Section A -Research paper

ST Elevation Myocardial Infraction: Types and management

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Abstract:

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ST segment elevation myocardial infarction remains a significant contributor to morbidity and mortality worldwide, despite a declining incidence and better survival rates. It usually results from thrombotic occlusion of a coronary artery at the site of a ruptured or eroded plaque. Diagnosis is based on characteristic symptoms and electrocardiogram changes, and confirmed subsequently by raised cardiac enzymes. Prognosis is dependent on the size of the infarct, presence of collaterals and speed with which the occluded artery is reopened. Mechanical reperfusion by primary percutaneous coronary intervention is superior to fibrinolytic therapy if delivered by an experienced team in a timely fashion. Post-reperfusion care includes monitoring for complications, evaluation of left ventricular function, secondary preventive therapy and cardiac rehabilitation.

Keywords: ST Elevation Myocardial Infraction, CAD, MI, PCI.

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Introduction:

Coronary artery disease (CAD) generally refers to coronary atherosclerosis that causes severe narrowing of the coronary arteries, resulting in inadequate blood supply to the myocardium (heart muscle) **(1).**

Acute Coronary Artery Syndrome (ACS) includes acute manifestations of coronary artery disease, including unstable angina (non-necrotizing myocardial ischemia), non-ST segment myocardial infarction elevation (NSTEMI) and ST-segment elevation myocardial infarction (NSTEMI), ST (STEMI) **(2).**

Myocardial infarction (MI) is commonly defined as the death of myocardial cells due to significant and prolonged ischemia due to an imbalance between supply and demand oxygen **(3).**

The incidence and prevalence of STEMI has been extensively studied and there is clear evidence that it remains a leading cause of death and morbidity globally. Large-scale epidemiological studies such as the Global Burden of Disease (GBD) Study have highlighted the significant burden of cardiovascular disease, of which STEMI is a significant contributor **(4) .**

Additionally, regional differences in the incidence of STEMI have been reported, with differences in risk factors, genetics, and health care infrastructure playing important roles **(5).**

ST-segment elevation myocardial infarction (STEMI) is a major public health concern globally, with significant morbidity and mortality implications.

Types of Myocardial Infarctions

1. ST-Segment Elevation Myocardial Infarction (STEMI)

STEMI is a well-recognized and severe form of myocardial infarction. It is characterized by a distinct electrocardiogram (ECG) pattern, with ST-segment elevation. This type of MI typically indicates a complete blockage of a coronary artery, necessitating immediate reperfusion therapy. STEMI is associated with a high risk of complications and mortality if not treated promptly**(6).**

2. Non-ST-Segment Elevation Myocardial Infarction (NSTEMI)

NSTEMI is another type of MI, characterized by an ECG pattern without ST-segment elevation. It usually indicates a partial or temporary blockage of a coronary artery. NSTEMI may be less severe than STEMI but is still associated with substantial risks and requires medical intervention. Accurate diagnosis and risk stratification are crucial for guiding treatment strategies **(7).**

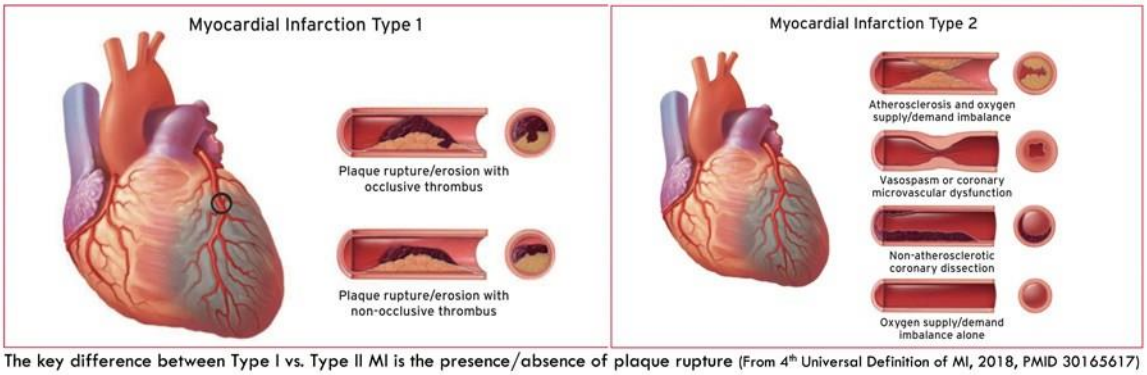

Figure (1) Types 1 and type 2 of Myocardial infarction..

