# A Case of Stent Thrombosis

Dept Of Cardiology

# Case History

- 55yr female
- Chest pain [Retrosternal, compressing associated with sweating] for 6hrs

- Known Diabetic on oral drugs
- Old IWMI. s/p PCI to RCA in Jan 2017 [DES]
- Discontinued antiplatelets and statins

# Examination

- Conscious, oriented
- PR – 60/mt; BP – 160/90
- CVS – no added sounds or murmurs

Name : 15193
Age :
Height : Years

09-06-2005 08:36:14 AM

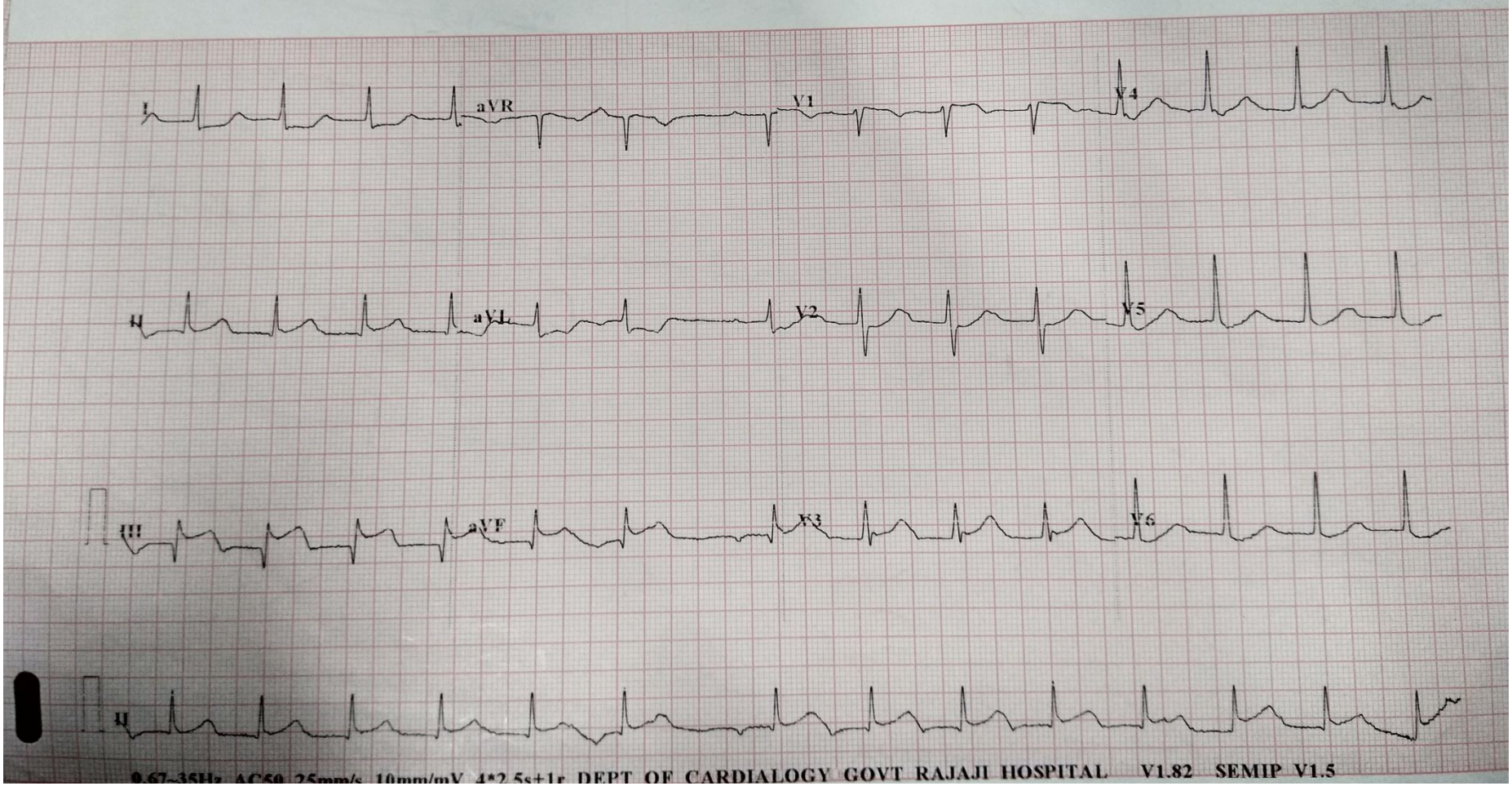
ID : 15197
Name :
Age : Years Gender : Male
Height : cm Weight : kg

| | | |
|---|---|---|
| HR | : 88 | BPM |
| P Dur | : 0 | ms |
| PR int | : 0 | ms |
| QRS Dur | : 103 | ms |
| QT/QTC int | : 408/496 | ms |
| RV5+SV1 amp | : 1.717 | mV |
| RV6/SV2 amp | : 1.101/0.718 | mV |

