Improving Door to Needle Thrombolysis in Acute ST-Elevation Myocardial Infarction

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ABSTRACT

Background: Although primary percutaneous coronary intervention is the recommended method of reperfusion for ST-segment elevation myocardial infarction patients, thrombolytic therapy should still be given to ST-segment elevation myocardial infarction patients when anticipated delay in percutaneous coronary intervention is more than 120 minutes from first medical contact.

Objective: The aim of this study is to assess improvement of door to needle time in cases of ST-segment elevation myocardial infarction after applying new clinical pathway for cases of ST-segment elevation myocardial infarction presenting to Emergency Department at King Abdulaziz University Hospital over one year period.

Methods: A prospective study conducted at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, in patients with ST-segment elevation myocardial infarction who underwent thrombolysis from November 2012 to October 2013 to compare door to needle time obtained from this study with door to needle time from previous records during October 2010 till September 2011.

Results: A total of 93 patients with ST-segment elevation myocardial infarction received thrombolytic in Emergency Department. Mean age 50 years. Median door to Electrocardiogram 3 minutes, median Electrocardiogram to thrombolytic 25 minutes and door to needle time 30 minutes. 54.8% of patients received thrombolytic within 30 minutes or less.

Conclusions: Improvement in door to needle time for thrombolysis of cases of ST-segment elevation myocardial infarction has been achieved at King Abdulaziz University Hospital during the period of the study compared to previous data.

Keywords
Ischemic heart disease, ST-segment elevation myocardial infarction, Thrombolytic therapy.
INTRODUCTION

According to American Heart Association (AHA) and American College of Cardiology (ACC) 2013 guidelines, primary percutaneous coronary intervention (PCI) is the recommended method of reperfusion for ST-segment elevation myocardial infarction (STEMI) patients \[1^2\]. However, thrombolytic therapy should still be given to STEMI patients with a symptoms onset within the previous 12 hours when the anticipated delay in PCI is more than 120 minutes from first medical contact (FMC).

The appropriate and timely use of either form of reperfusion therapy is likely more important than the choice of therapy. Every effort should be made as early as possible because of the time dependent reduction in both mortality and morbidity.

Door to needle (DTN) time with bench mark of 30 minutes or less is used as cardiac quality care indicator.

Data from King Abdulaziz University Hospital (KAUH) for STEMI cases who received thrombolytic therapy during the period from October 2010 through September 2011 showed that target DTN time of 30 minutes was not achieved (median DTN was 50 minutes).

The aim of this study is to assess the improvement of DTN time in cases of STEMI after applying a new clinical pathway for cases of STEMI presenting to the emergency department (ED) at KAUH during the one year period from 1 November 2012 through 31 October 2013.

MATERIAL AND METHODS

This is a prospective study including patients presented to the ED at KAUH with STEMI during the period from November 2011 through October 2013. This study was conceived from a collaborative agreement between the ED, cardiology team and quality department to apply a clinical pathway for STEMI.

Every effort was made to improve DTN time for cases of STEMI who received thrombolytic.

The guidelines entail:
1. All patients presented to ED with typical chest pain should have electrocardiogram (ECG) performed within 10 minutes.
2. ECG results to be interpreted within 10 minutes by ED physician who will notify cardiologist in the case of ECG showing STEMI of 1 mm or more in tow contagious leads.
3. Cardiologist should respond as early as possible and decide the form of reperfusion therapy, preferably by PCI, or by thrombolytic therapy, with a target door to balloon (DTB) time of 90 minutes, DTN time of 30 minutes. For cases of STEMI who received thrombolytic therapy these time periods are calculated:
   a. Door to ECG time.
   b. ECG to thrombolytic time.
   c. Door to thrombolytic time (DTN).

<table>
<thead>
<tr>
<th>DTN Time</th>
<th>Number of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 minutes or less</td>
<td>51</td>
<td>54.85%</td>
</tr>
<tr>
<td>31-60 minutes</td>
<td>36</td>
<td>38.7%</td>
</tr>
<tr>
<td>More than 1 hour</td>
<td>6</td>
<td>6.45%</td>
</tr>
</tbody>
</table>

TABLE 1. DTN time during the period from November 2012 through October 2013.

<table>
<thead>
<tr>
<th>DTN Time</th>
<th>Number of Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 min or less</td>
<td>20</td>
<td>21.1%</td>
</tr>
<tr>
<td>31-60 min.</td>
<td>38</td>
<td>40.5%</td>
</tr>
<tr>
<td>More than 1 hr.</td>
<td>36</td>
<td>38.3%</td>
</tr>
</tbody>
</table>

TABLE 2. DTN time from October 2010 through September 2011.
The results from November 2012 to October 2013 Table 1, Figure 1, were analyzed and compared with DTN time data from previous results obtained from October 2010 to September 2011 (Table 2, Fig. 2).

Exclusion criteria include: Subtle ECG changes, poor documentation, and presence of complications before thrombolytic (e.g., hypertension).

**RESULTS**

This study includes 93 cases of STEMI who received thrombolytic therapy: 90 (96.7%) males and 3 (3.3%) females. The mean age was 50 years, ranging from 37 to 77 years. The median Door to ECG time was 3 minutes, ranging from 3-120 minutes. 76 (81.7%) patients achieved the target Door to ECG time of 10 minutes or less. Median ECG to thrombolytic time was 25 minutes with a range of 0-170 minutes. Median Door to needle time was 30 minutes, ranging from 5-149 minutes. 51 (54.85%) patients achieved the target DTN of 30 minutes or less (Table 1, Fig. 1).

