

No reflow Phenomena

Prof. Hesham Boshra Mahmoud

No reflow phenomenon

- Diminished and impaired myocardial reperfusion despite successful opening and patency of infarct related artery (IRA) in STEMI following PCI.
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No reflow phenomenon

- It may set in and manifest soon **after ballooning or stenting** during PCI in the cath lab (or ICCU).
 - No reflow is a **multifactorial phenomenon**.
1. **Micro-embolization**
 2. **ischemia**
 3. **reperfusion injuries** .
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- Recognition of no reflow is essential if it occurs in the catheterization laboratory (cath lab).
 - Ideally the patient should not leave the cath lab unless no reflow has been satisfactorily managed.
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Clinically no reflow may present with:

- The recurrence of chest pain
 - Cardiogenic shock with hypotension
 - Malignant arrhythmias
 - Acute dyspnea due to pulmonary edema secondary to heart failure.
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Angiographic no reflow after PCI is associated with reduced myocardial salvage, larger infarct size and increased long term 5 year mortality.



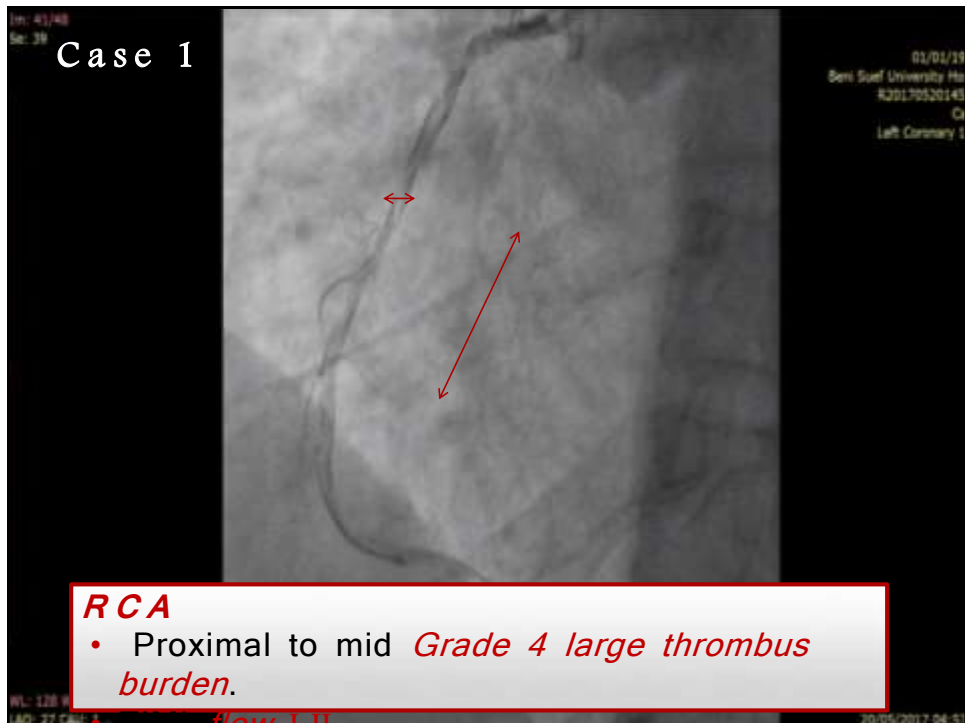
**Treating and Preventing No Reflow in
the Cardiac Catheterization Laboratory**

