STEMI

247 PROGRAM

DR ALKAMEL

INTERVENTIONAL CARDIOLOGIST

OUTLINES

STEMI DEFINITION
PATHOPHYSIOLOGY
EKG
MANAGEMENT
THROMBOLYIC VS PRIMARY PCI
PRIMARY PCI
247 PROGRAM
FASA EXPERIENCE

Epidimiology

The first cause of mortality all over the world
in 2017 about 17.5 million died due heart disease
in 2030 this number will be 23 milion


Coronary Heart Disease
1
KILLER

- 36 % of all mortality in the world due to heart disease
- 39 % of all mortality in IRAN due to heart disease
- 44% of all mortality in FARS due to heart disease more than any other province in IRAN

بیشترین علت مرگ ایرانیان در سال ۹۵ چه بوده است؟

منبع: سازمان ثبت احوال

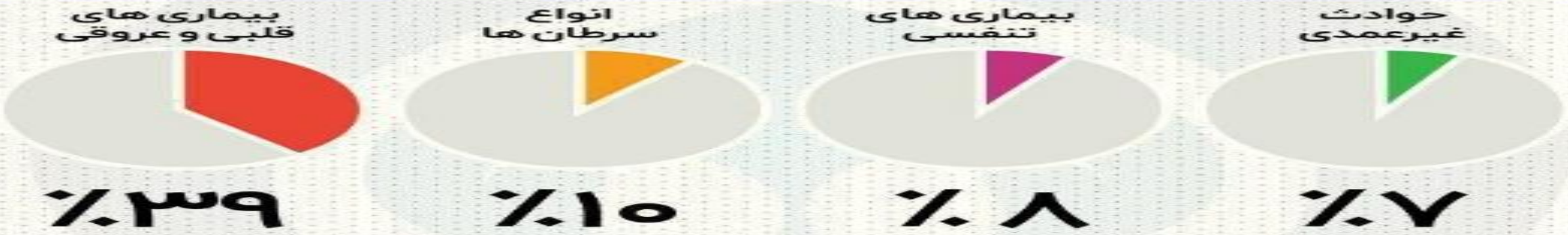
۳۶۹۷۵۱
تعداد کل فوت شدگان سال ۱۳۹۵

۶۳
میانگین سنی فوت شدگان مرد سال ۱۳۹۵

۶۵
میانگین سنی فوت شدگان سال ۱۳۹۵

۶۸
میانگین سنی فوت شدگان زن سال ۱۳۹۵

بیشترین سهم چهار علت عمده مرگ و میر در سال ۱۳۹۵:



زمان ثبت مرگ افراد بر حسب فصل

خبرگزاری شبستان
اینفوگرافیک: مهدی دل روشن

Acute Coronary Syndromes

1,360,000 Americans per year

- *Unstable Angina*

UA

550,000 /year

- Non-ST-Segment Elevation MI

NSTEMI

530,000 /year

- ST-Segment Elevation MI

STEMI

280,000 /year

DEFINITION

- STEMI is a clinical syndrome defined by characteristic symptoms of myocardial ischemia in association with persistent electrocardiographic (ECG) ST elevation and subsequent release of biomarkers of myocardial necrosis.

Anginal "Red Flags"

- Central Anterior Chest Pain
- Pressure, Tightness, Dull, Crush
- Radiating to Arms, Neck, Back
- Approx. 50% ACS Patients

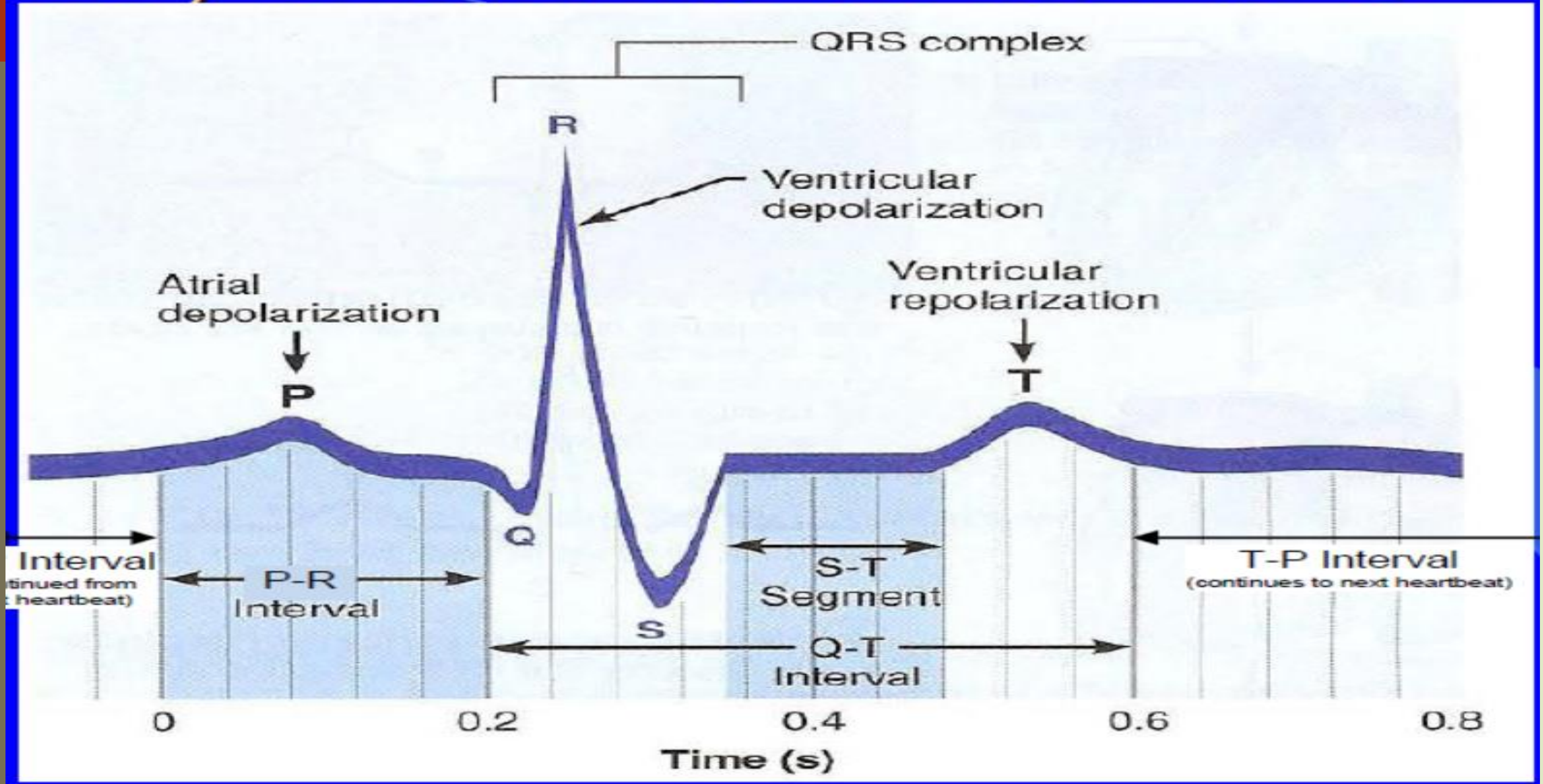
Anginal Equivalent "Red Flags"

- Dyspnea
- Palpitations
- Syncope
- Diaphoresis
- Nausea / Vomiting

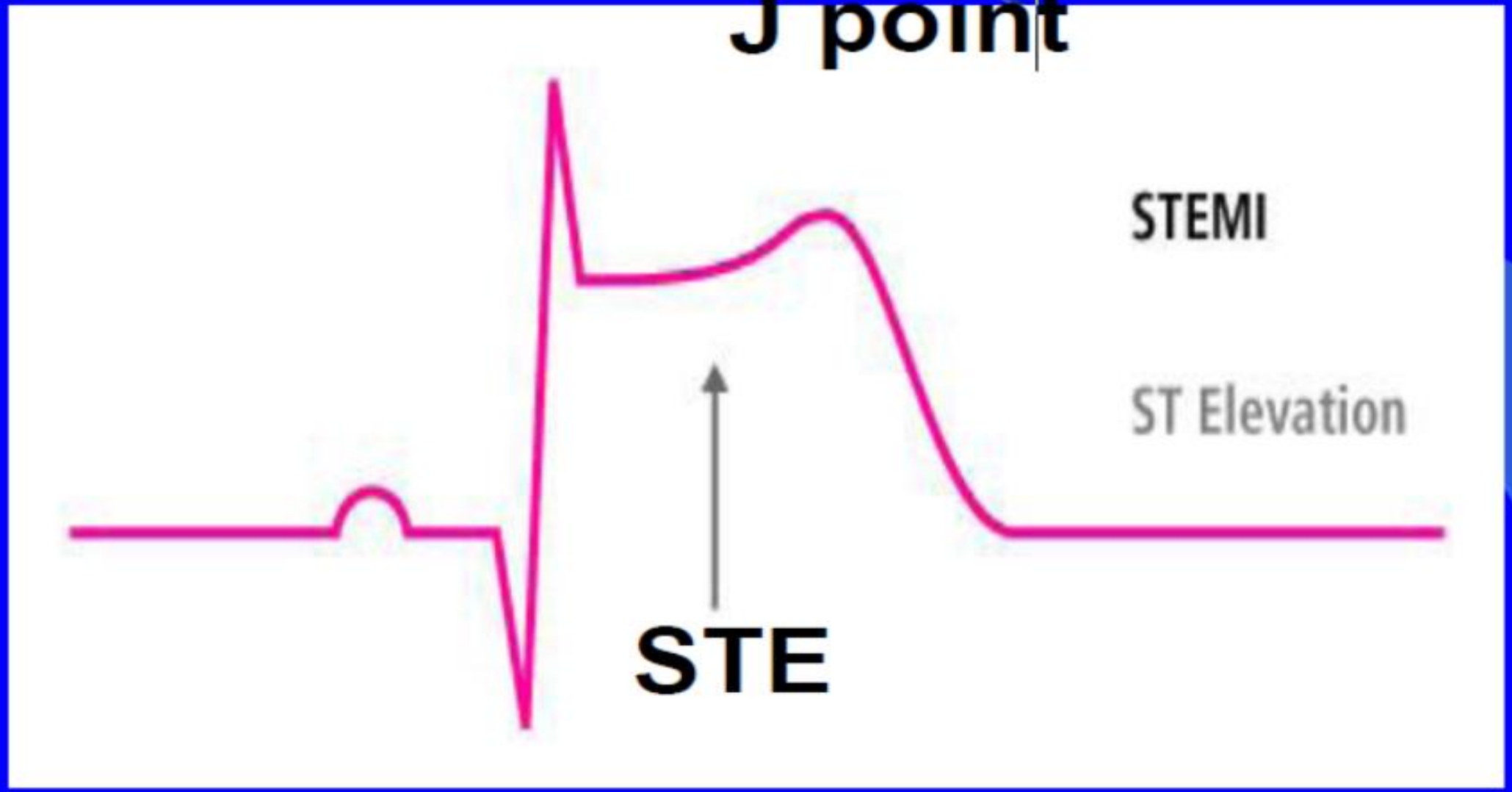
ECG

- in the proper clinical context, ST-segment elevation (measured at the J-point) is considered suggestive of ongoing coronary artery acute occlusion in the following cases:
- at least two contiguous leads with ST-segment elevation >2.5 mm in men < 40 years
- >2 mm in men >40 years
- or >1.5 mm in women in leads V2–V3 and
- >1 mm in the other leads [in the absence of left ventricular (LV) hypertrophy or left bundle branch block LBBB)]

Key Features of an ECG

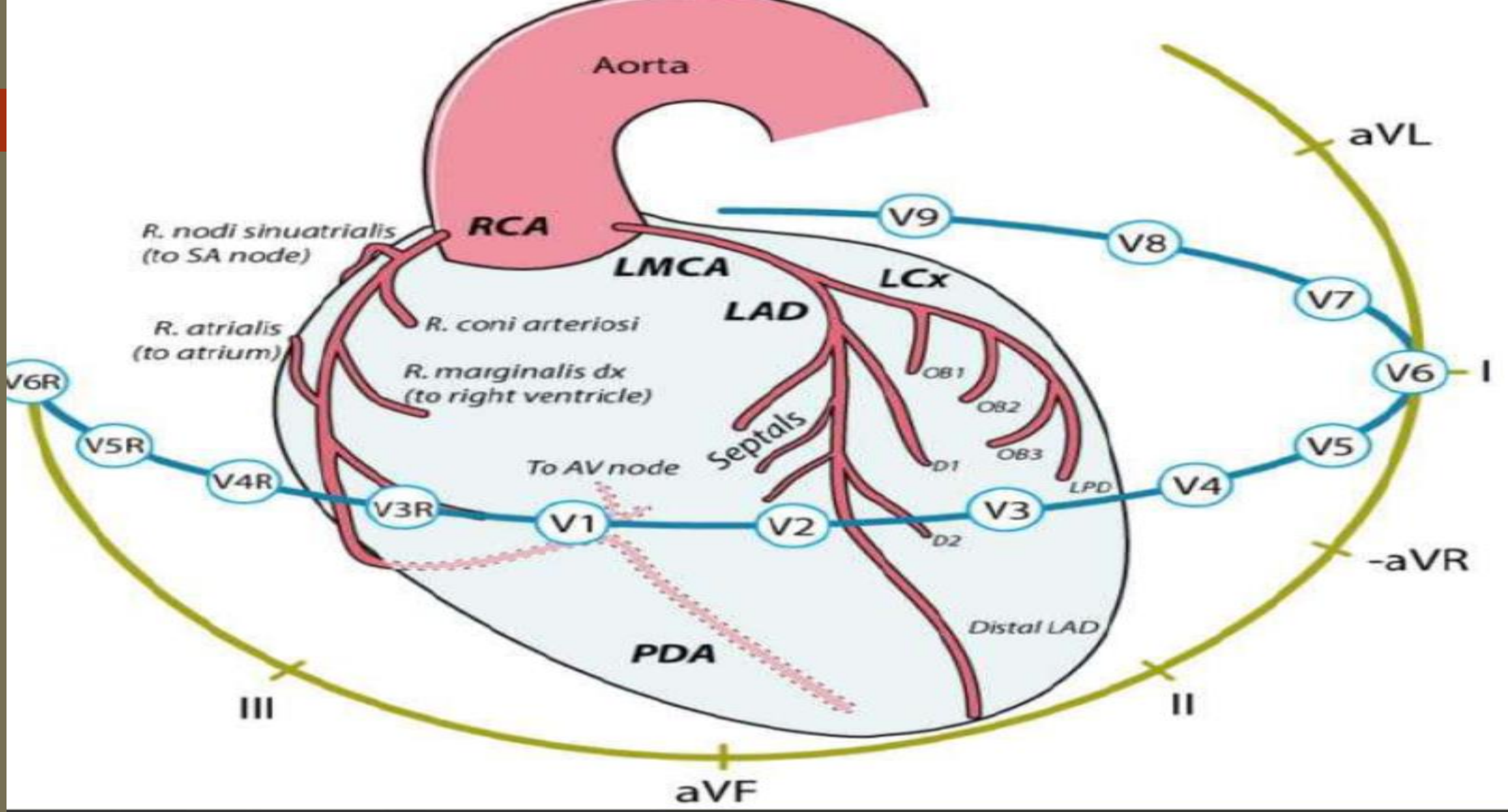


Example of ST-segment Elevation (STEMI)