3. Type 1, 2, 3, 4, and 5 MI

The Third Universal Definition of Myocardial Infarction introduced a broader classification system, which includes five types of MI. Type 1 refers to spontaneous MI related to atherosclerotic plaque rupture or erosion. Type 2 is due to an imbalance between myocardial oxygen supply and demand, often related to factors like tachyarrhythmias. Types 3, 4, and 5 MI are associated with specific clinical conditions, such as sudden cardiac death, percutaneous coronary intervention (PCI)-related MI, and coronary artery bypass graft (CABG)-related MI **(1)**

Table (1) Types of myocardial infarction.

Type	Clinical classification of MI[1]
Type 1	Spontaneous MI
Type 2	MI secondary to ischaemic imbalance
Type 3	MI resulting in death without biomarkers
Type 4a	MI related to PCI
Type 4b	MI related to stent thrombosis
Type 5	MI related to CABG

1. Thygesen K, et al. Universal definition of myocardial infarction. *J Am Coll Cardiol* 2012;60(16):1581-1598.

Management of STEMI:

Reperfusion Therapy

Reperfusion therapy is the cornerstone of STEMI management, with the goal of restoring blood flow to the ischemic myocardium. Two primary approaches are commonly employed:

- **Primary Percutaneous Coronary Intervention (PCI):**

Primary PCI, performed by interventional cardiologists, is the preferred reperfusion strategy when it can be administered within the guideline-recommended timeframe **(8)**.This invasive procedure involves the mechanical removal of the obstructing thrombus and the placement of stents to restore coronary blood flow.

- **Fibrinolysis:**

Fibrinolytic therapy involves the administration of thrombolytic agents to dissolve the occlusive thrombus. It is considered when primary PCI is not feasible due to factors such as a long transport time to a PCI-capable center. The choice between primary PCI and fibrinolysis is determined by patient characteristics and regional healthcare infrastructure **(9).**