Report Confirmed By:

30/01/18
சின்னம்மாள் 55/F

30/1/18 at 1:20pm




0.67-35Hz AC50 25mm/s 10mm/mV 4*2.5s+1r DEPT OF CARDIALOGY GOVT RAJAJI HOSPITAL V1.82 SEMIP V1.5

# ECHO

- Hypokinesia of Inferior wall and inferior septum
- Ejection Fraction: 51%

# Provisional Diagnosis

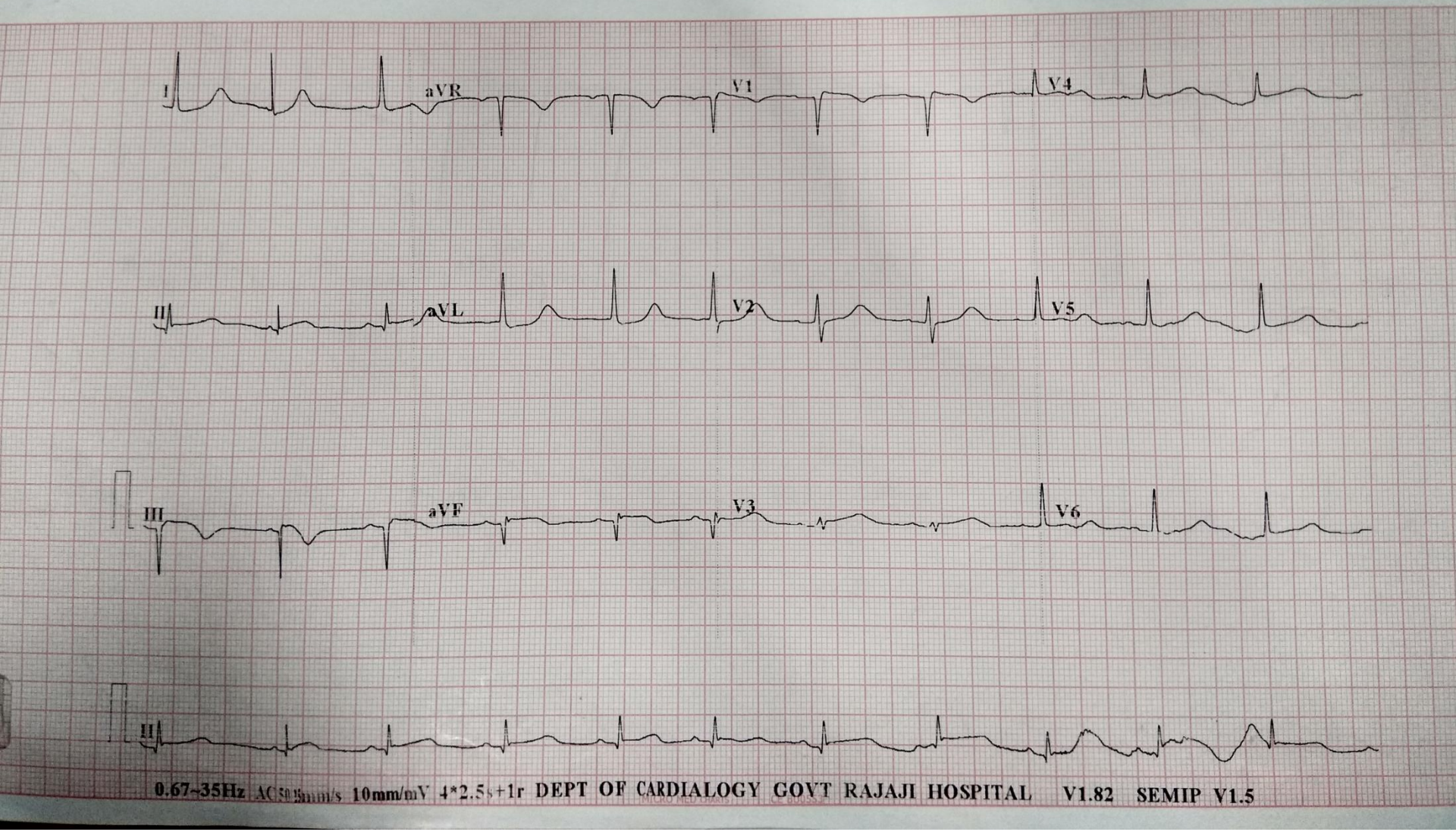
- CAD/STEMI/IWMI/TW-6hrs
- Old IWMI/ s/p PCI to RCA Jan 2017
- ? Stent Thrombosis
- DM
- Killip I/ TIMI 2/14