Anatomically Contiguous Leads

I Lateral	aVR Ignore	V1 Septal	V4 Anterior
II Inferior	aVL Lateral	V2 Septal	V5 Lateral
III	aVF	V3	V6


Aorta
RCA
LMCA
LAD
LCx
R. nodi sinuatrialis
(to SA node)
R. atrialis
(to atrium)
R. coni arteriosi
R. marginalis dx
(to right ventricle)
To AV node
Septals
OB1
OB2
OB3
D1
D2
LPD
Distal LAD
PDA
V9
V8
V7
V6
V5
V4
V3
V2
V1
V3R
V4R
V5R
V6R
aVL
I
-aVR
II
aVF
III

ECG evolution in non-reperfused myocardial infarction

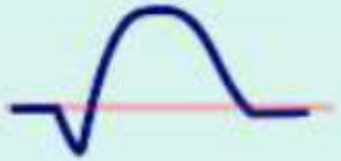
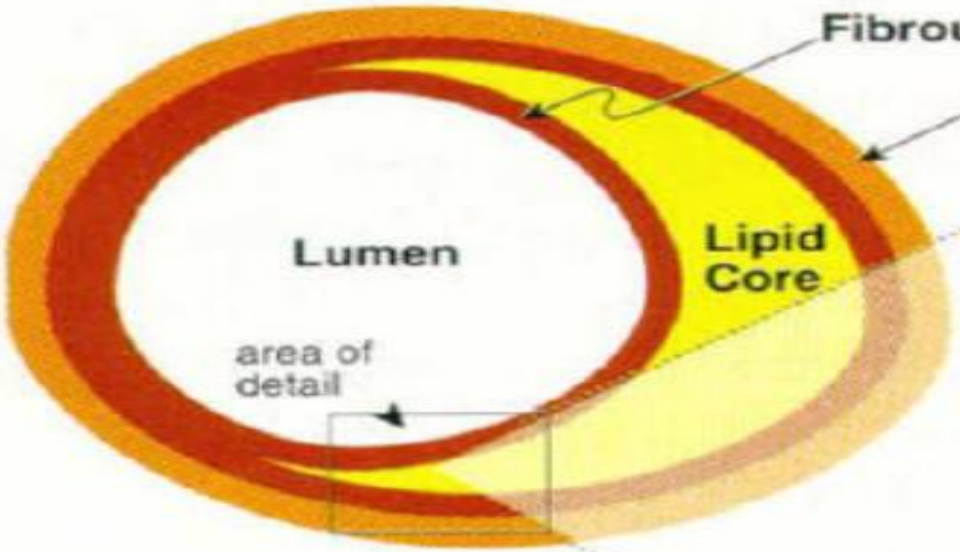
Normal		
Peaked T wave		minutes
Progression of ST segment elevation		minutes - hours
Loss of R wave, Q wave formation		hours - days
T wave inversion		days

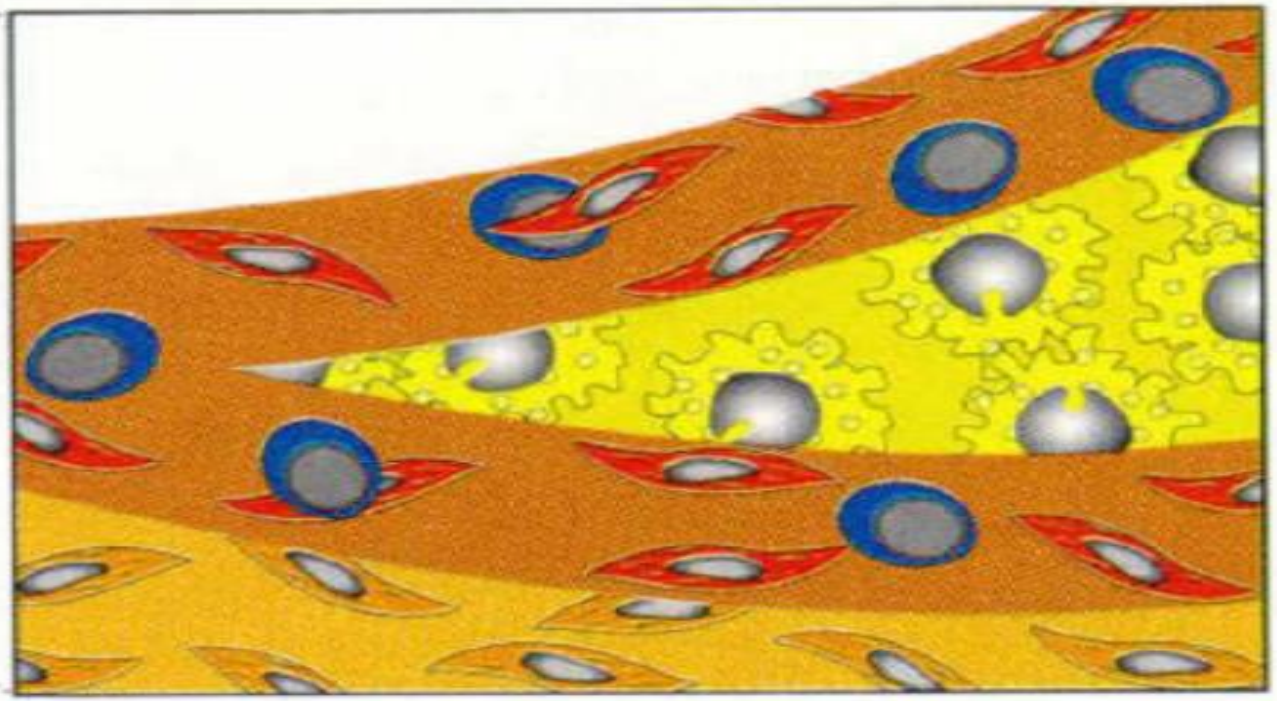
Table 5 Atypical ECG presentations that deserve prompt management in patients with signs and symptoms of ongoing myocardial ischaemia

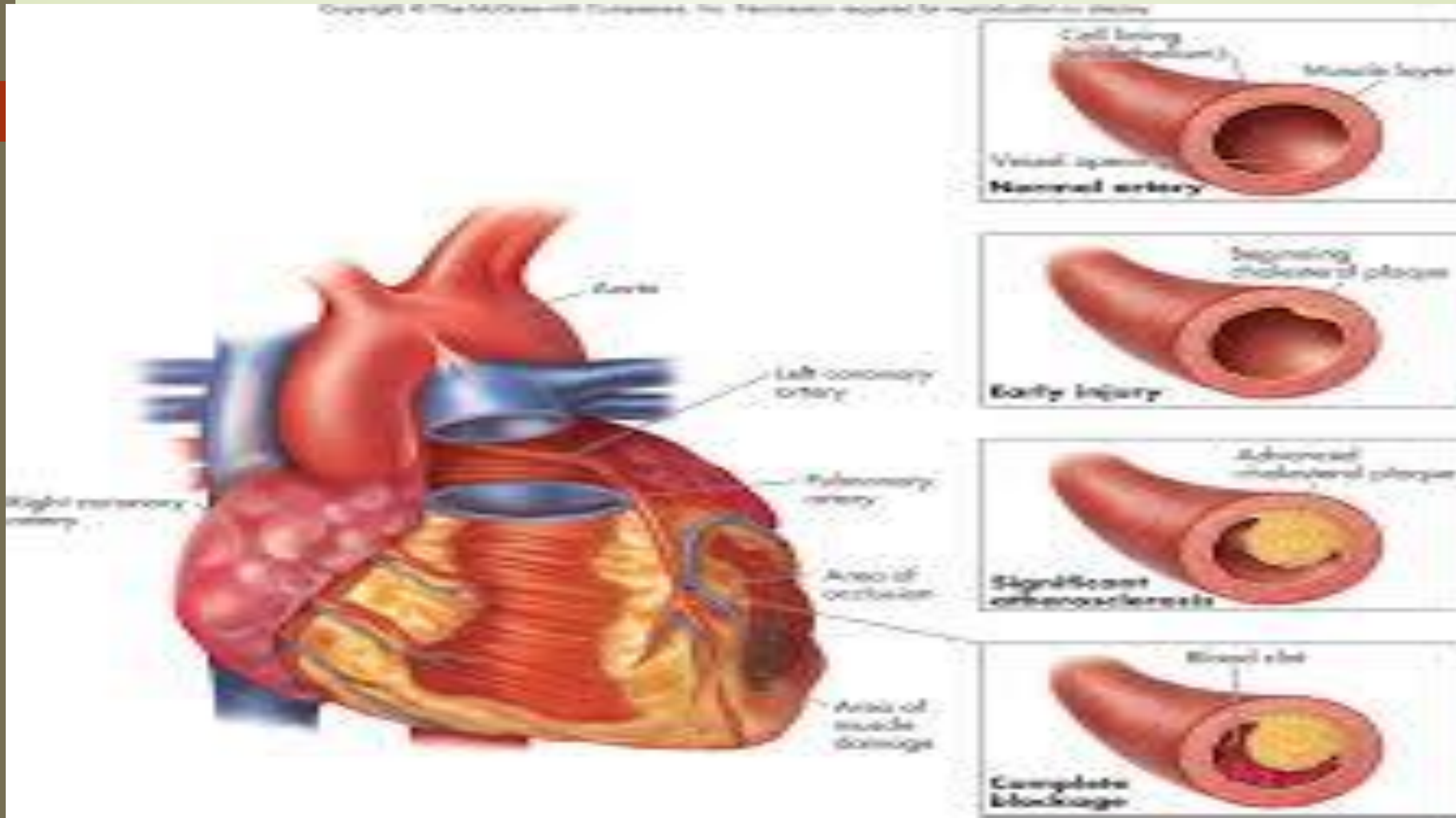
• LBBB
• Ventricular paced rhythm
• Patients without diagnostic ST-segment elevation but with persistent ischaemic symptoms
• Isolated posterior myocardial infarction
• ST-segment elevation in lead aVR

