Implementation of Emergency Service of Primary Percutaneous Coronary Intervention (Primary PCI) for ST-Elevation Myocardial Infarction

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Background

Pathophysiology of acute STEMI
(ST-elevation myocardial infarction)

- Acute thrombotic occlusion of coronary artery
- Leading to myocardial injury
Background

Reperfusion: Key to acute management
Background

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- Thrombolytic therapy
- Primary PCI
  (percutaneous coronary intervention)
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Reperfusion: Key to acute management

- Thrombolytic therapy
- Primary PCI
  (percutaneous coronary intervention)
Primary PCI Vs Thrombolytics

- Takes longer time to implement
  - potential delay in reperfusion

- But a much higher rate of reperfusion
  (93-96% compared to 50-60% with thrombolytic therapy)

Primary angioplasty versus intravenous thrombolytic therapy for AMI:
a quantitative review of 23 randomised trials
Lancet 2003 Jan 4;361(9351):13-20

Short-term outcomes

PTCA
Thrombolytic therapy

P<0.0001
P=0.0004
P=0.0001
P=0.032
P<0.0001
P=0.0002
P=0.0003
P<0.0001
Primary PCI preferable:

- In general, if available in timely fashion
  - (Goal: “Door-to-balloon” time < 90min)

- Special indications
  - Contraindication to thrombolytic therapy
  - Cardiogenic shock
  - Severe congestive heart failure (CHF)
  - Delayed presentation, with CHF, haemodynamic instability or persistent ischaemic symptoms
Limited Availability of Primary PCI

- Cath lab availability
- Lack of manpower & logistics for primary PCI
- Routine service not available in HA hospitals

- Thrombolytic therapy remains a mainstay of treatment
Objectives

- To maximize the utilization of resources and implement an emergency service of primary PCI for STEMI patients
  - “Routine” during cardiac cath lab (CCL) working hours
  - For special indication during off-hours

- Review the outcome of implementation
Methodology: Implementation of Primary PCI

Since Nov 2003:

- During CCL operating hours
  - AED/medical colleagues alerted CCL team for all MI cases
  - Primary PCI as possible
- During off-hours
  - Cardiologist and nurses on-call
  - Primary PCI for patients with specific indications

CCL = cardiac catheterization laboratory
Methodology:
Review of outcome

- Review period: Jan 02 to Jul 07
- Primary outcome analysis
  - The No. & proportion of reperfusion achieved by primary PCI, in CCL hrs & non-CCL hrs
- Secondary outcome analysis
  - In-hospital mortality
  - Door-to-balloon time in selected consecutive patients

CCL = cardiac catheterization laboratory
Result

- Study period: Jan 02 to Jul 07
- Primary PCI Vs Thrombolytics = 242 : 218 (Primary PCI = 52.6%)

<table>
<thead>
<tr>
<th></th>
<th>PCI gp (n=242)</th>
<th>TT gp (n=218)</th>
<th>Overall (n=460)</th>
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</thead>
<tbody>
<tr>
<td>Sex (%male)</td>
<td>69%</td>
<td>72%</td>
<td>70%</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>66 +/- 13</td>
<td>68 +/- 13</td>
<td>67 +/- 13</td>
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</table>
Primary PCI Vs Thrombolytics
Combined CCL & Non-CCL hours
## Primary PCI Vs Thrombolytics
### CCL Vs Non-CCL hours

<table>
<thead>
<tr>
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<th>Primary PCI</th>
<th>Thrombolytics</th>
<th>Total</th>
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<tbody>
<tr>
<td>CCL hrs</td>
<td>153</td>
<td>37</td>
<td>190</td>
</tr>
<tr>
<td>Non-CCL hrs</td>
<td>89</td>
<td>181</td>
<td>270</td>
</tr>
<tr>
<td>Total</td>
<td>242</td>
<td>218</td>
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Primary PCI Vs Thrombolytics
CCL hours

Primary PCI Vs Thrombolytics in CCL hrs

% Primary PCI Vs Thrombolytics in CCL hrs

No of Patients

Year


Primary PCI
Thrombolytics

0% 20% 40% 60% 80% 100%

Year


Primary PCI
Thrombolytics
Primary PCI Vs Thrombolytics
Non-CCL hours

Primary PCI Vs Thrombolytics in Non-CCL hrs

% Primary PCI Vs Thrombolytics in Non-CCL hrs

Year

No of Patients

2002 2003 2004 2005 2006 2007

Primary PCI
Thrombolytics
Primary PCI in Non-CCL hrs (n=89)

**Indications:**

- Haemodynamic/electrical instability (including cardiogenic shock) 45 (51%)
- Contraindication to thrombolytics 18 (20%)
- Delayed presentation with ischaemia 18 (20%)
- Availability of manpower 9 (9%)
Clinical outcome: In-hospital mortality

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<tr>
<td>PCI (All hrs)</td>
<td>13%</td>
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<td>11%</td>
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<td>Thrombolytics (All hrs)</td>
<td>19%</td>
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### Clinical outcome: In-hospital mortality

PCI Vs Thrombolytics: No significant difference -- a trend toward reduction in mortality

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Clinical outcome: In-hospital mortality

PCI in CCL hrs ("routine cases") Vs Thrombolytics -- Reduced mortality

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P=0.04
Door-to-Balloon Time

26 consecutive patients in CCL hrs (1/7/06 to 31/1/07)

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<th>Door to balloon time (4 cases excluded due to delayed in diagnosis initially)</th>
<th>Mean +/- SD: 86.3 +/- 36.7min</th>
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<tr>
<td>Range:</td>
<td>30 – 156min</td>
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<tr>
<td>&lt;90min:</td>
<td>12/22 (54.5%)</td>
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<tr>
<td>&lt;120min:</td>
<td>21/22 (95%)</td>
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Conclusion

- We managed to provide primary PCI service to benefit a significant proportion of STEMI patients by optimal utilization of resources
- Improved short-term outcome by primary PCI
- Future goals
  - Further expand the implementation of primary PCI -- ? Routine service during off-hours
  - More comprehensive analysis of door-to-balloon (DTB) time & clinical outcome
  - Evaluate means to shorten the DTB time