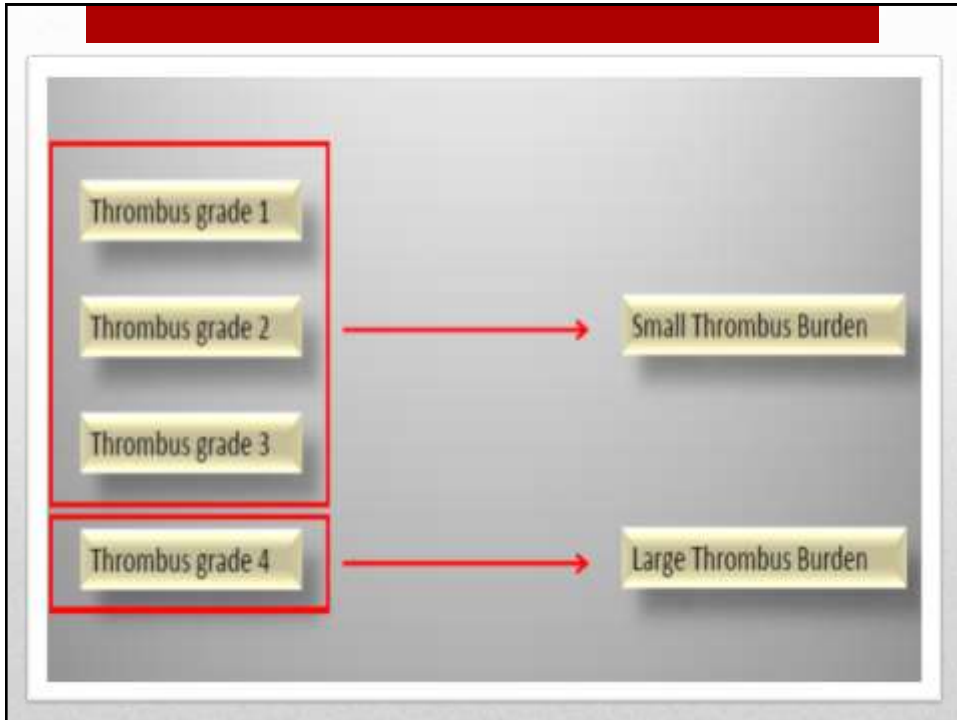
No one clear definite approach

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- Two different scenarios (cases)
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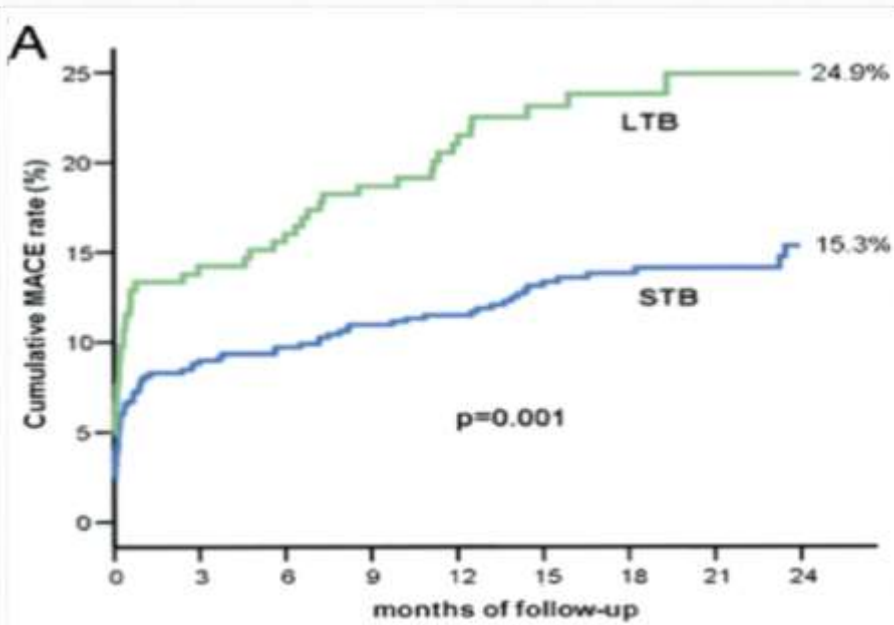
Thrombus Grade Classification

Thrombus Grade	Definition
Thrombus grade 0 (G0)	No angiographic characteristics of thrombus are present
Thrombus grade 1 (G1)	Possible thrombus is present, with such angiography characteristics as <ul style="list-style-type: none"> - Reduced contrast density, haziness, irregular lesion contour, - Or a smooth convex meniscus at the site of total occlusion suggestive but not diagnostic of thrombus; in thrombus
Thrombus grade 2 (G2)	there is definite thrombus, with greatest dimensions $< 1/2$ the vessel diameter
Thrombus grade 3 (G3)	there is definite thrombus but with greatest linear dimension $> 1/2$ but < 2 vessel diameters
Thrombus grade 4 (G4)	there is definite thrombus with greatest linear dimension > 2 vessel diameters
Thrombus grade 5 (G5)	There is total occlusion (unable to assess thrombus burden due to total vessel occlusion).





