impact on Successful Thrombolysis

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Abstract

Background: To evaluate the Door to needle time and its impact on successful thrombolysis.

Methods: In this cross sectional study all patients admitted with Acute Myocardial Infarction (AMI), who were candidates for fibrinolysis, were included. Streptokinase 1.5 million units i.v was given over one hour to all the patients. Door to needle time was calculated. Successful thrombolysis was considered as resolution of chest pain with 70 % ST-segment resolution 60–90 minutes after thrombolysis.

Results: Ninety four patients with acute myocardial infarction eligible for thrombolysis were given intravenous streptokinase. Majority (87.2%) were male. Successful thrombolysis was attained in 62.9% among those who received streptokinase within 30 minutes of onset of pain and in 16.7% of those who received streptokinase after more than 30 minutes.

Conclusion: Timing of streptokinase infusion after first medical contact is an important predictor of successful thrombolysis.

Key Words: Fibrinolysis; Streptokinase

Introduction

Fibrinolytic therapy (FT) has reduced mortality following acute myocardial infarction (AMI). The Grampian Region Early Anistreplase Trial (GREAT) showed that delaying thrombolytic treatment by 1 h increases the hazard ratio of death by 20%, equivalent to the loss of 43/1000 lives within the next 5 years (95% CI 7-88, P = 0.012). Delaying thrombolytic treatment by 30 minutes reduces the average expectation of life by approximately 1 year. The American College of Chest Physicians (ACCP) guidelines recommend that for patients with acute MI who are candidates for fibrinolytic therapy, the therapy should be administered within 30 min of arrival to the hospital or first contact with the health-care system.1

Early resolution of ST-segment elevation has been demonstrated to be a simple and useful predictor of final infarct size, left ventricular function, and clinical outcomes after both thrombolytic and coronary interventional approaches.2 Thrombolytic therapy for acute myocardial infarction reduces fatality and improves clinical outcomes. However, in 60% of patients the treatment does not restore perfusion in the myocardium at risk, and such failure indicates a worse prognosis. Reperfusion therapy in STEMI is the most important component of treatment, as it strongly influences short- and long-term patient outcome. The main objective of healthcare providers should be to achieve at least 75% of reperfusion therapy applied to patients of STEMI in a timely manner, and preferably within 30 minutes according to the guidelines.3

Patients and Methods

In this descriptive study all patients who were thrombolysed for AMI at Armed Forces Institute of Cardiology/National Institute of Heart Diseases, Rawalpindi, from July 2, 2011 to October 10, 2011 who were candidates for fibrinolysis, were enrolled. Streptokinase 1.5 million units i.v given over 1 hour was the fibrinolytic agent used in all the patients. Door to needle time was calculated by the medical officer/senior nurse on duty managing the patient in emergency ward or the coronary care unit. Successful thrombolysis was considered as resolution of chest pain with 70 % ST-segment resolution 60–90 minutes after thrombolysis. Patients presenting with chest pain of less than 12 hr duration, exhibiting ECG ST segment elevation of 2 mm in two contiguous chest leads and 1 mm elevation in limb leads and patients who had no contraindication to streptokinase, were included.

Results

Ninety four patients with acute myocardial infarction during the period were thrombolysed. Majority (87.2%) were male with a mean age of 58.9 years. Interior wall infarction was seen in 38.3%. In
74.5% door to needle time was up to 30 minutes (Table 1). Successful thrombolysis was achieved in those who were thrombolysed up to half an hour (62.9%) and had a duration of pain less than 6 hours (57.1%) (Table 2). Hypotension was registered in 40.4% (Table 3).

### Table 1: Baseline characteristics of patients (n=94)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Factors</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>34(36.2)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>20(21.3)</td>
</tr>
<tr>
<td>Smoking</td>
<td>30(31.9)</td>
</tr>
<tr>
<td><strong>Type of Myocardial Infarction</strong></td>
<td></td>
</tr>
<tr>
<td>Anterior wall</td>
<td>36(38.3)</td>
</tr>
<tr>
<td>Anteroseptal wall</td>
<td>8(8.5)</td>
</tr>
<tr>
<td>Anterolateral wall</td>
<td>10(10.6)</td>
</tr>
<tr>
<td>Lateral wall</td>
<td>4(4.3)</td>
</tr>
<tr>
<td>Inferior wall</td>
<td>20(21.2)</td>
</tr>
<tr>
<td>Posteroinferior wall</td>
<td>6(6.4)</td>
</tr>
<tr>
<td>Inferior wall with RV extension</td>
<td>10(10.6)</td>
</tr>
<tr>
<td><strong>Door to Needle Time</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 30 minutes</td>
<td>70(74.5)</td>
</tr>
<tr>
<td>More than 30 minutes</td>
<td>24(25.5)</td>
</tr>
</tbody>
</table>