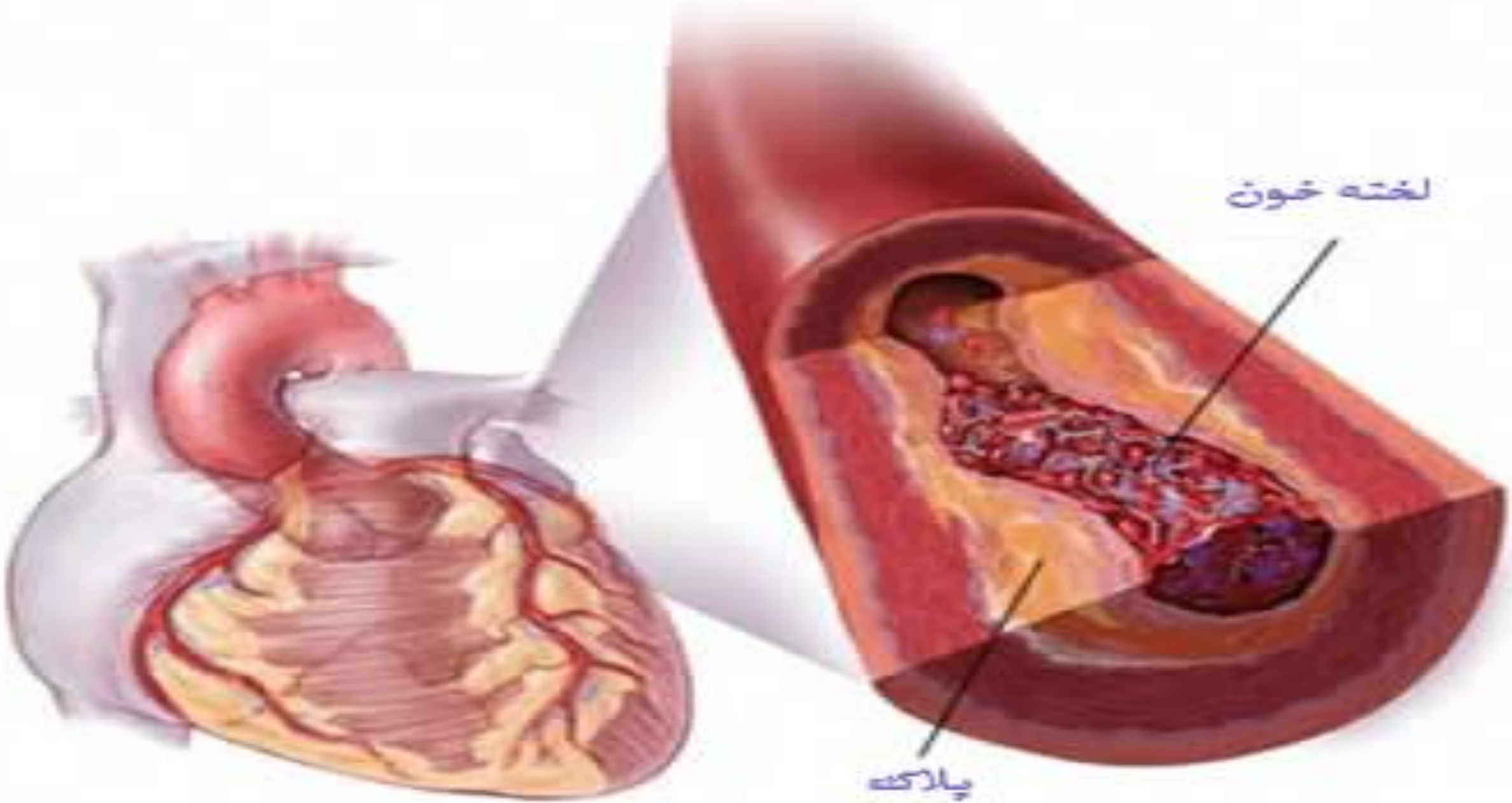


"Vulnerable" Plaque

"Stable" Plaque



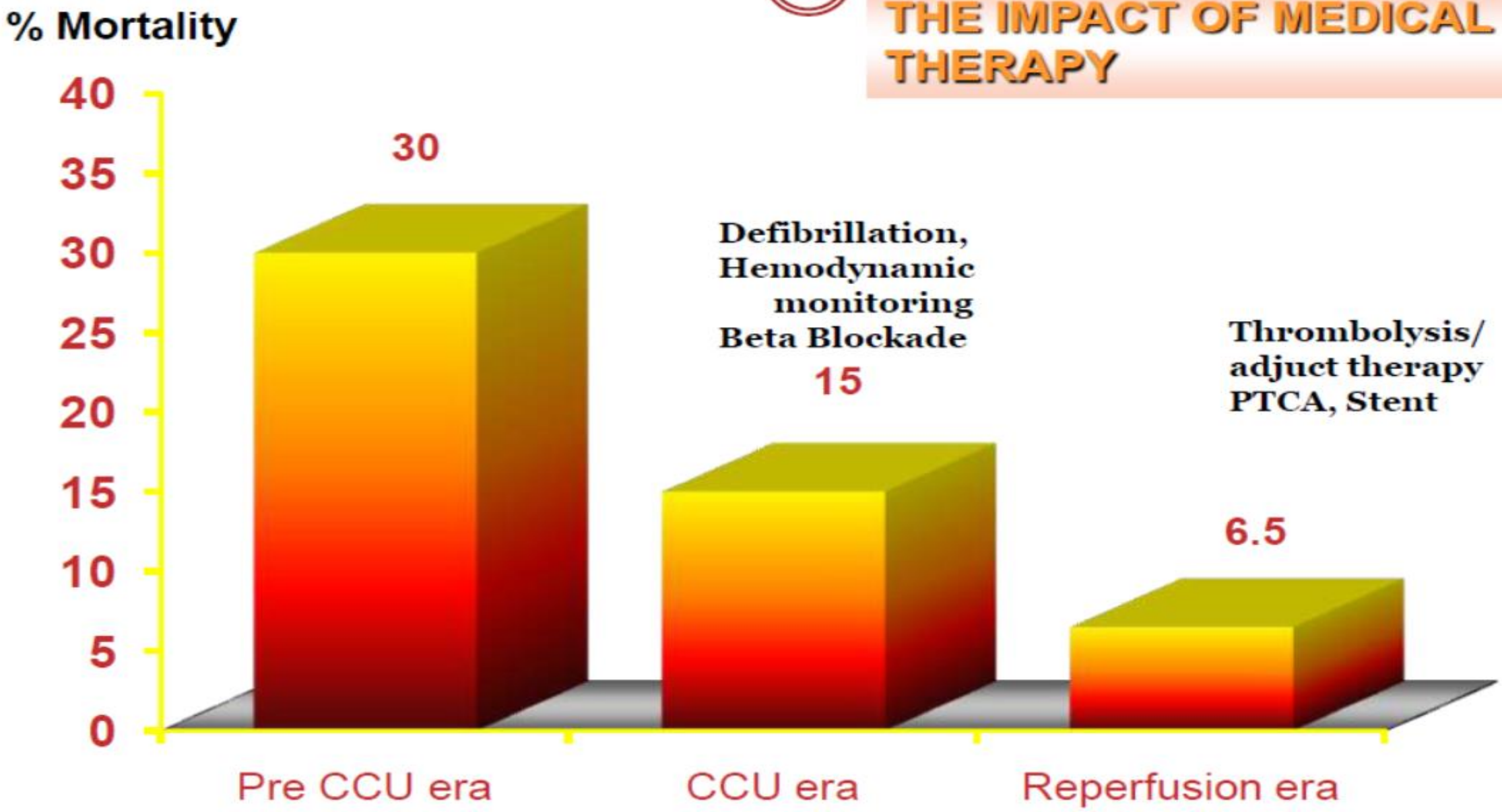

Aorta
Left coronary artery
Pulmonary artery
Area of occlusion
Area of muscle damage
Normal artery
Early injury
Significant atherosclerosis
Complete blockage


لخته خون
پلاکه

Cardiac Compromise

MANAGEMENT OF Acute Myocardial Infarction

THE IMPACT OF MEDICAL THERAPY



- The in-hospital mortality of unselected STEMI patients in the national registries of the ESC countries varies between 6% and 14%

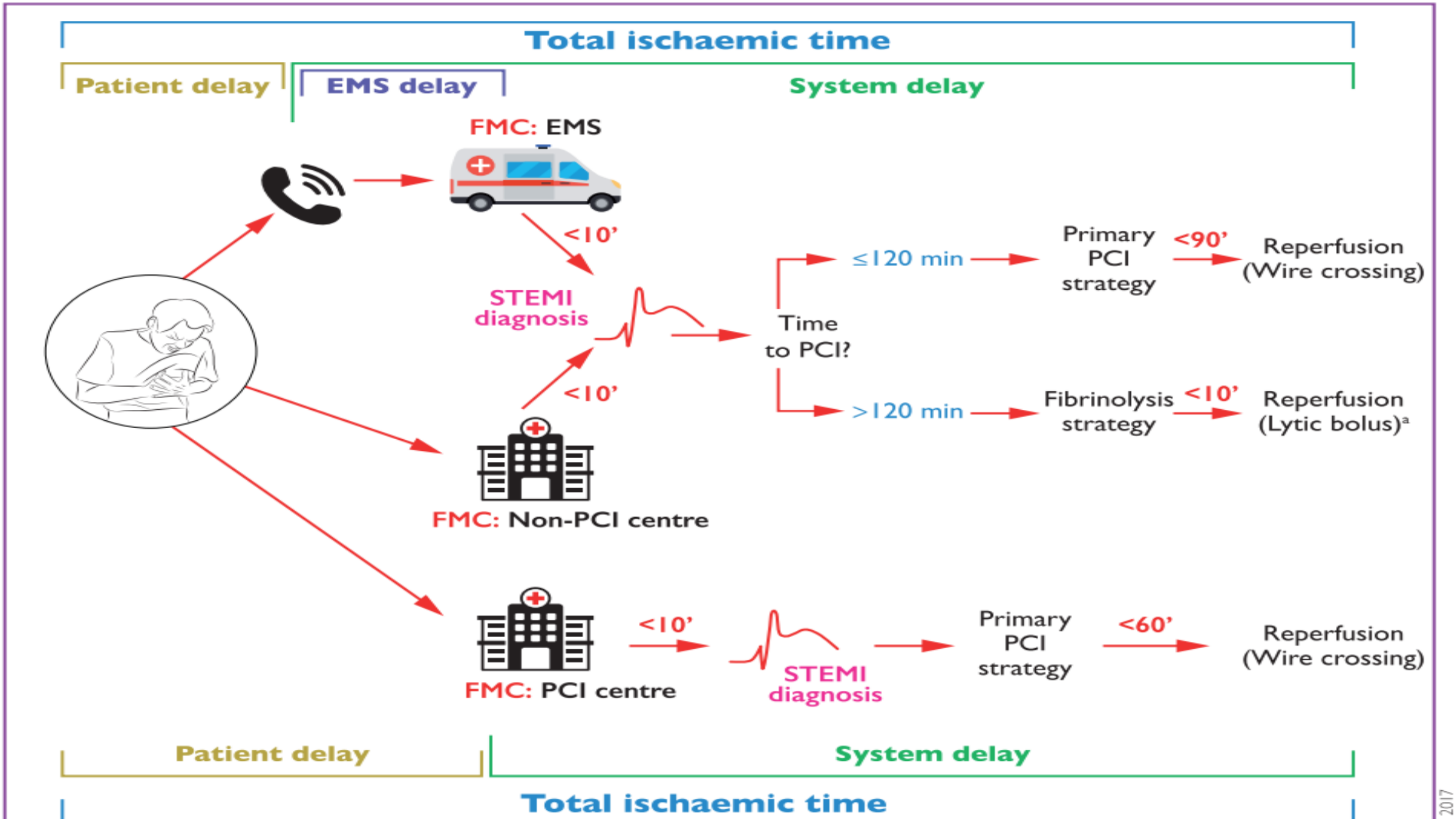

Total ischaemic time
Patient delay
EMS delay
System delay
FMC: EMS
<10'
STEMI diagnosis
≤120 min
Primary PCI strategy
<90'
Reperfusion (Wire crossing)
Time to PCI?
>120 min
Fibrinolysis strategy
<10'
Reperfusion (Lytic bolus)a
<10'
FMC: Non-PCI centre
FMC: PCI centre
<10'
STEMI diagnosis
Primary PCI strategy
<60'
Reperfusion (Wire crossing)
Patient delay
System delay
Total ischaemic time

Table 4 Definitions of terms related to reperfusion therapy

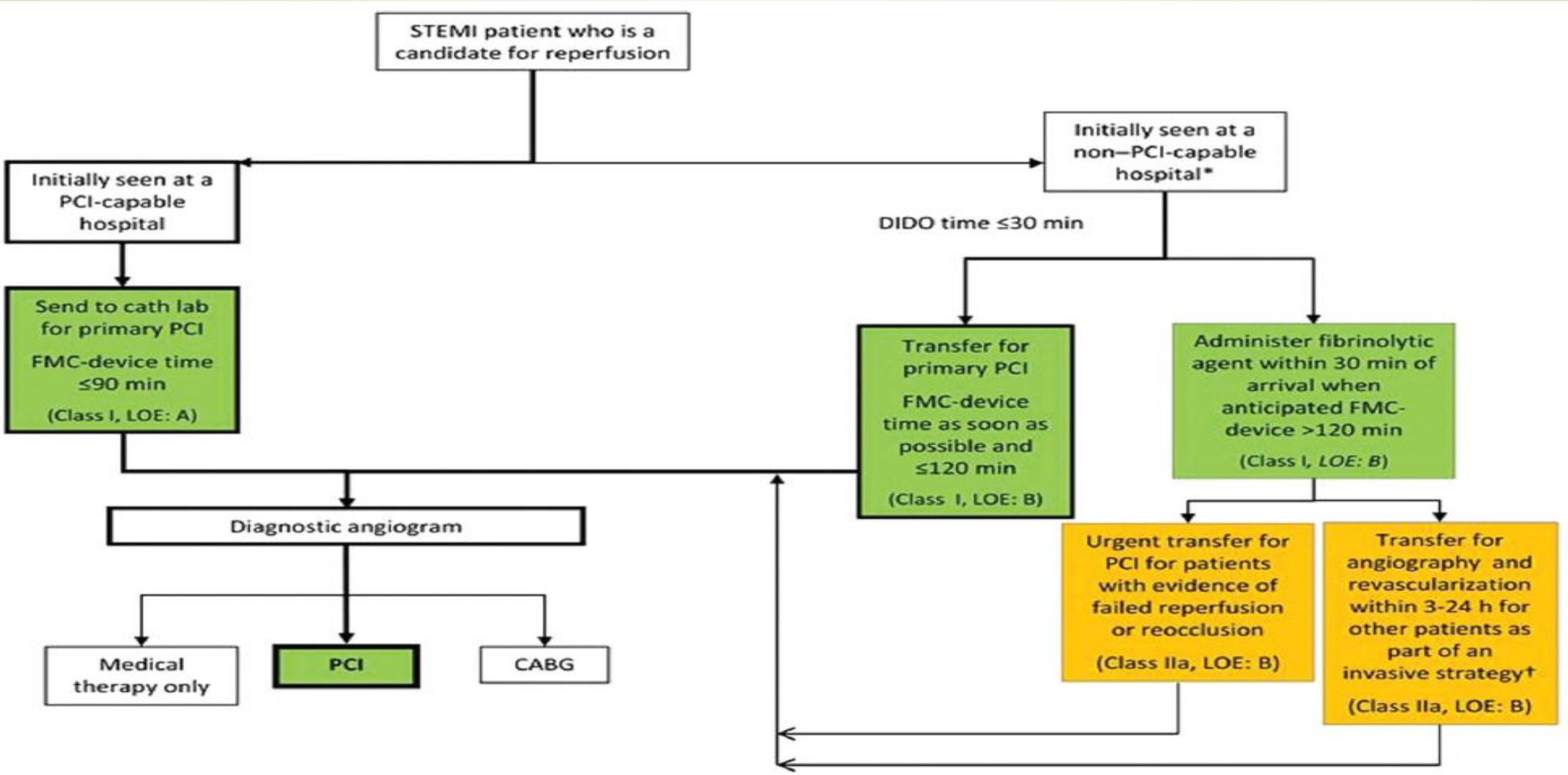
Term	Definition
FMC	The time point when the patient is either initially assessed by a physician, paramedic, nurse or other trained EMS personnel who can obtain and interpret the ECG, and deliver initial interventions (e.g. defibrillation). FMC can be either in the prehospital setting or upon patient arrival at the hospital (e.g. emergency department)
STEMI diagnosis	The time at which the ECG of a patient with ischaemic symptoms is interpreted as presenting ST-segment elevation or equivalent

Primary PCI	Emergent PCI with balloon, stent, or other approved device, performed on the IRA without previous fibrinolytic treatment
Primary PCI strategy	Emergent coronary angiography and PCI of the IRA if indicated
Rescue PCI	Emergent PCI performed as soon as possible in the case of failed fibrinolytic treatment
Routine early PCI strategy after fibrinolysis	Coronary angiography, with PCI of the IRA if indicated, performed between 2 and 24 hours after successful fibrinolysis
Pharmacoinvasive strategy	Fibrinolysis combined with rescue PCI (in case of failed fibrinolysis) or routine early PCI strategy (in case of successful fibrinolysis)

Table 5 Summary of important time targets

Intervals	Time targets
Maximum time from FMC to ECG and diagnosis[a]	≤10 min
Maximum expected delay from STEMI diagnosis to primary PCI (wire crossing) to choose primary PCI strategy over fibrinolysis (if this target time cannot be met, consider fibrinolysis)	≤120 min
Maximum time from STEMI diagnosis to wire crossing in patients presenting at primary PCI hospitals	≤60 min
Maximum time from STEMI diagnosis to wire crossing in transferred patients	≤90 min
Maximum time from STEMI diagnosis to bolus or infusion start of fibrinolysis in patients unable to meet primary PCI target times	≤10 min
Time delay from start of fibrinolysis to evaluation of its efficacy (success or failure)	60–90 min
Time delay from start of fibrinolysis to angiography (if fibrinolysis is successful)	2–24 hours

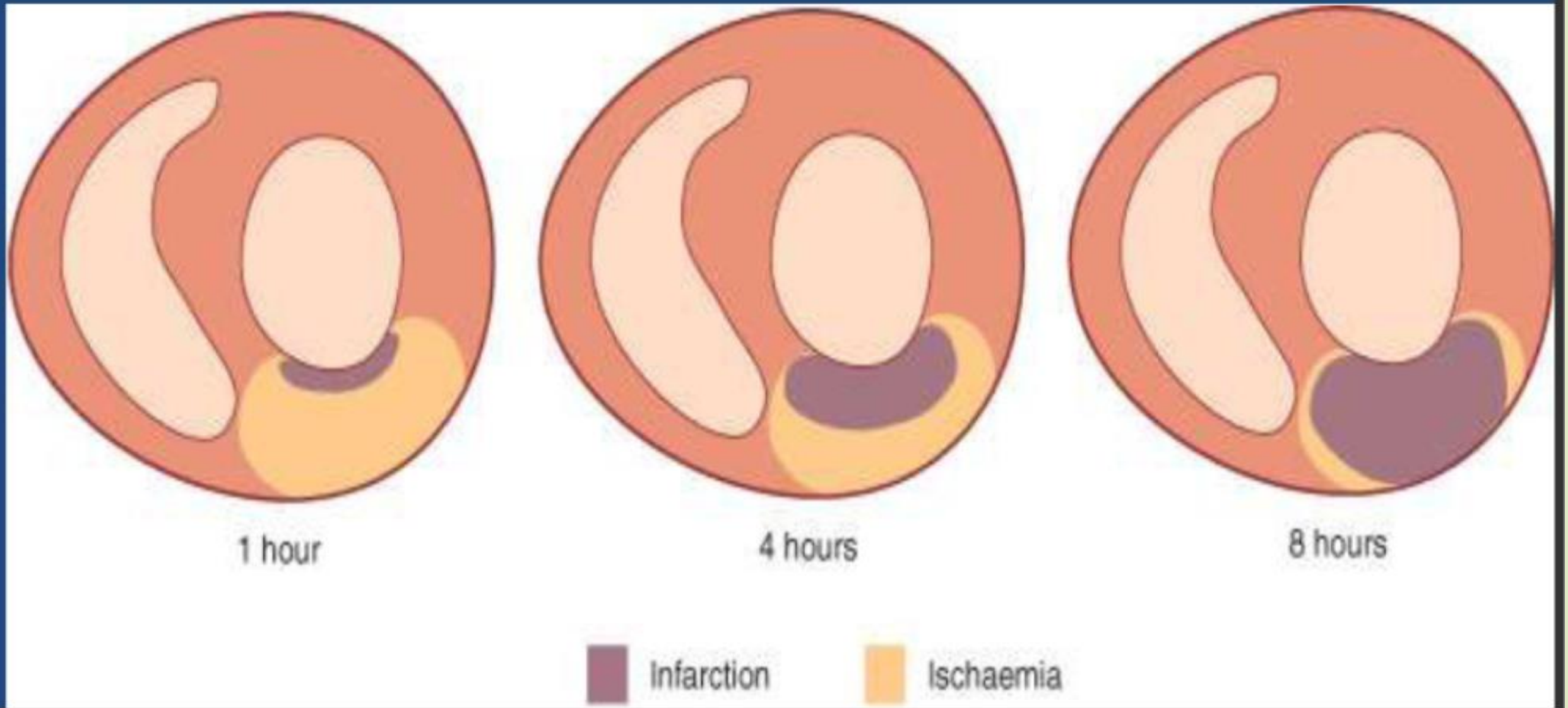
Reperfusion Therapy for Patients with STEMI



*Patients with cardiogenic shock or severe heart failure initially seen at a non–PCI-capable hospital should be transferred for cardiac catheterization and revascularization as soon as possible, irrespective of time delay from MI onset (*Class I, LOE: B*). †Angiography and revascularization should not be performed within the first 2 to 3 hours after administration of fibrinolytic therapy.