Thrombus burden : clinical implications



2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation

The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC)

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- Routine use of thrombus aspiration is not recommended.

(class III –LOE A)

- Routine use of deferred stenting is not recommended.

(class III –LOE B)

Procedural aspects of the primary percutaneous coronary intervention strategy

Recommendations	Class ^a	Level ^b
IRA strategy		
Primary PCI of the IRA is indicated. ^{ESC/ACC/AHA/ILCOR/ILM}	I	A
New coronary angiography with PCI if indicated is recommended in patients with symptoms or signs of recurrent or remaining ischaemia after primary PCI.	II	C
IRA technique		
Stenting is recommended (over balloon angioplasty) for primary PCI. ^{ACC/AHA/ESC/ILCOR/ILM}	I	A
Stenting with new-generation DES is recommended over BMS for primary PCI. ^{ACC/AHA/ESC/ILCOR/ILM}	I	A
Radial access is recommended over femoral access if performed by an experienced radial operator. ^{ACC/AHA/ESC}	I	A
Routine use of thrombus aspiration is not recommended. ^{ESC/ACC}	III	A
Routine use of deferred stenting is not recommended. ^{ESC/ACC}	III	B

Periprocedural and post-procedural antithrombotic therapy^a in patients undergoing primary percutaneous coronary intervention

Recommendations	Class ^b	Level ^c
Antiplatelet therapy		
A potent P2Y ₁₂ inhibitor (prasugrel or ticagrelor), or clopidogrel if these are not available or are contraindicated, is recommended before (or at latest at the time of) PCI and maintained over 12 months, unless there are contraindications such as excessive risk of bleeding. ^{196,197}	I	A
Aspirin (oral or i.v. if unable to swallow) is recommended as soon as possible for all patients without contraindications. ^{192,193}	I	B
GP IIb/IIIa inhibitors should be considered for bailout if there is evidence of no-reflow or a thrombotic complication.	IIa	C
Cangrelor may be considered in patients who have not received P2Y ₁₂ receptor inhibitors. ^{198–199}	IIIb	A

- GP IIb/IIIa inhibitors should be considered for bailout if there is evidence of no-reflow or a thrombotic complication.
(class IIa –LOE C)

Pharmacological treatment of noreflow

- Calcium channel blockers
- Epinephrine
- Glycoprotein IIB/IIIA inhibitors

Calcium channel blockers

- Verapamil, diltiazem and nifedipine have been studied for their beneficial effects in no reflow.
 - Thus all three calcium channel blockers have produced good results in the treatment of no reflow.
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Epinephrine!!

Epinephrine has been administered for the treatment of no reflow, when all other drugs have failed and the patient remains critically unstable.

Glycoprotein IIB/IIIA inhibitors

The intracoronary or intravenous abciximab did not result in any difference in the combined end point of death, reinfarction or congestive heart failure.

Since IC abciximab bolus is safe, it may be preferred if abciximab is indicated

. ESC guidelines (2017) recommends use of GpIIb/IIIa as a bail out procedure in no reflow patients.