**DISCUSSION**

American College of Cardiology/American Heart Association (ACC/AHA) 2013 guidelines for the management of patients with STEMI emphasizes timely, early reperfusion therapy, preferably by PCI. If PCI delay is unavoidable, thrombolysis should be given as early as possible with a target door to needle time of 30 minutes or less[1,3,4].

Data from previous records for cases of STEMI who received fibrinolysis at KAUH, Jeddah, KSA during the period from October 2010 to September 2011, showed that only 21% of cases who received thrombolytic achieved the target DTN time of 30 minutes or less. The median DTN time was 50 minutes. After October 2012, collaborative meetings between the ED, cardiology team, nursing staff and quality department at KAUH, resulted in the documentation of a clinical pathway for management of STEMI cases.

Prospective study of cases of STEMI who received thrombolytic at KAUH after applying the new guidelines began November 2012. Results showed a statistically significant improvement in DTN time compared against previous data obtained from October 2011 through September 2012. 54.85% of cases received thrombolytic with a DTN time of 30 minutes or less and a median DTN time of 30 minutes. Similarly, a study at Turkey by Yayalı showed improvement of DTN time through implementation of a better organized team approach with specially trained personnel: mean DTN time was reduced from 80 to 30 minutes during regular hours and from 85 to 33 minutes outside regular hours[5]. In this case thrombolytic was received in the CCU.

Shifting the thrombolytic site from the CCU to the ED showed an improvement in DTN time at a Canadian rural emergency department: 58% received thrombolytic within 30 minutes or less with a median DTN time of 27 minutes[6]. Similar improvement resulted in a study done at Al Khor Hospital, Doha, Qatar. Shifting the thrombolytic site from the CCU to the ED reduced the median DTN time from 33.5 minutes in the CCU to 17 minutes in the ED[7].

All cases of STEMI presenting to the ED at King Abdulaziz University Hospital received thrombolytic in the ED but only with approval of the cardiology registrar who decides the type of reperfusion therapy. Again, PCI is preferred but thrombolytic may be performed in accordance with hospital protocol. The nursing team achieved the target door to ECG of less than 10 minutes in 82% of total cases. This was vital in reducing DTN time. The primary delay was access to the ED physician and his experienced reading of the ECG, which was required before activating the cardiology team. This was also the cause for a marked delay in reperfusion in many other parts of the world[8,9]. Overcrowding of the ED also contributed to a delay of DTN time.

More efforts are ongoing to reduce reperfusion time through nurse-initiated thrombolysis[10] and pre-hospital administration of thrombolysis[11].

**CONCLUSION**

Reduction in DTN time for fibrinolysis of cases of STEMI has been achieved at King Abdulaziz University Hospital during the period from November 2012 till October 2013 compared to the previous data period. DTN time pointed to cardiac service quality improvement and the need for regular follow up (Fig. 3).

**REFERENCES**


**FIGURE 3.** Comparison between DTN time 30 min. or less during October 2010 - September 2012 and DTN time during November 2012 - October 2013.


التمكن من إجراء تحسن في الزمن بين الوصول لقسم الطوارئ و بدأ العلاج بالأدوية المذنبة للخزات لإعادة التروية في علاج مرضى حالات إحتشاء العضلة القلبية المصحوبة بارتفاع الST-Segment

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المستخلص.

الهدف: بالرغم من أن القسطرة الداخليّة هي طريقة العلاج الوعائيّة بحالة إعداد التروية في حالات إحتشاء العضلة القلبية (STEMI) ST-Segment المصموحة بإ_completion ظهار الـ STEMI القسطرة الداخليّة لأكثر من 120 دقيقة من وصول المريض للمستشفى، والهدف من هذه الدراسة هو تقييم التحسن في الزمن بين وصول المريض إلى باب قسم الطوارئ، و بدأ تلقى العلاج بأدوية إدراة الخزات وذلك بعد تطبيق المسار العلاجي الجديد لهؤلاء المرضى.

طريقة البحث: أجريت هذه الدراسة المقطّعة للمقارنة بين الزمن المحضنت بين وصول المريض إلى قسم الطوارئ بمستشفى جامعة الملك عبد العزيز بجدة ببدء تلقى العلاج بأدوية إدراة الخزات لمرضى حالات STEMI الموقعة في دراسة سابقة في الفترة بين شهري أكتوبر و سبتمبر 2011 و بعد تطبيق المسار العلاجي الجديد في الفترة بين شهري نوفمبر و أكتوبر 2012.

النتائج: تم مراقبة 93 مريضا بالأدوية المذنبة للخزات لإعادة التروية في حالات STEMI. كان متوسط أعمار المرضى 50 عاماً و متوسط الزمن بين الوصول لقسم الطوارئ و بدأ تلقى العلاج بالأدوية المذنبة للخزات 25 دقيقة و متوسط الزمن بين الوصول و بدأ العلاج بالأدوية المذنبة للخزات 30 دقيقة، كما تلقى 54.8% من المرضى العلاج بالأدوية المذنبة للخزات خلال 30 دقيقة أو أقل.

المستخلص: تم الوصول إلى تحسن في الزمن بين الوصول لقسم الطوارئ و بدأ العلاج بالأدوية المذنبة للخزات لإعادة التروية في علاج مرضى حالات إحتشاء العضلة القلبية المصموحة بإ_completion ظهار الـ STEMI خلال الفترة بين شهري نوفمبر وأكتوبر 2013 و ذلك بالمقارنة مع نتائج دراسة سابقة.