Primary Angioplasty in Myocardial Infarction (PAMI)

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Published on 23rd September 2019

What is primary angioplasty in myocardial infarction (PAMI)?

Primary Angioplasty in Myocardial Infarction (PAMI) or Primary Percutaneous Coronary Intervention (PPCI) is the angioplasty done as a life-saving emergency procedure in a patient with an on-going myocardial infarction. As the major pathology behind myocardial infarction is a completely occluded culprit vessel, timely revascularisation represents the most effective way of reperfusing the jeopardized myocardium. The term coronary angioplasty is used to describe a technique wherein a balloon is used to crush blockages in the blood vessels (coronary arteries) supplying the heart and thereby restoring blood flow. These procedures are invariably followed by insertion of metal scaffolding called a stent which prevents recoil and reduces re-blockage at the ballooned site.

When the PAMI is advocated?

Primary percutaneous transluminal coronary angioplasty has been advocated for treatment of acute myocardial infarction for over 3 decades. The current recommendations, based on multiple randomized clinical trials, maintain PAMI as the treatment of choice over thrombolysis in the management of ST-segment elevation myocardial infarction (STEMI), contingent upon treatment at centres with a skilled percutaneous coronary intervention (PCI) laboratory and rapid initiation. Appropriately selected patients undergoing primary PCI were shown to have lower rates of nonfatal re-infarction, stroke, and short-term mortality than thrombolytic recipients in a meta-analysis of data from 23 randomized trials on STEMI. The main limiting factors for the use of primary angioplasty are, on the one hand, the availability of infrastructure, material, and trained personnel and on the other hand, ensuring that the intervention of the artery responsible is performed as soon as possible after infarction is diagnosed.

What is door–to–balloon time and door–to–needle time?

Door-to-balloon time (DTB) is the time from first hospital arrival to first attempt at reperfusion with any intracoronary device. Both American College of Cardiology/American Heart Association and the European Society of Cardiology propose a DTB time of less than 90 min as standard. The door to needle time (DTN) is the interval between the patient's arrival at the hospital and the initiation of fibrinolytic therapy. Recommended standard DTN time is less than 30 minutes.

When is an invasive strategy preferred over thrombolysis (fibrinolysis)?

Invasive strategy is preferred over fibrinolysis when skilled PCI laboratory is available where medical contact to balloon dilatation (DTB) can be kept less than 90 minutes. Invasive strategy should be the preferred mode of reperfusion strategy in cases of high risk STEMI with cardiogenic shock and whenever there are contraindications for fibrinolysis like intracranial hemorrhage. If the presentation of MI is late (symptom onset was more than 3 hrs ago) or the diagnosis of ST-elevation myocardial infarction is in doubt after seeing the ECG and history, then preferred strategy should be invasive. The time dependency is critical with fibrinolysis because of the decrease in efficacy of the fibrinolytic agent as coronary thrombi mature over time.

Are there any clinical situations where thrombolysis is preferred over primary angioplasty?

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Cite this article as: Arshad M. Primary Angioplasty in Myocardial Infarction (PAMI). IMA Kerala Medical Journal. 2019 Sep 23;12(3):72–3.

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macological reperfusion therapy. But when invasive strategy is not an option in conditions such as catheterization, preoccupied laboratory, difficulties in vascular access or lack of access to a skilled PCI laboratory; fibrinlolysis should be the revascularization strategy. Fibrinolysis is also preferred in cases of delay to an invasive strategy, for example; prolonged transport to an interventional centre. When the patient presents within 3 hours after the onset of symptoms, fibrinolysis with a bolus thrombolytic over PPCI is acceptable.

Is it advisable to transfer the patient of myocardial infarction from a non-interventional centre to an invasive centre for the sake of angioplasty?

Though primary angioplasty is a better reperfusion strategy than fibrinolysis, one should not forget that the time-to-treatment significantly affects the success of the reperfusion strategy. The benefits are "time-dependent", hence the rationale for the usage, "Time is Muscle". Each 30 minute delay from symptom onset to reperfusion, increases the relative risk of 1 year mortality by 8%. When performed rapidly after presentation in an experienced centre, primary PCI is superior to pharmacologic reperfusion strategy. Although several studies have reported that referral to a PCI centre is superior to fibrinolysis in a local hospital, such studies were conducted in dedicated health care systems with extremely short transportation and door to balloon time at the PCI centre. Transportation to an invasive centre is definitely not preferred if the anticipated DTB time minus the DTN time is more than 1 hour.

Is there any time limit for primary angioplasty?

Though general consensus is that mortality benefit of PAMI can be obtained up to 12 hours after the onset of symptoms, it is reasonable to consider reperfusion therapy in patients with persistent symptoms and ST segment elevation in surface electrocardiogram beyond 12 hours.

What are the benefits of angioplasty over fibrinolysis?

An overview of short term results of 10 comparisons of the two approaches has shown that, compared to fibrinolysis; primary angioplasty results in a lower mortality (4.4% vs. 6.5%), translating into an absolute benefit of two lives saved per 100 patients treated with angioplasty compared with fibrinolysis. The reduction in the combination of death or non-fatal reinfarction after angioplasty compared with fibrinolysis is even more striking (11.9% vs. 7.2%). With respect to safety, stroke was reduced from 2.0% with fibrinolysis to 0.7% with angioplasty. The higher the risk of the patient, the greater will be the potential of primary angioplasty compared with thrombolysis.

How do we lose time after the patient reaches an invasive centre?

Failure to attain the golden 90 minutes of door to balloon time was recently assessed in an Indian study. Eighty-five patients who underwent primary PCI were studied. The mean DTB time was 80.5 min. DTB time was <90 min in 76.5%, and DTB time >90 min occurred in 23.5%. Mean door to ECG – 6.5 min , mean time for the decision of PCI – 7.5 min , mean time taken for the patient's consent – 19.6 min, average time for financial process – 39.2 min, mean time for STEMI team activation – 6.7 min, average time for sheath to balloon – 5.2 min. 89.5% of patient related delay was due to delay in giving consent and financial reasons. Total mortality was 4.7%. Mortality among <90 min was 3.1% and mortality among >90 min was 10%. The prominent time delays came in the form of time taken for the patient's consent for the procedure (19.6 min) and time taken for approval of anticipated cost (39.15 min). The overall awareness of acute MI and its management is very low among most of the patients and the relatives, that a majority of them spent at least 15 min discussing what has been explained to them with either their kin or their primary physician on the phone. Once the decision for PCI was given, the next hurdle was to think about arranging the finances. The patients who had some form of insurance scheme had much lower time intervals for financial process than those who had no insurance. This data is in stark contrast to the data from the developed countries, where consent for PCI and financial decisions were not even considered as facets of DTB time.