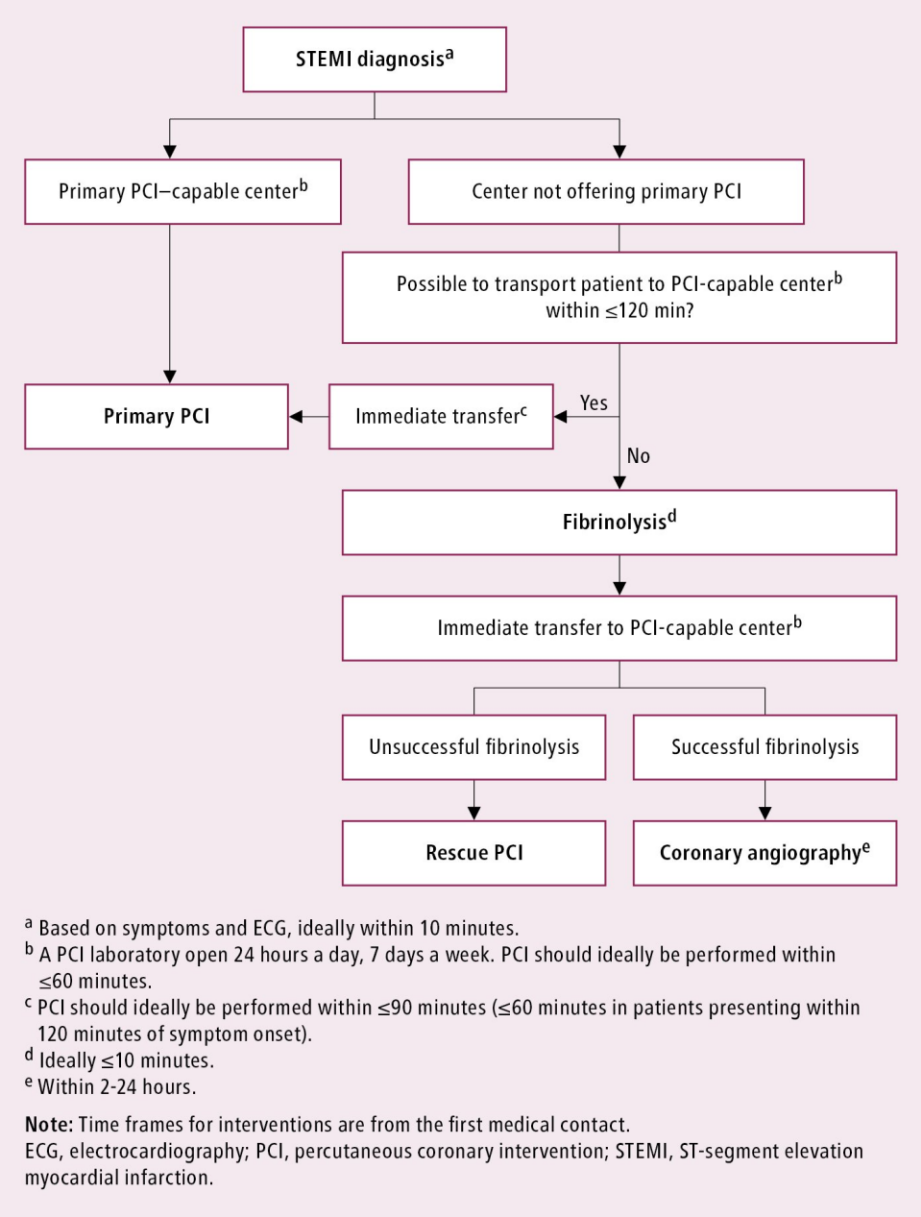

Figure (2) Algorithm of STEMI management.

- **Pharmacological Interventions**

Pharmacological interventions in STEMI management are essential for symptom relief, symptom control, and risk reduction:

- **Antiplatelet Therapy:**

Dual antiplatelet therapy with aspirin and a P2Y12 receptor inhibitor (e.g., clopidogrel, ticagrelor, or prasugrel) is initiated during acute STEMI management and continued for a duration

specified by guidelines **(10)** These agents prevent further platelet aggregation and reduce the risk of recurrent thrombosis.

- **Beta-Blockers:**

Beta-blockers are administered early in STEMI to reduce myocardial oxygen demand and decrease the risk of arrhythmias **(7)**

However, their routine use is evolving, and individualized decisions are made based on patient characteristics.

- **ACE Inhibitors and Angiotensin Receptor Blockers (ARBs):**

These medications are recommended for patients with STEMI, particularly those with reduced left ventricular function or heart failure **(9)** They help reduce cardiac remodeling and improve long-term outcomes.

- **Statins:**

High-intensity statin therapy is initiated in the acute phase of STEMI to reduce low-density lipoprotein cholesterol levels and minimize atherogenic risk **(7)**

- **Long-Term Care and Secondary Prevention**

Long-term management of STEMI extends beyond the acute phase to address secondary prevention, rehabilitation, and lifestyle modifications:

- **Cardiac Rehabilitation:**

Cardiac rehabilitation programs are recommended to support physical and psychological recovery and improve patient outcomes **(11).**

- **Lifestyle Modification:**

Lifestyle interventions, including smoking cessation, dietary changes, and physical activity, are integral to secondary prevention**(9).**

- **Secondary Prevention Medications:**

Ongoing use of antiplatelet therapy, beta-blockers, ACE inhibitors or ARBs, and statins is crucial for reducing the risk of recurrent events **(7)**

- **Advances in Treatment**

The cornerstone of STEMI treatment is early reperfusion therapy, typically achieved through primary percutaneous coronary intervention (PCI) or thrombolytic therapy. Research indicates that primary PCI is the preferred reperfusion strategy when feasible, offering better outcomes in terms of mortality and reduced infarct size compared to thrombolysis **(9).** Ongoing

research is focused on optimizing PCI techniques and identifying the most suitable candidates for thrombolytic therapy **(8).**

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