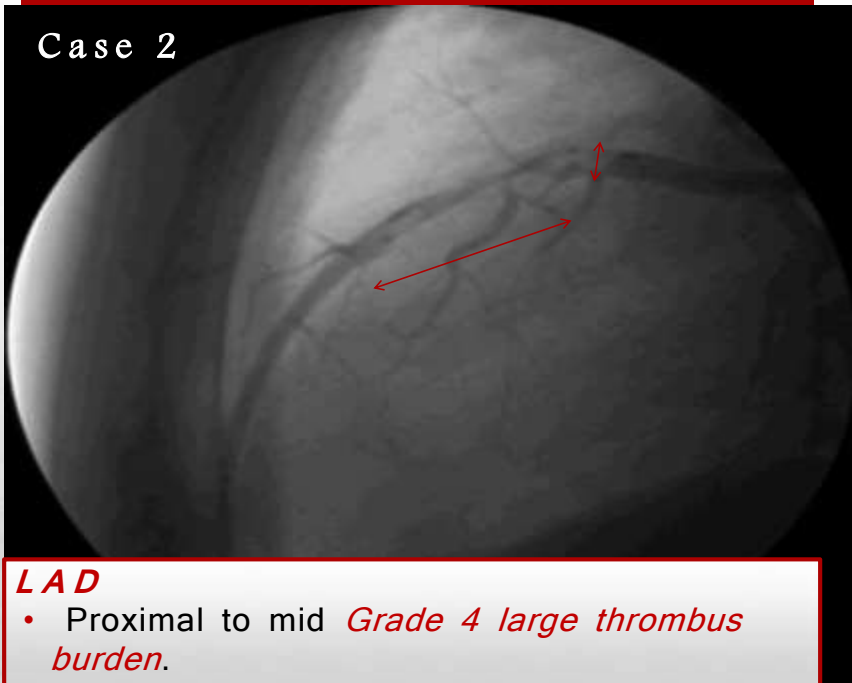
Pharmacological treatment of noreflow

- **Adenosine**
 - **Nicorandil**
 - **Sodium nitroprusside**
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Conclusion of case 1

- Manual aspiration thrombectomy or deferred stenting may have a role in patients with large thrombus burden (*not following the guidelines*).
 - No-reflow may prove resistant to pharmacological therapy in 5–10% cases, with adverse short term and long term outcomes.
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Case 2



LAD

- Proximal to mid *Grade 4 large thrombus burden*.

• TIMI flow II-III

- Routine use of thrombus aspiration is not recommended.

(class III –LOE A)

- Routine use of deferred stenting is not recommended.

(class III –LOE B)

Procedural aspects of the primary percutaneous coronary intervention strategy

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IRA strategy		
Primary PCI of the IRA is indicated. ^{176,178,180}	I	A
New coronary angiography with PCI if indicated is recommended in patients with symptoms or signs of recurrent or remaining ischemia after primary PCI.	I	C
IRA technique		
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Stenting with new-generation DES is recommended over BMS for primary PCI. ^{186,187,189}	I	A
Radial access is recommended over femoral access if performed by an experienced radial operator. ^{143-145,188}	I	A
Routine use of thrombus aspiration is not recommended. ^{177,179}	III	A
Routine use of deferred stenting is not recommended. ¹⁷³⁻¹⁷⁵	III	B

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Aspirin (oral or i.v. if unable to swallow) is recommended as soon as possible for all patients without contraindications. ^{183,188}	I	B
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Cangrelor may be considered in patients who have not received P2Y ₁₂ receptor inhibitors. ^{185,189}	IIIb	A

- GP IIb/IIIa inhibitors should be considered for **bailout** if there is evidence of no-reflow or a thrombotic complication.

(class IIa –LOE C)

**Safety and efficacy of immediate vs. deferred
stenting in stable patients with acute coronary
syndromes and intracoronary thrombi**
Thesis

**Submitted for partial fulfillment of M.D degree in
Cardiovascular Medicine**

By

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• Study design:

- The study included 53 patients with TIMI flow II or III (obtained either spontaneously or after manual aspiration and/or balloon dilatation of an occluded coronary artery) subjected to either immediate or deferred stenting according to discretion of the operator;
 - Immediate stenting (**IS**) group: included thirty patients with the stent implanted immediately in presence of thrombotic burden ,
 - Deferred stenting (**DS**) group: twenty three patients with the stent implanted after period of intense antithrombotic therapy.
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- **Results:**

- Stenting was performed less frequently in the delayed stenting group than in the immediate stenting group, because of the angiographic improvement in lesion characteristics (100% vs. 70%, $P=0.001$). Specially male, smokers, less than 40y
 - Stent diameter was more and stent length was less in delayed stenting group, however, this is not statistically significant
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- The thrombus-related angiographic events (no or slow flow or distal embolization) was observed more in the IS group in comparison with the DS group; (33 % vs. 13%, $P= 0.089$).
 - Patients who develops slow or no flow had certain angiographic features;
 - i) initial higher thrombus burden
 - ii) there was initial abrupt cutoff pattern without taper before the occlusion
 - iii) Less TIMI II flow before stent implantation .
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Conclusion of case 2

In high-risk STEMI patients undergoing PCI with LTB, *deferred stenting* could be a helpful rescue technique .

Take Home Message

prevention is always better than treatment.

Take Home Message

There is *no one clear definite approach*
for dealing with high-risk STEMI patients
undergoing PCI with LTB.

Thank You