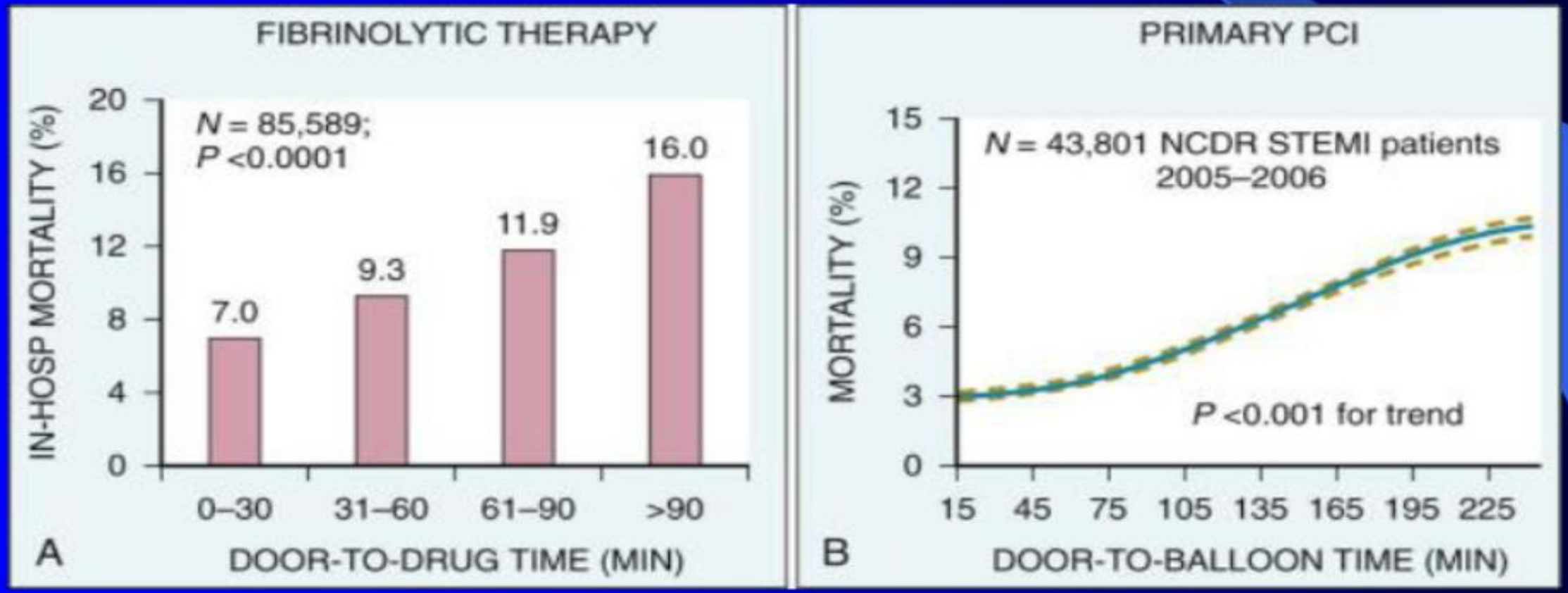
TIME IS MUSCLE

Minutes mean muscle

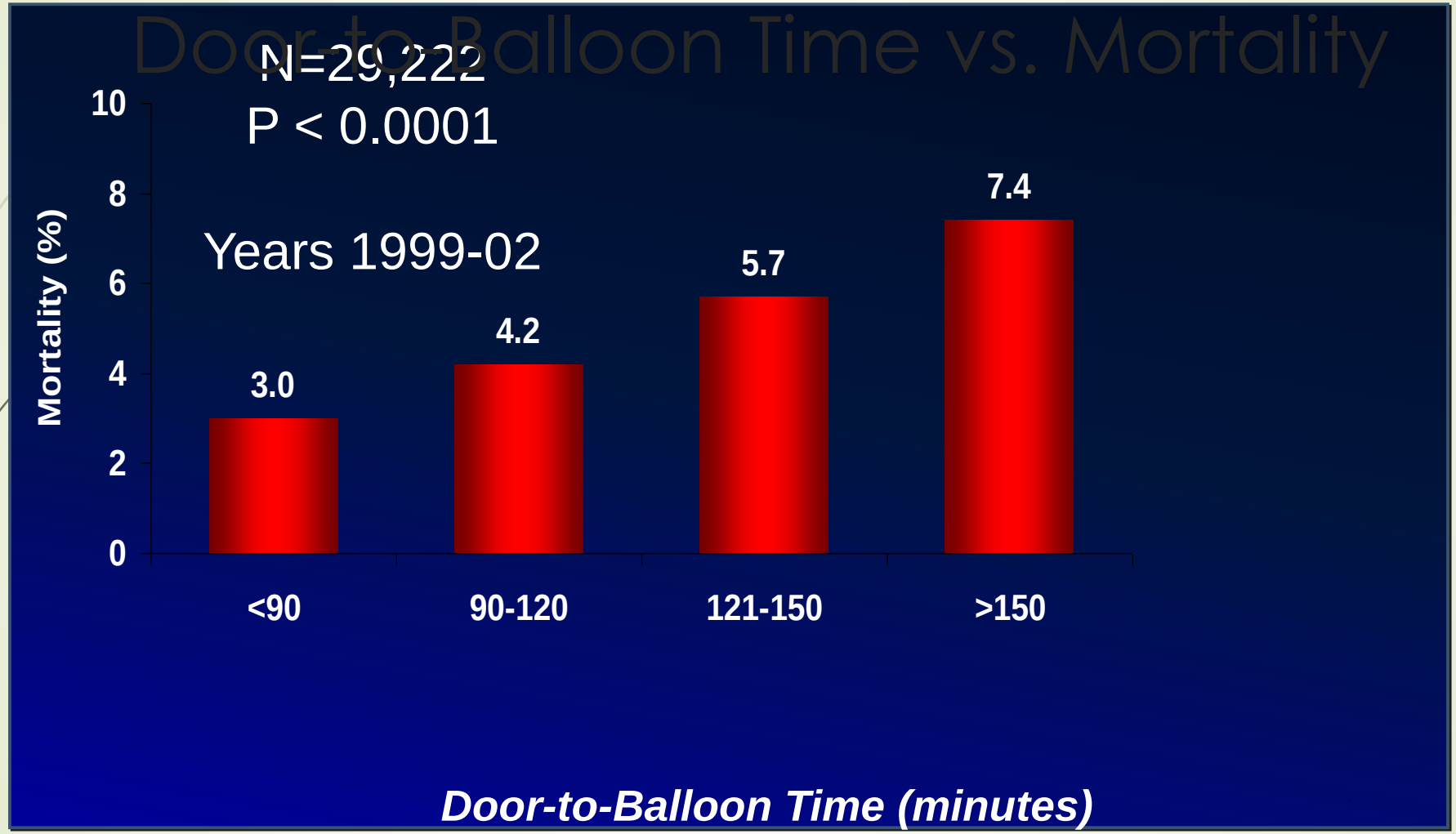


Importance of Rapid Reperfusion in STEMI

30-minute delay = 8% increase in 1-year mortality



NRMI-3-4: Primary PCI



McNamara J Am Coll Cardiol 2006;47:2180-2186

- The mortality of STEMI is influenced by many factors:

- age
- Killip class
- time delay to treatment
- mode of treatment
- history of prior myocardial infarction
- diabetes mellitus,
- renal failure,
- number of diseased coronary arteries
- ejection fraction, and treatment

Relief of hypoxaemia and symptoms

Recommendations	Class[a]	Level[b]
Hypoxia		
Oxygen is indicated in patients with hypoxaemia ($SaO_2 < 90\%$ or $PaO_2 < 60$ mmHg).	I	C
Routine oxygen is not recommended in patients with $SaO_2 \geq 90\%$.[64–66]	III	B
Symptoms		
Titrated i.v. opioids should be considered to relieve pain.	IIa	C
A mild tranquillizer (usually a benzodiazepine) should be considered in very anxious patients.	IIa	C

Antiplatelet Therapy to Support Primary PCI for STEMI

A loading dose of a $P2Y_{12}$ receptor inhibitor should be given as early as possible or at time of primary PCI to patients with STEMI. Options include:

- Clopidogrel 600 mg; or
- Prasugrel 60 mg; or
- Ticagrelor 180 mg

therapies in primary PCI	
Antiplatelet therapies	
Aspirin	Loading dose of 150–300 mg orally or of 75–250 mg i.v. if oral ingestion is not possible, followed by a maintenance dose of 75–100 mg/day
Clopidogrel	Loading dose of 600 mg orally, followed by a maintenance dose of 75 mg/day
Prasugrel	Loading dose of 60 mg orally, followed by a maintenance dose of 10 mg/day In patients with body weight ≤60 kg, a maintenance dose of 5 mg/day is recommended Prasugrel is contra-indicated in patients with previous stroke. In patients ≥75 years, prasugrel is generally not recommended, but a dose of 5 mg/day should be used if treatment is deemed necessary
Ticagrelor	Loading dose of 180 mg orally, followed by a maintenance dose of 90 mg *b.i.d.*
Abciximab	Bolus of 0.25 mg/kg i.v. and 0.125 µg/kg/min infusion (maximum 10 µg/min) for 12 hours
Eptifibatide	Double bolus of 180 µg/kg i.v. (given at a 10-min interval) followed by an infusion of 2.0 µg/kg/min for up to 18 hours
Tirofiban	25 µg/kg over 3 min i.v., followed by a maintenance infusion of 0.15 µg/kg/min for up to 18 hours


Plavix
75 mg film-coated tablet Clopidogrel
28 film-coated tablets
Plavix


Rx
Ticagrelor Tablets
BRILINTA
ब्रिलिन्टा
AstraZeneca


90
T


4759
10 MG


Caja con 14 tabletas
Effient
prasugrel
Tabletas
10 mg
Recubiertas

Clopidogrel 75 mg / daily

Osvix 75 mg / daily

Zylt 75 mg /daily


Plavix
Clopidogrel
14 comprimés pelliculés
14 film-coated tablets
75 mg
sanofi aventis
Plavix 75 mg


