

# Primary coronary intervention for ST elevation myocardial infarction in a starting heart center in Indonesia: the first 100 patients

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**Background:** The benefits of Primary percutaneous coronary intervention (PCI) for ST elevation myocardial infarction (STEMI) have been demonstrated, but most studies were conducted in experienced centres in western world. Experience, logistics and patient characteristics may differ in other parts of the world, particularly in a starting center.

**Methods:** Data on all consecutive STEMI patients treated with primary PCI in Cinere hospital, Jakarta, Indonesia were collected in a prospective database.

**Results:** Between July 2006 and December 2008, a total of 100 patients with STEMI were treated by primary PCI. Mean age was  $56.9 \pm 10.4$  years (range 37-82), 88% was male. Mean time between onset of chest pain and admission was  $369 \pm 388$  minutes. The mean time between admission and balloon inflation was 258 minutes. Before PCI, 50% of patients had TIMI 0 flow. After primary PCI 94% of patients had TIMI 2/3 flow. There were no deaths in the catheterisation room, and no emergency coronary bypass surgery was needed as a result of PCI complications. Mean left ventricular ejection fraction as measured by echocardiography after 1 day was  $48 \pm 12$  %.

**Conclusions:** Outcome after primary PCI at a starting center is excellent in this series. Primary PCI was effective in restoration of TIMI flow, without complications. Time delay between symptom onset, admission and balloon inflation was long and all efforts should be encouraged to shorten this.

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**Keywords:** acute myocardial infarction, primary PCI

## Intervensi Koroner Perkutan Primer untuk Infark Miokard Elevasi ST di Pusat Jantung Pemula di Indonesia: 100 pasien pertama

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**Latar belakang:** Manfaat Intervensi perkutan primer (IKP) untuk Infark Miokard Elevasi ST (IMEST) telah terbukti, namun demikian kebanyakan penelitian mengenai ini di laksanakan dipusat layanan jantung yang berpengalaman di dunia barat, Pengalaman, logistik dan karakteristik pasien mungkin berbeda di belahan dunia ini, terutama di pusat yang baru mulai.

**Metode:** Seluruh data pasien konsekutif dengan IMEST yang ditangani dengan IKP primer di pusat jantung Cinere, Jakarta, Indonesia dihimpun melalui seperangkat data yang dilaksanakan secara propekstif.

**Hasil:** Antara Juli 2006 dan Desember 2008, dari seluruh jumlah 100 pasien dengan IMEST yang ditangani dengan IKP primer. Rerata usia adalah 56,9 tahun  $\pm$  10,4 tahun (berkisar 37-82 tahun), 88 % diantaranya adalah pria. Rerata waktu antara onset nyeri dada dan masuk rumah sakit adalah 369  $\pm$  388 menit. Rerata waktu antara masuk rumah sakit dengan inflasi balon adalah 258 menit. Sebelum IKP, 50 % pasien dengan aliran TIMI 0. Setelah IKP primer 94 % pasien memperoleh aliran TIMI 2/3. Tidak ada kematian didalam ruang kateterisasi maupun diperlukan tindakan bedah graft pintas arteri koroner yang gawat akibat komplikasi dari IKP. Rerata fraksi ejeksi yang diukur dengan ekokardiografi setelah 1 hari adalah 48 $\pm$ 12 %.

**Kesimpulan:** Hasil akhir yang diperoleh setelah IKP primer pada pusat jantung yang baru dimulai adalah baik pada serial ini. IKP primer efektif dalam memperbaiki aliran TIMI, tanpa komplikasi. Keterlambatan waktu antara permulaan gejala, saat masuk dan inflasi balon masih panjang dan segala usaha harus diupayakan untuk memendekan waktu ini.

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**Kata kunci:** infark miokard akut, IKP primer

Randomized controlled trials, involving more than 7500 patients with ST elevation Myocardial Infarction (STEMI), have demonstrated the superiority of

primary percutaneous coronary intervention (PCI) compared to fibrinolytic therapy (1), with the greatest absolute mortality advantage of primary PCI in high-risk patients such as those with cardiogenic shock<sup>(2,3)</sup>. However, almost all these trials were performed in the United States or Western Europe in highly experienced centers. Also because success and complications of PCI are dependent of the experience of the operator and the hospital, it is mandatory to monitor the results of primary PCI in a new starting hospital.

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In the South Asia region, including Indonesia, both morbidity and mortality due to cardiovascular disease is high and it is expected that this will increase even more (4). Main causes are the high prevalence of diabetes (5), hypertension (6) and smoking (7, 8).

To assess the results of primary PCI, as well as hospital mortality after the procedure in a new hospital in Jakarta, Indonesia, we performed a prospective registry.