### Table 2: Patients characteristics in relation to successful thrombolysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>Successful Thrombolysis</th>
<th>Failure of Thrombolysis</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total pts given Streptokinase</td>
<td>94</td>
<td>48 (51.1%)</td>
<td>46 (48.9%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>82</td>
<td>44 (53.7%)</td>
<td>38 (46.3%)</td>
<td>0.22</td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>4 (33.3%)</td>
<td>8 (66.6%)</td>
<td>0.71</td>
</tr>
<tr>
<td>Hypertension</td>
<td>34</td>
<td>20 (58.8%)</td>
<td>14 (41.2%)</td>
<td>0.22</td>
</tr>
<tr>
<td>Smoking</td>
<td>30</td>
<td>18 (60.0%)</td>
<td>12 (40.0%)</td>
<td>0.27</td>
</tr>
<tr>
<td>Diabetes</td>
<td>20</td>
<td>9 (45.0%)</td>
<td>11 (55.0%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Anterior MI</td>
<td>36</td>
<td>19 (52.8%)</td>
<td>17 (47.2%)</td>
<td>0.67</td>
</tr>
<tr>
<td>Inferior MI (incl Posterior and RV infarct)</td>
<td>36</td>
<td>20 (55.6%)</td>
<td>16 (44.4%)</td>
<td>0.53</td>
</tr>
<tr>
<td>Anteroseptal MI</td>
<td>8</td>
<td>5 (62.5%)</td>
<td>3 (37.5%)</td>
<td>0.71</td>
</tr>
<tr>
<td>Anterolateral MI</td>
<td>10</td>
<td>4 (40.0%)</td>
<td>6 (60.0%)</td>
<td>0.51</td>
</tr>
<tr>
<td>Door to needle time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; or = 30 min</td>
<td>70</td>
<td>44 (62.9%)</td>
<td>26 (37.1%)</td>
<td>0.00</td>
</tr>
<tr>
<td>&gt; 30 min</td>
<td>24</td>
<td>4 (16.7%)</td>
<td>20 (83.7%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Pain Duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 6hrs</td>
<td>56</td>
<td>32 (57.1%)</td>
<td>24 (42.9%)</td>
<td>0.20</td>
</tr>
<tr>
<td>&gt; 6hrs</td>
<td>38</td>
<td>16 (42.1%)</td>
<td>22 (57.9%)</td>
<td>0.73</td>
</tr>
</tbody>
</table>

### Table 3: Thrombolytic Therapy-Major Side Effects

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotension</td>
<td>40.4%(n=38)</td>
</tr>
<tr>
<td>Ventricular Tachycardia/Idioventricular Rhythm</td>
<td>12.7%(n=12)</td>
</tr>
<tr>
<td>Heart Block</td>
<td>18.1%(n=17)</td>
</tr>
<tr>
<td>Major Bleed</td>
<td>3.2%(n=3)</td>
</tr>
<tr>
<td>Death</td>
<td>4.2%(n=4)</td>
</tr>
</tbody>
</table>

### Discussion

This study shows the importance of early thrombolysis in getting the success in saving myocardium. No other factor including the duration of chest pain could gain statistical significance in terms of successful thrombolysis. Several modes of reperfusion therapy for evolving Myocardial Infarction (MI) have been developed which differ in terms of effectiveness, complexity and cost. Currently, the most relevant treatment options are: SK (1.5 MU over 1 hour), reteplase (2 boluses of 10 MU), and alteplase (tissue plasminogen activator, t-PA, 100 mg over 1.5 hour) and immediate angioplasty. Streptokinase is the least costly treatment option while direct angioplasty is expensive and complex. Treatment of acute STEMI with thrombolytic therapy showed greater mortality reduction. Thrombolytic therapy with SK and other agents reduces mortality and is now well accepted as the mainstay of revascularisation options for most patients after an acute myocardial infarction.

Coronary atherosclerosis is a diffuse process with segmental lesions called coronary plaques. The plaque ruptures, exposing the endothelial lining, and allowing prothrombotic enzymes and molecular triggers to mix with the blood. Platelets are activated, and the coagulation cascade is amplified resulting in a thrombus that occludes the vessel, preventing the circulation of oxygenated blood. Irreversible ischemia-induced myocardial necrosis may occur within 20-60 minutes of occlusion. The mainstay of treatment is reperfusion therapy through administration of fibrinolytics (pharmacologic reperfusion) or primary percutaneous coronary intervention (PCI) (mechanical reperfusion).

The intracoronary infusion of SK will produce lysis of the occluding thrombus in up to 80% of patients. The SK regimen (1.5 MU/60 minutes) has remained unchanged for the past 20 years in patients with STEMI due to fear of hypotension (a specific effect of this thrombolytic agent) and of haemorrhagic complications.
In myocardial infarction each passing minute leads to progression of myocardial muscle damage thus conferring advantage to early thrombolysis. The American College of Chest Physicians (ACCP) guidelines recommend that for patients with acute MI who are candidates for fibrinolytic therapy, the therapy should be administered within 30 min of arrival to the hospital or first contact with the healthcare system.

Most guidelines recommend a door-to-needle time of less than 30 minutes but it is difficult to achieve this in most of the patients. A study conducted by Zed et al at the Vancouver General Hospital showed that a door-to-needle time of <30 min was achieved in only 24.3%. In contrast in present study 74.5% of the patient were thrombolyzed within 30 minutes of arrival. This high rate was mainly due to prompt recognition of the diagnosis of myocardial infarction by taking a quick history and taking an ECG within 5 minutes of patients arrival to the emergency setting and quickly sending the patient to the appropriate ward for initiation of thrombolysis. Majority (62.9%) of these patients were then able to achieve successful thrombolysis.

**Conclusion**

Early recognition of myocardial infarction and then early thrombolysis are important factors, resulting in a successful thrombolysis.

**References**