75 mg
Zyllt® 75
Clopidogrel
28 F.C. tablets
Each tablet contains:
Clopidogrel (as hydrogen sulfate) 75mg
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+ در دمای کمتر از ۳۰ درجه سانتیگراد نگهداری نمایید.
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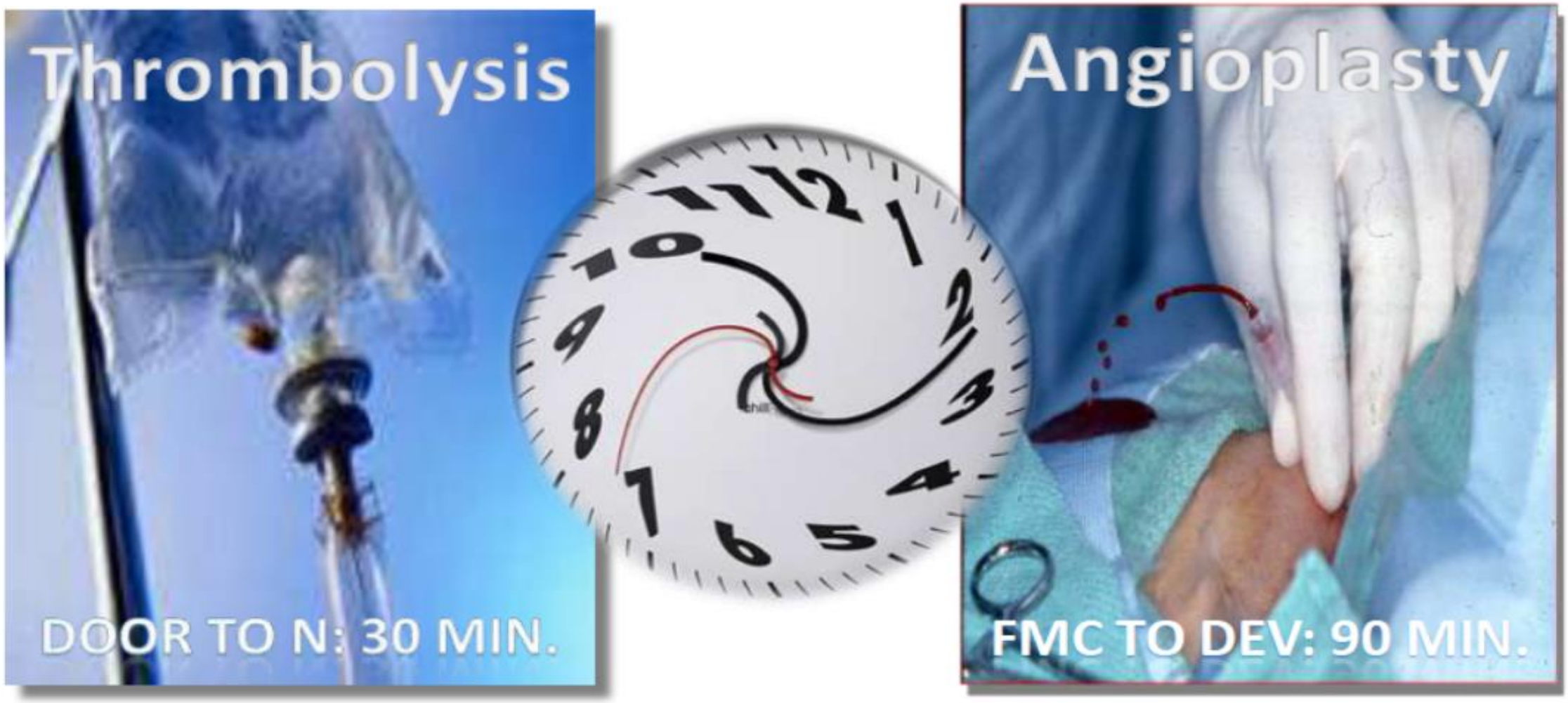
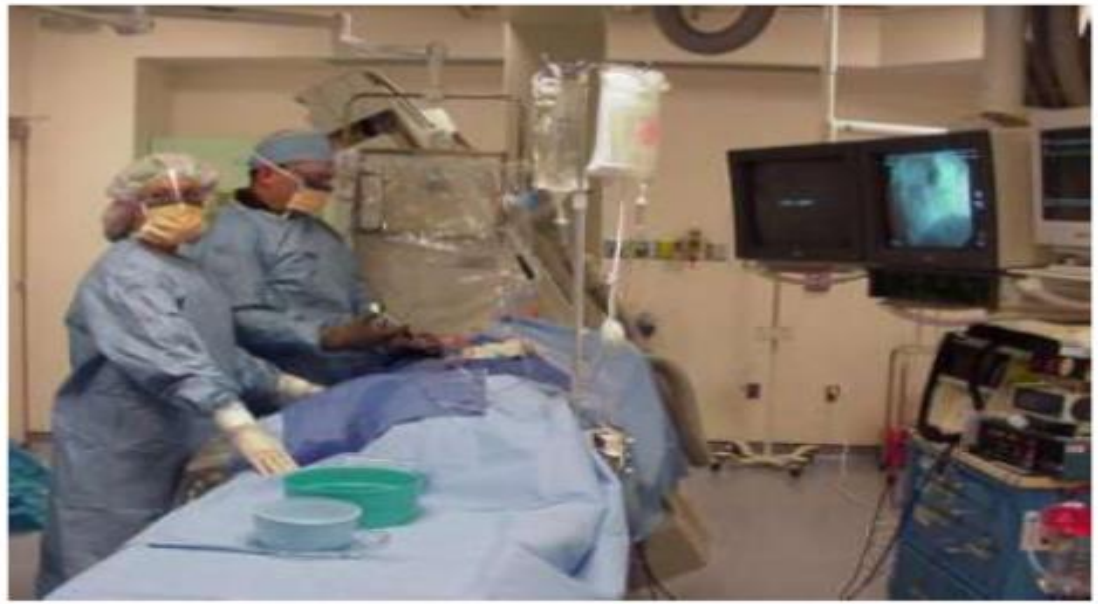
103*50*25 mm

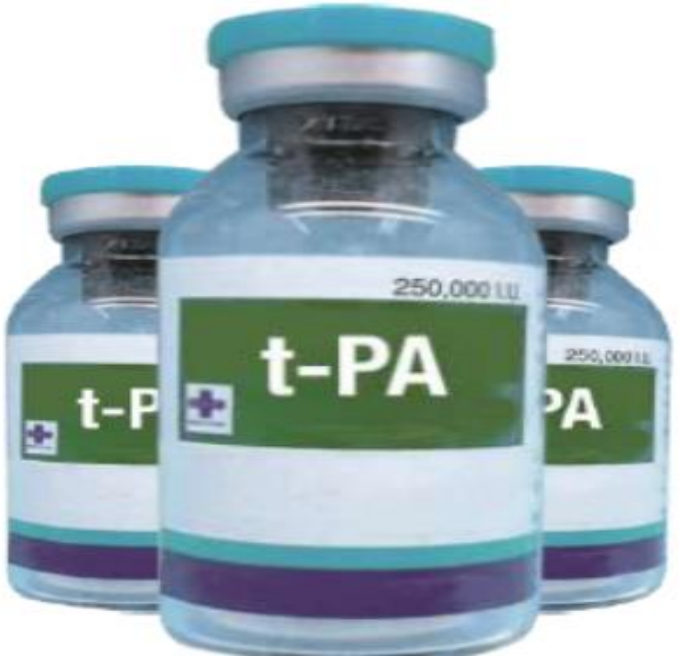
Reperfusion



Primary PCI

angioplasty vs thrombolysis





Symptoms onset 0

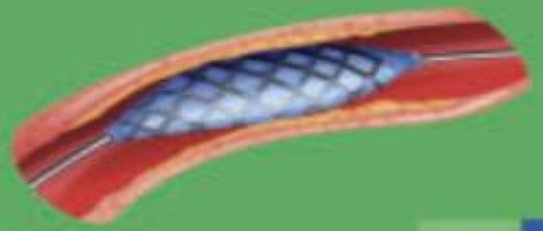
Early phase of STEMI

3 hours

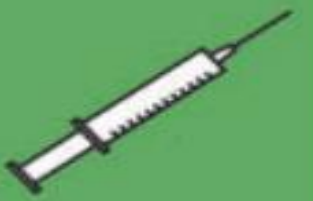
12 hours

Primary PCI

I A



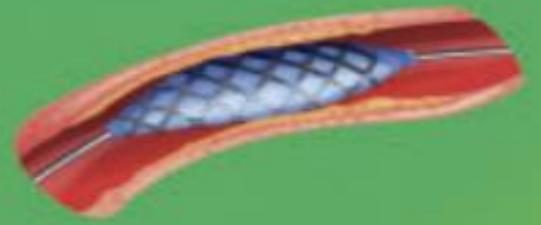
I A



Fibrinolysis
(only if PCI cannot be performed within 120 min from STEMI diagnosis)

Primary PCI

I A



I A

Fibrinolysis
(only if PCI cannot be performed within 120 min from STEMI diagnosis)

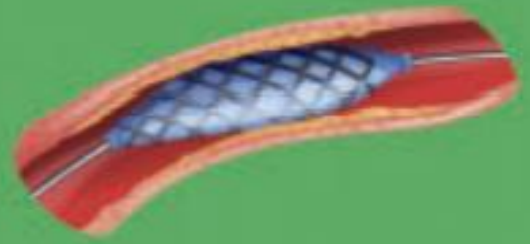
12 hours

Evolved STEMI

48 hours

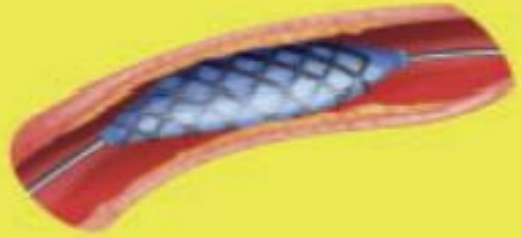
Recent STEMI

Primary PCI
(if symptoms, hemodynamic instability, or arrhythmias)



I C

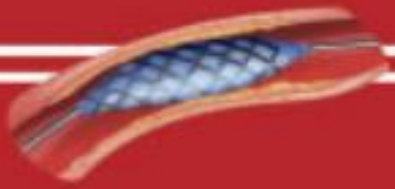
Primary PCI
(asymptomatic stable patients)



IIa B

Routine PCI
(asymptomatic stable patients)

III A



Thrombolytic drugs

- Streptokinase
- Urokinase
- Anistreplase
- tissue Plasminogen Activators (t-PA)
  - Alteplase
  - Reteplase
  - Tenecteplase

Table 7 Doses of fibrinolytic agents and antithrombotic co-therapies

Drug	Initial treatment	Specific contra-indications
Doses of fibrinolytic therapy		
Streptokinase	1.5 million units over 30–60 min i.v.	Previous treatment with streptokinase or anistreplase
Alteplase (tPA)	15 mg i.v. bolus 0.75 mg/kg i.v. over 30 min (up to 50 mg) then 0.5 mg/kg i.v. over 60 min (up to 35 mg)	
Reteplase (rPA)	10 units + 10 units i.v. bolus given 30 min apart	
Tenecteplase (TNK-tPA)	Single i.v. bolus: 30 mg (6000 IU) if <60 kg 35 mg (7000 IU) if 60 to <70 kg 40 mg (8000 IU) if 70 to <80 kg 45 mg (9000 IU) if 80 to <90 kg 50 mg (10000 IU) if ≥90 kg It is recommended to reduce to half-dose in patients ≥75 years of age.[121]	

Thrombolytics for AMI

Benefits

- Widespread availablity
- 12-17% survival benefit
- Preserves LVEF

Limitations

- 20% of vessels remain occluded
- 45% have TIMI flow< 3
- Median time to reperfusion is 45 minutes
- No reliable marker of reperfusion
- Recurrent ischemia occurs in 15-30%
- Intracranial bleeds occur in 0.5-1.5%

Table 8 Contra-indications to fibrinolytic therapy

Absolute
Previous intracranial haemorrhage or stroke of unknown origin at anytime
Ischaemic stroke in the preceding 6 months
Central nervous system damage or neoplasms or arteriovenous malformation
Recent major trauma/surgery/head injury (within the preceding month)
Gastrointestinal bleeding within the past month
Known bleeding disorder (excluding menses)
Aortic dissection
Non-compressible punctures in the past 24 hours (e.g. liver biopsy, lumbar puncture)

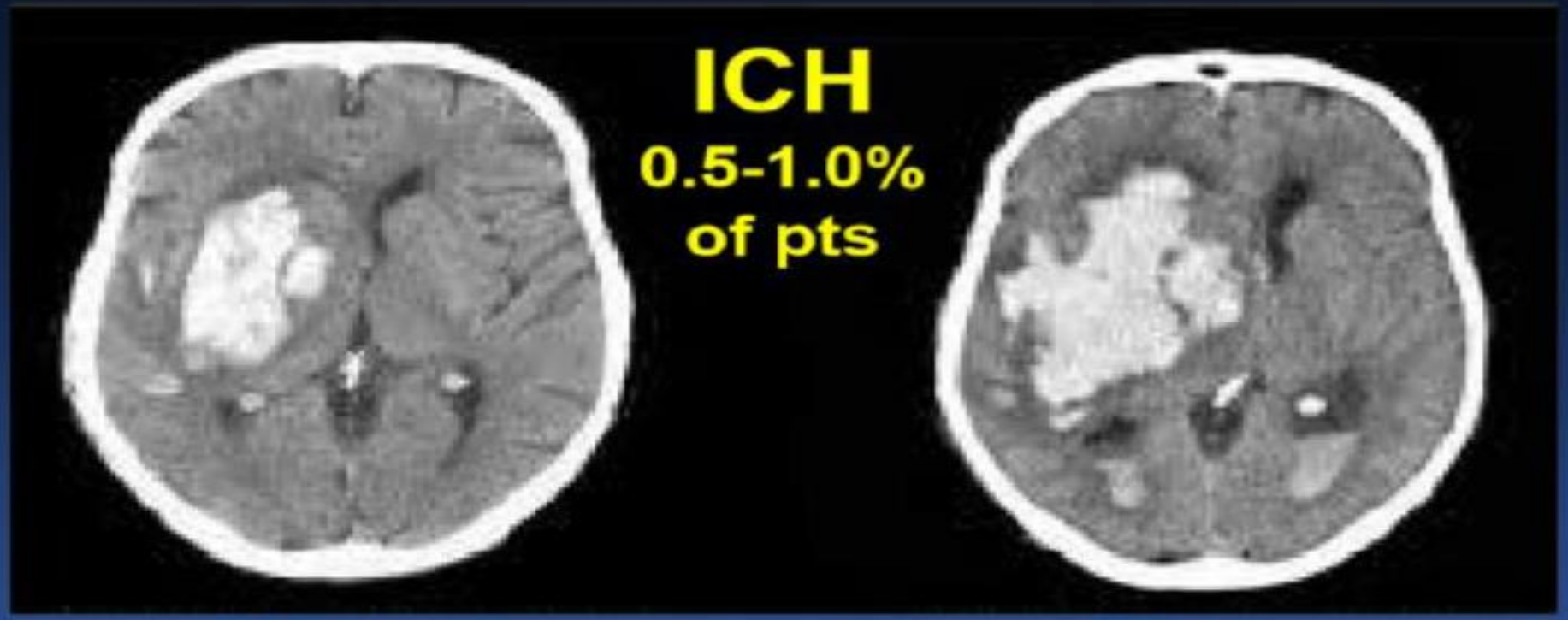
Relative
Transient ischaemic attack in the preceding 6 months
Oral anticoagulant therapy
Pregnancy or within 1 week postpartum
Refractory hypertension (SBP >180 mmHg and/or DBP >110 mmHg)
Advanced liver disease
Infective endocarditis
Active peptic ulcer
Prolonged or traumatic resuscitation

Fibrinolytic therapy

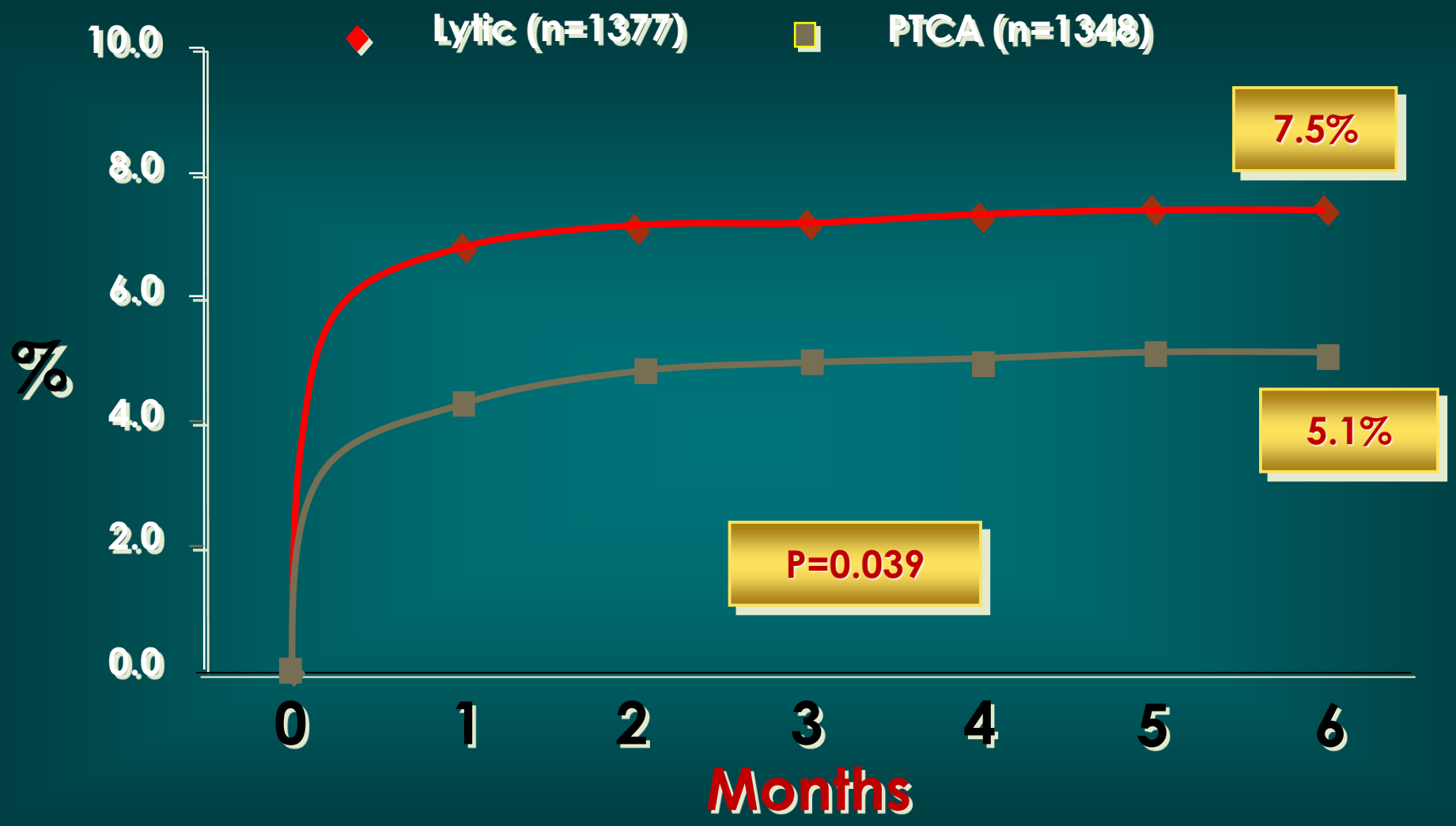
Did save lives compared to placebo, BUT

- At best, restored TIMI 3 flow in 55% (rt-PA), +
- ↑ Incidence of recurrent ischemia and reinfarction