## Patients and Methods

All data on the first 100 consecutive patients treated with primary PCI for STEMI in Klinik Kardiovaskular - Cinere Hospital, Jakarta, Indonesia between August 2006 and October 2008 were registered in a dedicated database. Cinere Hospital, Jakarta started in 2006 with PCI program. They have a close collaboration with the Isala klinieken, Zwolle, the Netherlands, and there is always an experienced consultant cardiologist from Netherlands in Jakarta.

**There was no industry involvement in the design, conduct or analysis of this study.**

All patients with STEMI, presenting within 6 hours after symptom-onset, or those presenting between 6 and 24 hours if they had persisting chest pain associated with clinical evidence of on-going ischemia, were eligible for primary PCI and inclusion in the registry.

All patients were pretreated with aspirin, a loading dose of clopidogrel and intravenous nitroglycerin and heparin. Treatment with glycoprotein IIB/IIIA inhibitors was left to the discretion of the physicians. Stenting of target lesion were performed using standard interventional techniques. After the primary PCI all patients were treated with guidelines provided medication, including statins and beta-blockers. All patients received clopidogrel for at least 6 months.

## Statistical Analysis

Statistical analysis were performed with the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 15.0. Continuous data were expressed as mean  $\pm$  standard deviation and categorical data as percentage, unless otherwise denoted. Differences between continuous data were performed by

students t test and the chi-square or Fisher's exact test were used as appropriate for dichotomous data. For all analyses, statistical significance is assumed when the two-tailed probability value is  $< 0.05$ .

## Results

Data were collected from 100 patients. Mean age was  $56.9 \pm 10.4$  years (range 37-82), 88% was male. The mean time between onset of chest pain and admission was  $369 \pm 388$  minutes. Females were older,  $66.3 \pm 9.7$  years compared to males,  $55.6 \pm 9.9$  ( $p=0.001$ ). The time between symptom onset and admission was longer in females,  $412 \pm 462$  minutes compared to males  $362 \pm 380$  minutes, but this was not statistically significant ( $p=0.7$ ).

Baseline characteristics of the patients are listed in table 1. The prevalence of diabetes, high lipids and smoking was high. Males were more frequently smokers (56%) compared to females (8%,  $p=0.002$ ). Diabetes was more common in females (50%) than in males (28%), but this difference was not statistically significant ( $p=0.11$ ). There were many patients with signs of heart failure on admission, 10% had heart failure Killip class 3 and 13% had Killip class 4.

**Table 1.** General characteristics of 100 patients treated with primary PCI for STEMI in Klinik Kardiovaskular, Cinere hospital, Jakarta

	N = 100
	% or mean $\pm$ SD
Age (years)	$56.9 \pm 10.4$
Male	88
Diabetes	30
High lipids	56
Hypertension	49
Smoking	48
Previous MI	28
Previous PCI	8
Previous Coronary Bypass Surgery	2
Anterior location	60
Admission Creatinin (mg/dl)	$1.24 \pm 1.09$
Killip $\geq 2$ on admission	46
Ventricular Fibrillation before angiography	11
Time between onset chest pain and admission (minutes)	$369 \pm 388$

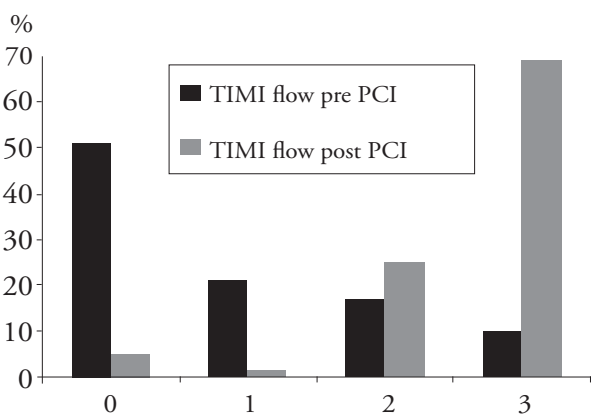
**Table 2 .** Angiographic findings in 100 patients treated with primary PCI for STEMI in Klinik Kardiovaskular Cinere hospital, Jakarta.

	N = 100 % or mean ± SD
Time between admission and balloon inflation (minutes)	258 ± 317
Multi vessel disease	33
TIMI 0 before angioplasty	50
Bare metal stent	49
Drug Eluting stent	24
TIMI 2/3 flow after angioplasty	94

In table 2 angiographic findings are summarized. The mean time between admission and balloon inflation was 258 minutes with a median time of 163 minutes. Time between admission and balloon inflation was significant longer in females, 553 ± 675 minutes as compared to males, 219 ± 217 minutes (p=0.004).

Of the 100 patients, 33% had multivessel disease. This was (not significant) more often observed in males (37%) compared to females (13%, p=0.18). The prevalence of multivessel disease was comparable in smokers (39%) and non-smokers (32%) and in patients with (33%) and without (35%) diabetes.