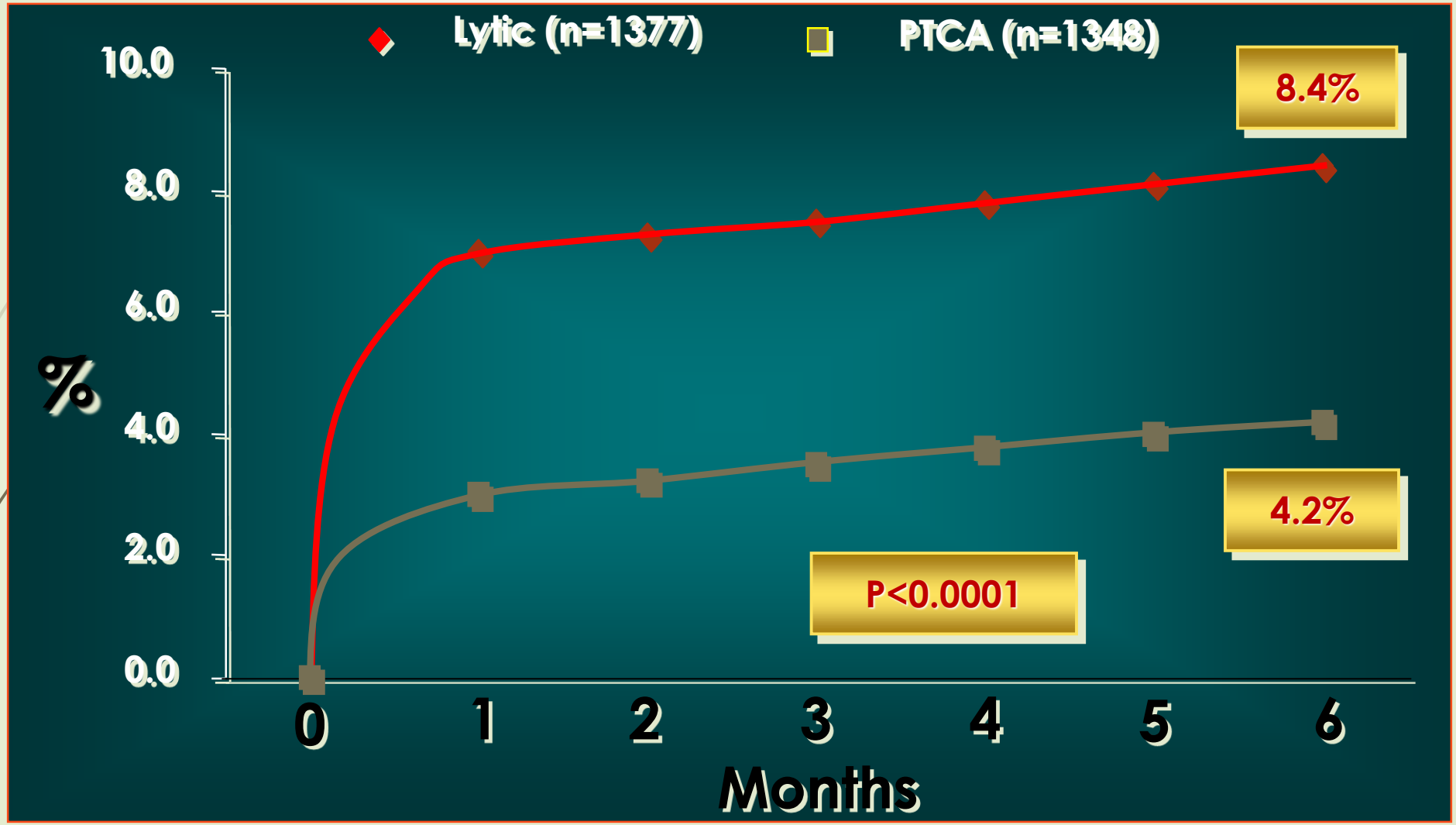
+



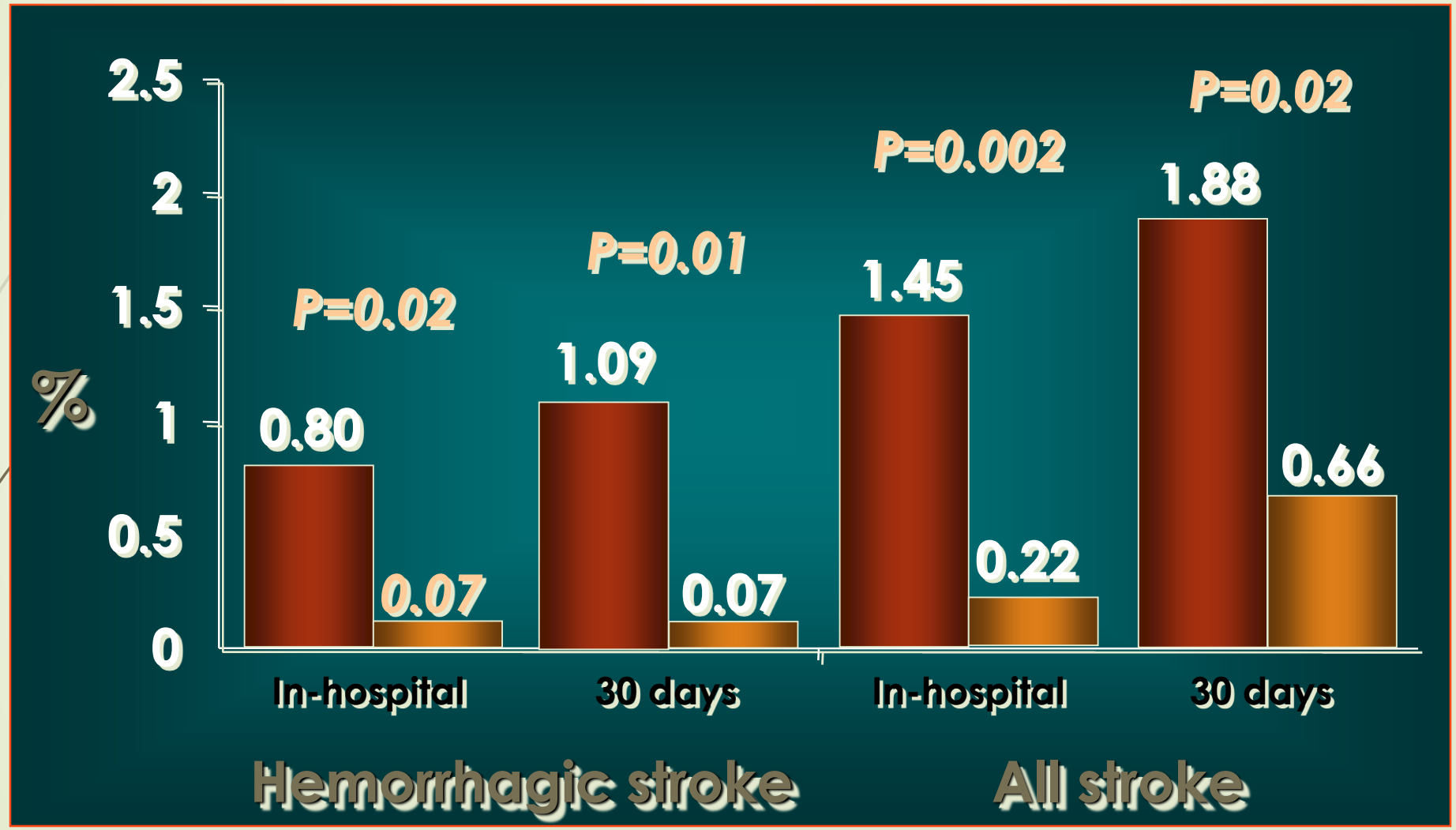
PCAT (11 studies, n=2,725): Mortality



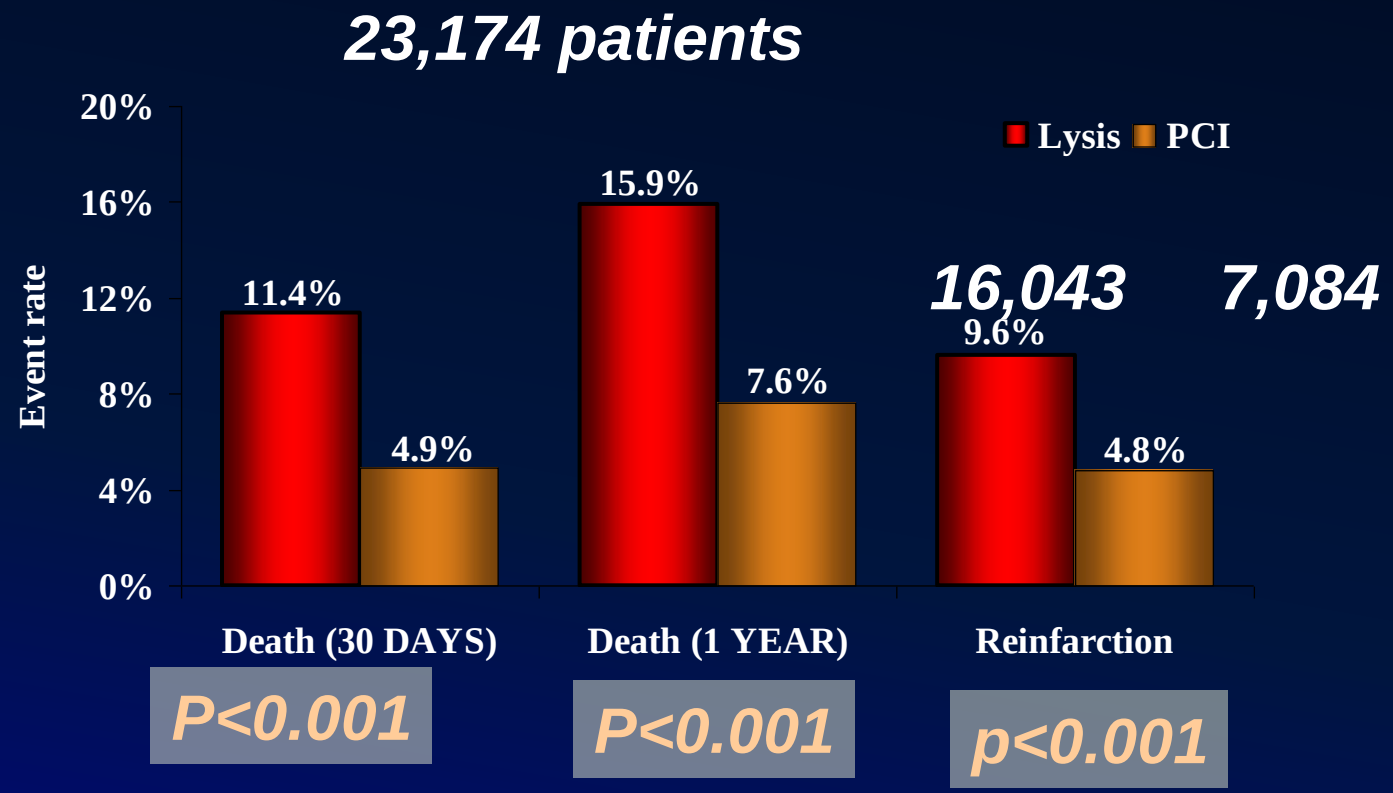
PCAT: Reinfarction



PCAT: Stroke


2.5
2
1.5
1
0.5
0
%
P=0.02
0.80
0.07
P=0.01
1.09
0.07
P=0.002
1.45
0.22
P=0.02
1.88
0.66
In-hospital
30 days
In-hospital
30 days
Hemorrhagic stroke
All stroke

Primary PCI versus Thrombolytics Swedish Heart Intensive Care Registry (RIKS-HIA)



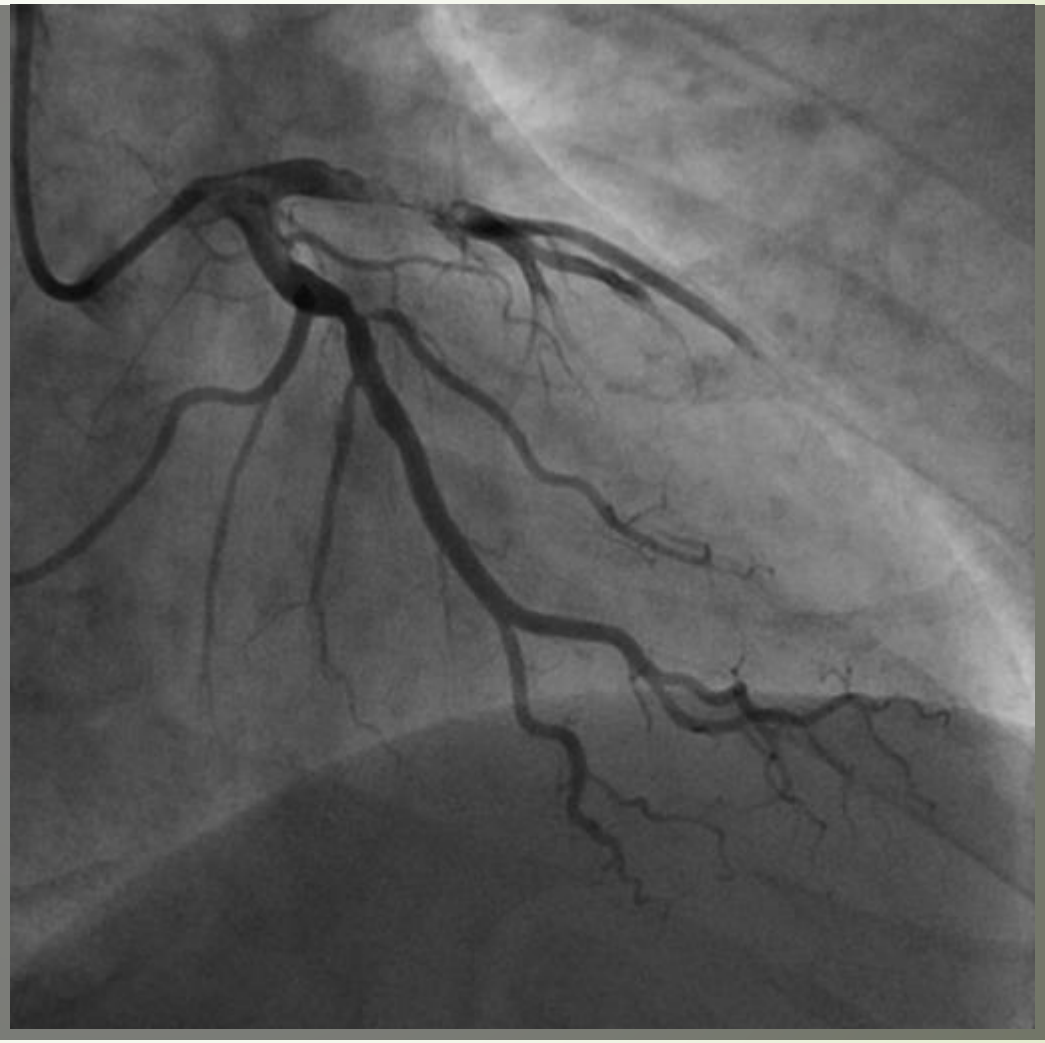
Stenestrand, U. et al. JAMA 2006;296:1749-1756.

Doses of antiplatelet co-therapies		
Aspirin	Starting dose of 150–300 mg orally (or 75–250 mg intravenously if oral ingestion is not possible), followed by a maintenance dose of 75–100 mg/day	
Clopidogrel	Loading dose of 300 mg orally, followed by a maintenance dose of 75 mg/day. In patients ≥75 years of age: loading dose of 75 mg, followed by a maintenance dose of 75 mg/day.	
Doses of anticoagulant co-therapies		
Enoxaparin	In patients <75 years of age: 30 mg i.v. bolus followed 15 min later by 1 mg/kg s.c. every 12 hours until revascularization or hospital discharge for a maximum of 8 days. The first two s.c. doses should not exceed 100 mg per injection. In patients ≥75 years of age: no i.v. bolus; start with first s.c. dose of 0.75 mg/kg with a maximum of 75 mg per injection for the first two s.c. doses. In patients with eGFR <30 mL/min/1.73 m^2, regardless of age, the s.c. doses are given once every 24 hours.	
UFH	60 IU/kg i.v. bolus with a maximum of 4000 IU followed by an i.v. infusion of 12 IU/kg with a maximum of 1000 IU/hour for 24–48 hours. Target aPTT: 50–70 s or 1.5 to 2.0 times that of control to be monitored at 3, 6, 12 and 24 hours.	
Fondaparinux (only with streptokinase)	2.5 mg i.v. bolus followed by a s.c. dose of 2.5 mg once daily up to 8 days or hospital discharge.	

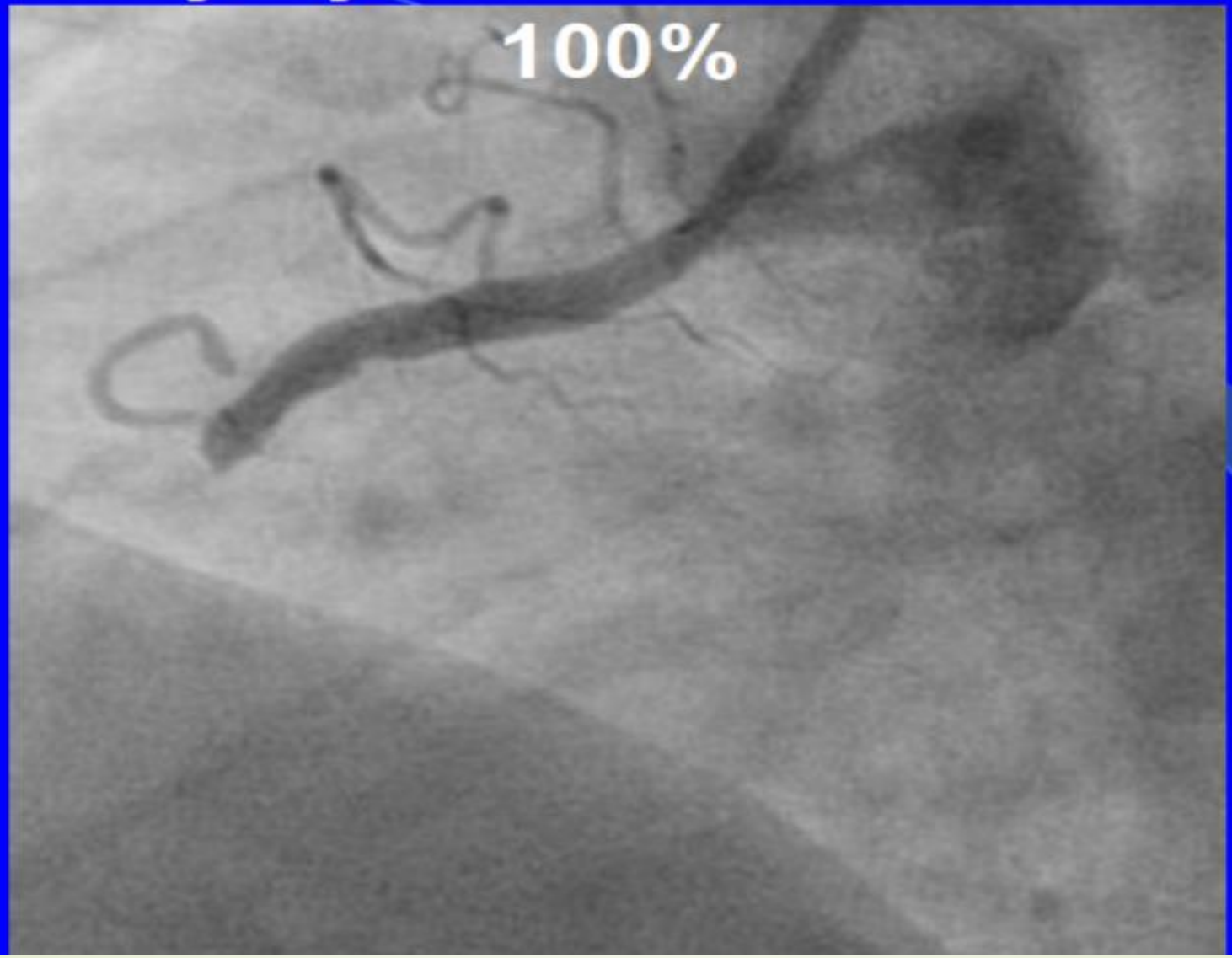
Primary PCI

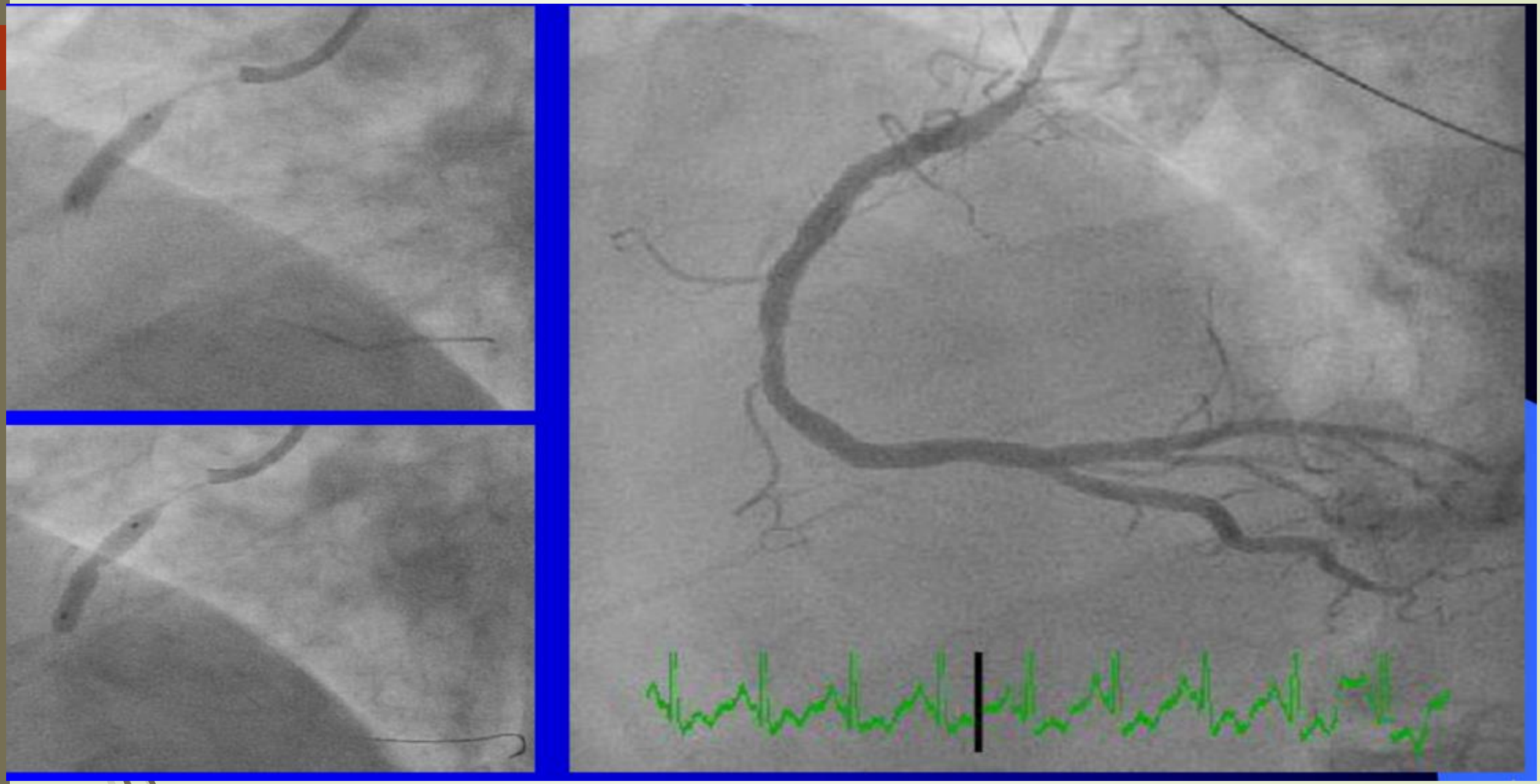
The Goal of Primary PCI in STEMI

- Restore flow in the culprit artery and optimize myocardial perfusion (by angio and EKG criteria)
- Preserve LV function.
- Reduce MI complications
- Reduce mortality.



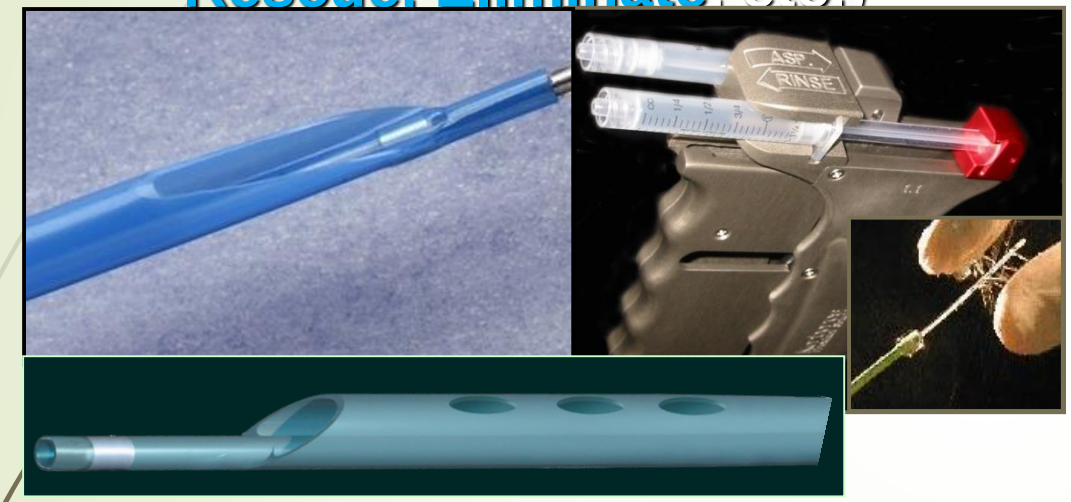
Left Coronary System has mild CAD. RCA is 100%





Mechanical Approaches to Thrombus

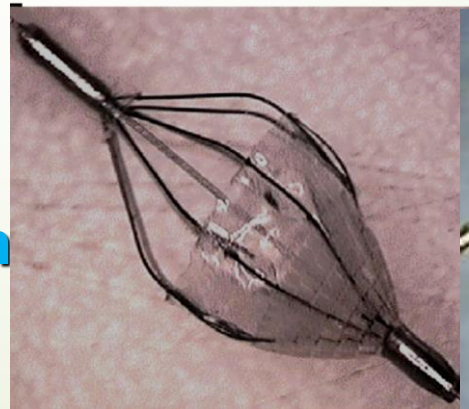
Thrombus aspiration
(Rinspirator, Pronto, Export, Rescue, Eliminate, etc.)