The observed TIMI flow in the infarct related vessel before and after PCI is summarized in figure 1. The frequency of TIMI flow 0 (occluded vessel) was (not-significant) more often observed in males (52%) compared to females (42%, p = 0.49), and in patients with anterior location (54%) as compared to inferior location (43%) but comparable between patients



**Figure 1.** TIMI flow in the infarct related vessel before and after primary PCI in 100 patients

with (47%) and without diabetes (52%). Mean age of patients with TIMI 0 flow before PCI was 56 ± 10 years compared to 58 ± 11 years of patients with TIMI 1-3 flow before PCI (p =0.58).

TIMI 2 or 3 flow in the infarct related vessel was achieved in 94% of patients. Achieved TIMI 2 or 3 flow was slightly more common in males (95%) than in females (83%, p =0.10). Mean age of patients with TIMI 2/3 flow after PCI was 57 ± 11 years compared to 54 ± 5 years of patients with TIMI 2/3 flow after PCI (p =0.61). TIMI flow 2/3 was significant less often observed in patients who had TIMI flow 0 before PCI (88%) than in patients with TIMI flow 1-3 before PCI (100%, p =0.01).

There were no deaths in the catheterisation room. Also, no patients required transfer for emergency coronary bypass surgery as a result of PCI complications. Mean left ventricular ejection fraction as measured by echocardiography after 1 day was 48 ± 12 %. Mean LV ejection fraction of patients with anterior wall infarction was lower, 46% ± 12% compared to 52% ± 13% in patients with inferior wall myocardial infarction PCI (p =0.05).

## Discussion

We describe a high-risk group of patients with STEMI with more than 10% Killip class 4 on admission. In these first 100 patients with STEMI treated by primary PCI in our hospital, it was demonstrated that primary PCI was effective, resulting in restoration of TIMI 2/3 flow in more than 90%. Delay between onset of symptoms, admission and first balloon inflation was long.

Our results suggest that primary PCI in a starting heart center in Indonesia is safe and is effective in achieving reperfusion. However, our results were achieved in the setting of a close collaboration with an experienced center. Possibly, this may influence the favourable results. Our results confirm the PAMI-No SOS study, that showed that primary PCI in high-risk STEMI patients in hospitals without on-site cardiac surgery is safe and effective (9). Also other studies in both Western world and Asia reported that primary PCI can be safely performed in hospitals without on site cardiac surgery (10, 11). However, it is important to monitor results of PCI, particularly primary PCI, in small hospitals, since correlation between operator and hospital volume and PCI outcomes has been described (12). But, with modern techniques, this correlation

may be less pronounce, (13). It has also been suggested that expertise and experience of the whole professional team, rather than just of the individual operator, play a major role (14).

The prevalence of risk factors in our patients was very high, with diabetes 30%, and smoking, hypertension or high lipids in almost 50% of patients. Cardiac rehabilitation should be an essential part of the contemporary care of these patients after the acute phase. Risk factor modification should be achieved by encouraging exercise, education, life style change, counselling, support, and strategies aimed at targeting traditional risk factors for cardiovascular disease. Intensive programs for smoking cessation should already be started during hospital admission (15). The high prevalence of diabetes in our study may be associated with the high prevalence of diabetes in the general population in Indonesia.

In our study, there was a long time interval between symptom onset, hospital admission and balloon inflation. All these intervals should be shorter. Education in the general population should make people more aware of potential cardiac symptoms and the importance to seek fast medical care. Ambulance transport should be improved, possibly by regional approaches round hospitals with PCI facilities and prehospital ECGs transmitted to an emergency department or relying on ambulance-based paramedics trained to diagnosis STEMI and to determine which patients should be transported directly to specialized PCI centers (16). In-hospital delay was in our study mainly because of financial considerations and patient delay because of fear for the procedure. General population, government and insurance companies should be informed that costs of primary PCI, particularly if performed with only balloon, is lower than conservative treatment.

### Limitations

We studied only patients in one hospital, involving only few patients, and we could therefore not perform subgroup analyses. Furthermore, selection bias may occur as only survivors of STEMI undergoing primary PCI were included in this registry. We had no data on patients who had STEMI but were not treated with primary PCI, or who were not admitted in the hospital at all. Finally, we had no follow-up data, mainly because many patients went back to their referring hospital the day after the primary PCI.

### Conclusions

Primary PCI for ST elevation Myocardial Infarction is safe and effective at a starting heart center in Indonesia, if performed by an experienced team. However, prehospital and in-hospital time delay is high, and therefore all efforts should be aimed towards reduction in total ischemic time, by developing regional logistics with pre-hospital triage and fast track facilities in dedicated PCI centers.

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