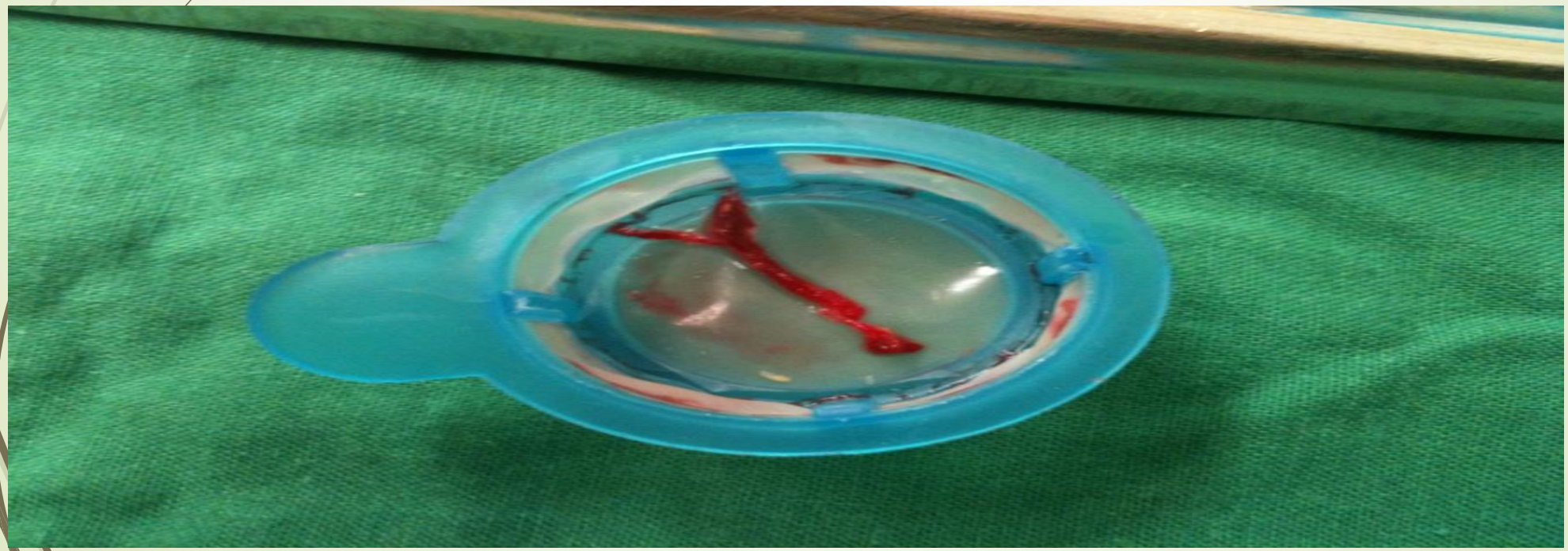
Thrombectomy
(AngioJet, X-Sizer)

Distal protection (GuardWire, FilterWire, AngioGuard, etc.)

FilterWire, An

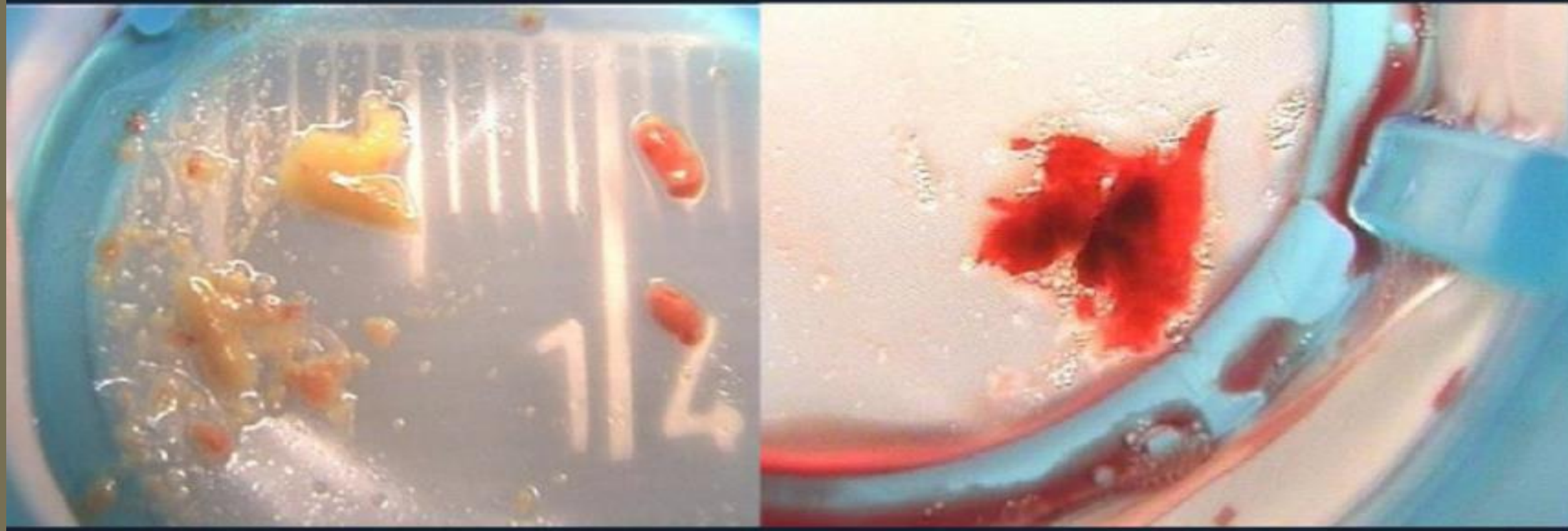


THROMBUS ASPIRATION

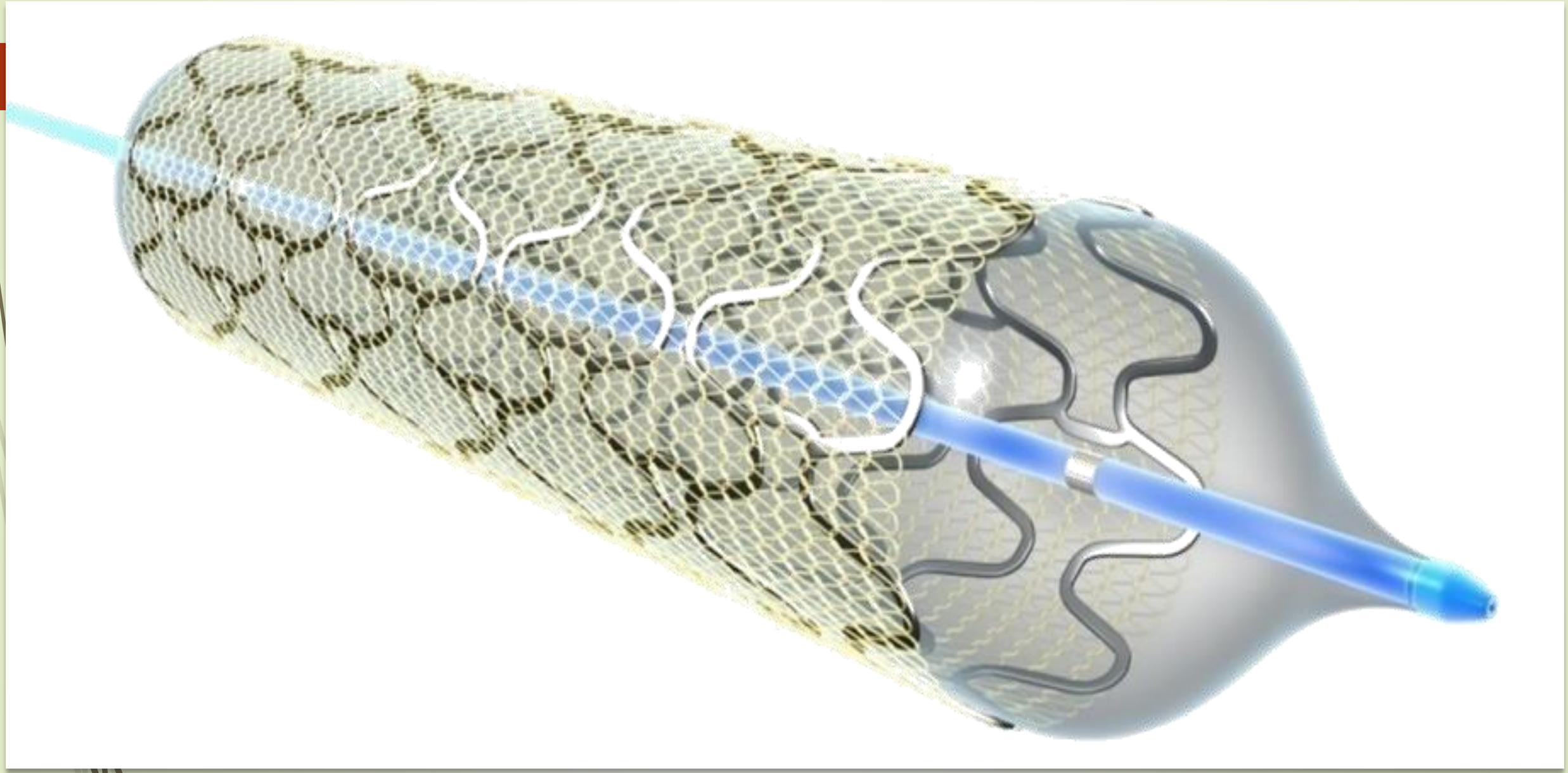


Aspiration Thrombectomy in AMI

Macroscopic embolic debris can be retrieved from >80% of cases



CHOICE OF STENT



Monitoring		
It is indicated that all STEMI patients have ECG monitoring for a minimum of 24 h.	I	C
Length of stay in the CCU		
It is indicated that patients with successful reperfusion therapy and an uncomplicated clinical course are kept in the CCU/ICCU for a minimum of 24 h whenever possible, after which they may be moved to a step-down monitored bed for an additional 24–48 h.	I	C
Hospital discharge		
Early discharge (within 48–72 h) should be considered appropriate in selected low-risk patients[c] if early rehabilitation and adequate follow-up are arranged.[257,259–262,264,265]	IIa	A


RECOGNIZE

247 PROGRAM

- STARTED AT 1393
- 30 VOLUNTEER HOSPITALS
- It means 24 h 7 days we should do primary PCI
- WE SHOULD NOT GIVE FIBRINOLYTIC TO ANY PATIENT
- IN FASA IT START AT 11/1394

- Different communities and regions have established programs that coordinate logistical services,
  - pre-hospital emergencies facilities
  - tele-medicine
  - inter-hospital coordination
  - decision making technologies

  to improve the management and prognosis of patients with STEMI.

- It need highly coordination between EMS
- Emergency department
- Cath lap team
- Everybody should be sensitive and give importance for the time

WHO ELIGIBLE TO DO PRIAMRY PCI

- Inteventional cardiologist who at least do 75 angioplasty per year at least
  11 of them should be primary PCI

Every hospital should at least 36 primary pci per year

Technician

- At least have 2 year experience in cath lab or CCU or ICU
- CAN DO advance CPR
- Can work with balloon PUMP

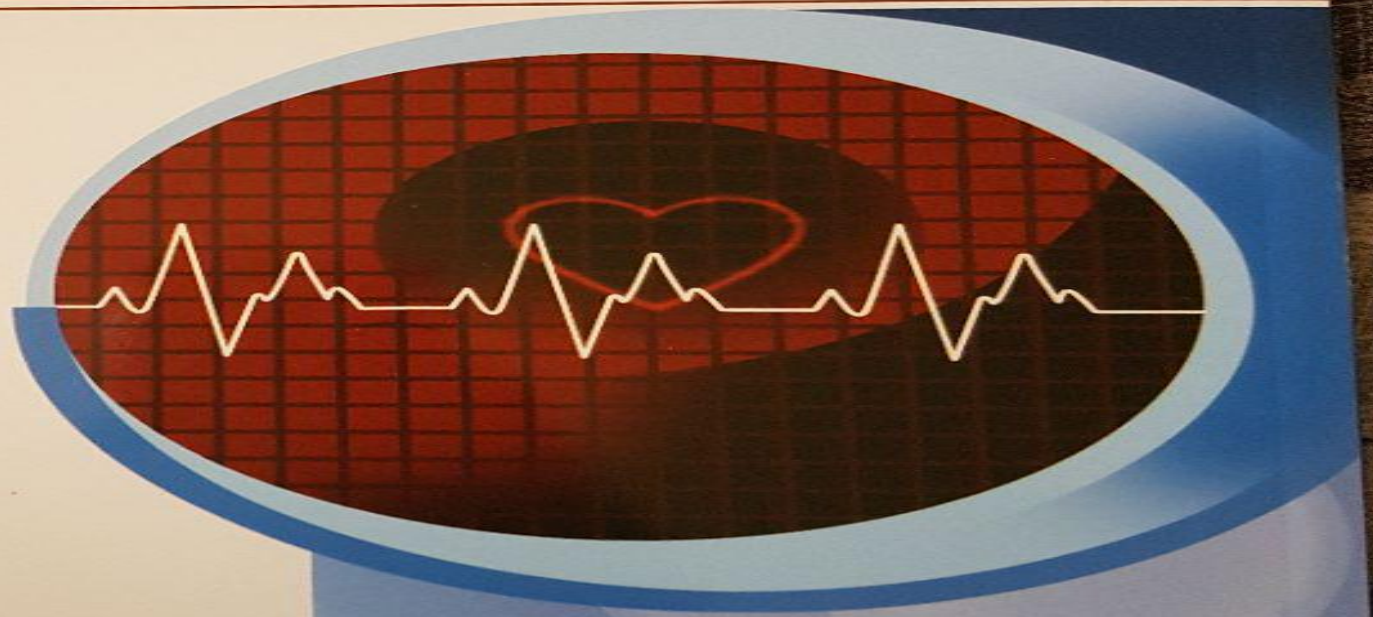
247 code

- Person who can activte 247 code
- Interventional cardiologist
- Cardiologist
- Emergency specialist
- Cardiology resident
- internist

وزارت بهداشت، درمان و آموزش پزشکی

شناسنامه استاندارد خدمات

مدیریت درمان سکته حاد قلبی



کمیته علمی مدیریت درمان سکته حاد قلبی
معاونت درمان
مهر۱۳۹۵

in hospital management

- The patient with chest pain should take an ECG in less than 10 min
- The ECG should seen and interpreat by Emergency specialist in less than 2 min
- If the diagnosis is dedicated the Emergency specialist Should inform the interventional cardiologist and the supervisor
- The physician should tell the patient family about the diagnosis and how it is serious and what is the treatment options
- The supervisor should call the cath lap team
- The cath lap team should be in the cath lap in less than 30 min

- At this team the patient should be given
- IV line should be taken from the left arm because we use the right radial as the main access
- 300mg of ASA
- 600 mg OF PLAVIX
- Analgesic like morphine 4mg every 3 -5 min
- O2 if O2sat less than 90%
- Pearl TNG Every 5 min
- Iv beta blocker if the Patient pressure is high

- The patient should CBR
- DC Shock should be attach to the patient until the patient lay in the cath lap bed
- If the patient have is intubated or have respiratory distress the anesthesiologist should be present during the hole procedure and until the patient referred to CCU and get stabilized

- The cath lap nurse should informed CCU about the patient situation to be prepared
- When the patient transferred to CCU DC shock should be attached to him/her
- Do not neglected even small details because you can missed the patient easily

FASA experience

- Primary PCI IN FASA Started before 247 program since 92
- It began systematically at 11/ 94 until now
- We do approximately 950 primary PCI
- We cover all the cities of east of FARS
- We still have a lot of challenges

- We still have a big matter with time

- Pain to help 3.5 HOUR = 210 MINUTES

In 1395

- Door to balloon 174
- DOOR TO EKG 65
- STEMI TO Decision 29 m
- Decition to code 42 minutes
- Code to cathlab 26 minutes

in 1399

- Door to balloon 66

referred patient

for patient referred from other cities because it takes along time than usual to send the patient to our hospital it is reasonable to give the patient a fibrinolytic drug and then send them for angioplasty this is called phamacoinvasive strategy

conclusion

- We need to alert and educate people and personnel about the importance of time in acute MI
- WE SHUOLD Support EMS system
- Telemonitoring
- Every body should learn his/her family

- Thank you for your attention and time