# Treatment

- Loading Dose of Aspirin 300mg, Clopidogrel 300mg and Atorvastatin 80mg
- Streptokinase 1.5MU infusion [Patient developed allergic reactions, treated with antihistamines]
- Heparin after 6hrs

RV5+SV1 amp : 1.585 mV
RV6/SV2 amp : 0.784/0.367 mV

Report Confirmed by:

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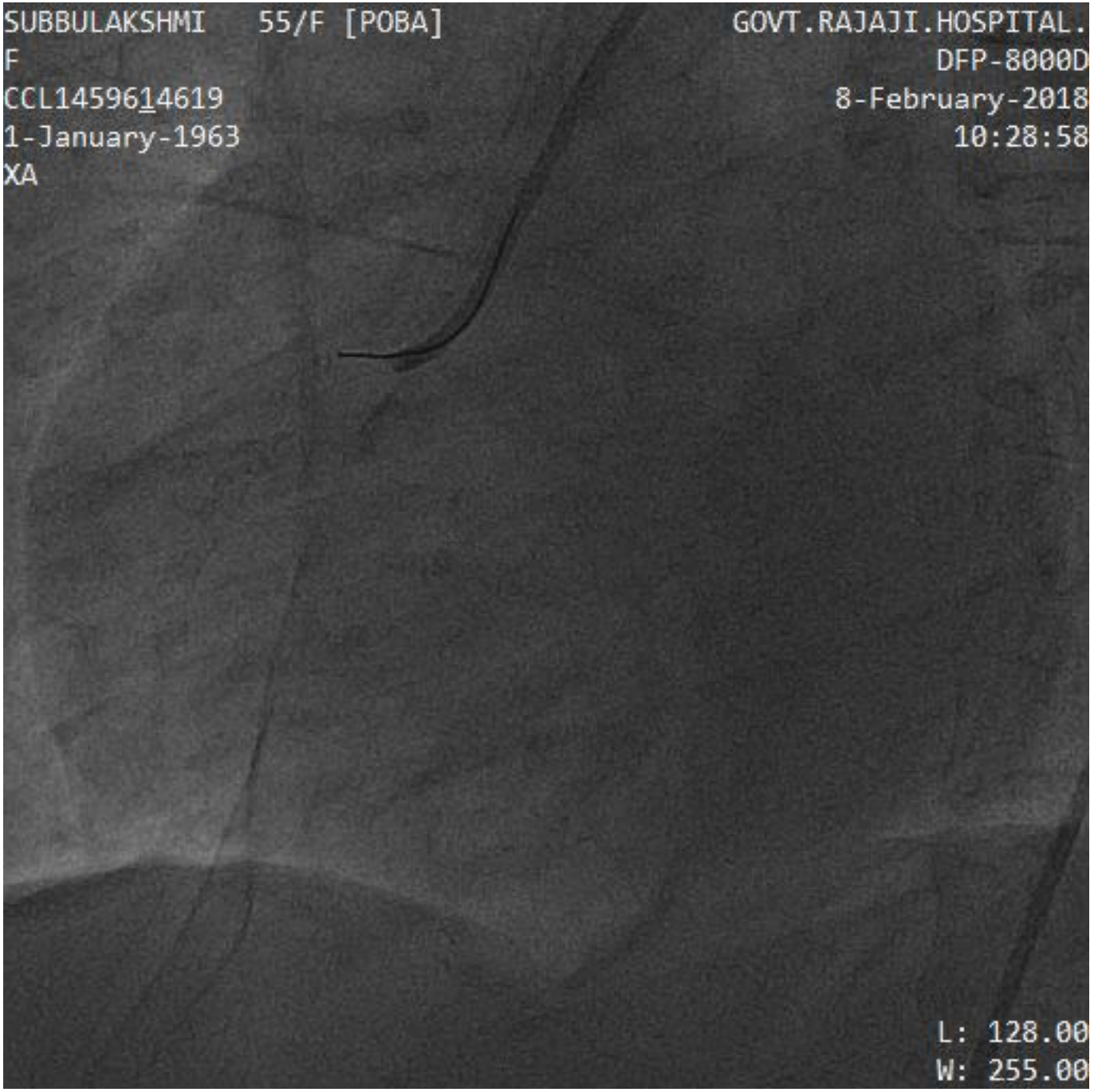
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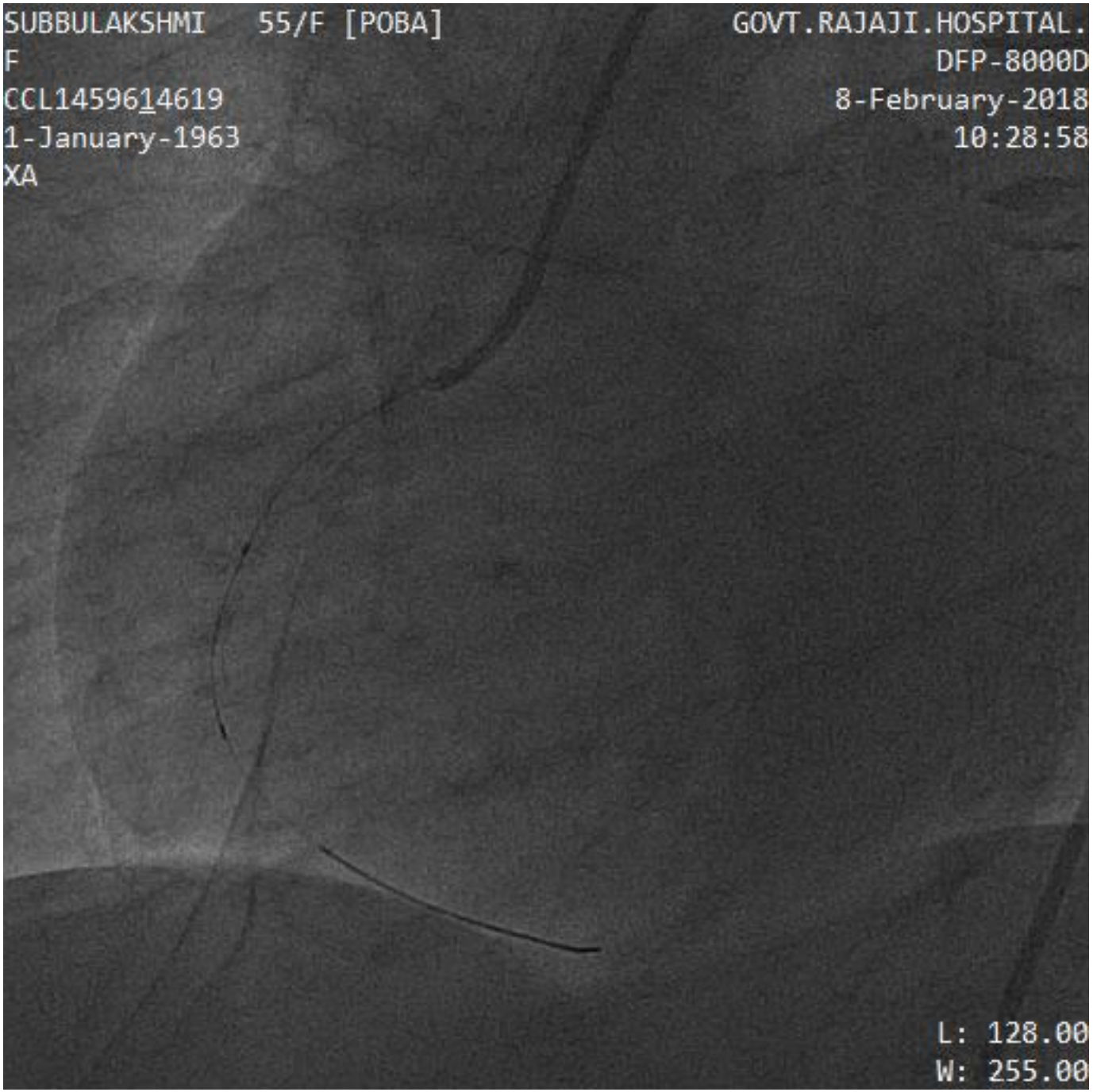
CCL145961 4619
1-January-1963
XA
GOVT.RAJAJI.HOSPITAL.
DFP-8000D
8-February-2018
10:28:58
L: 128.00
W: 255.00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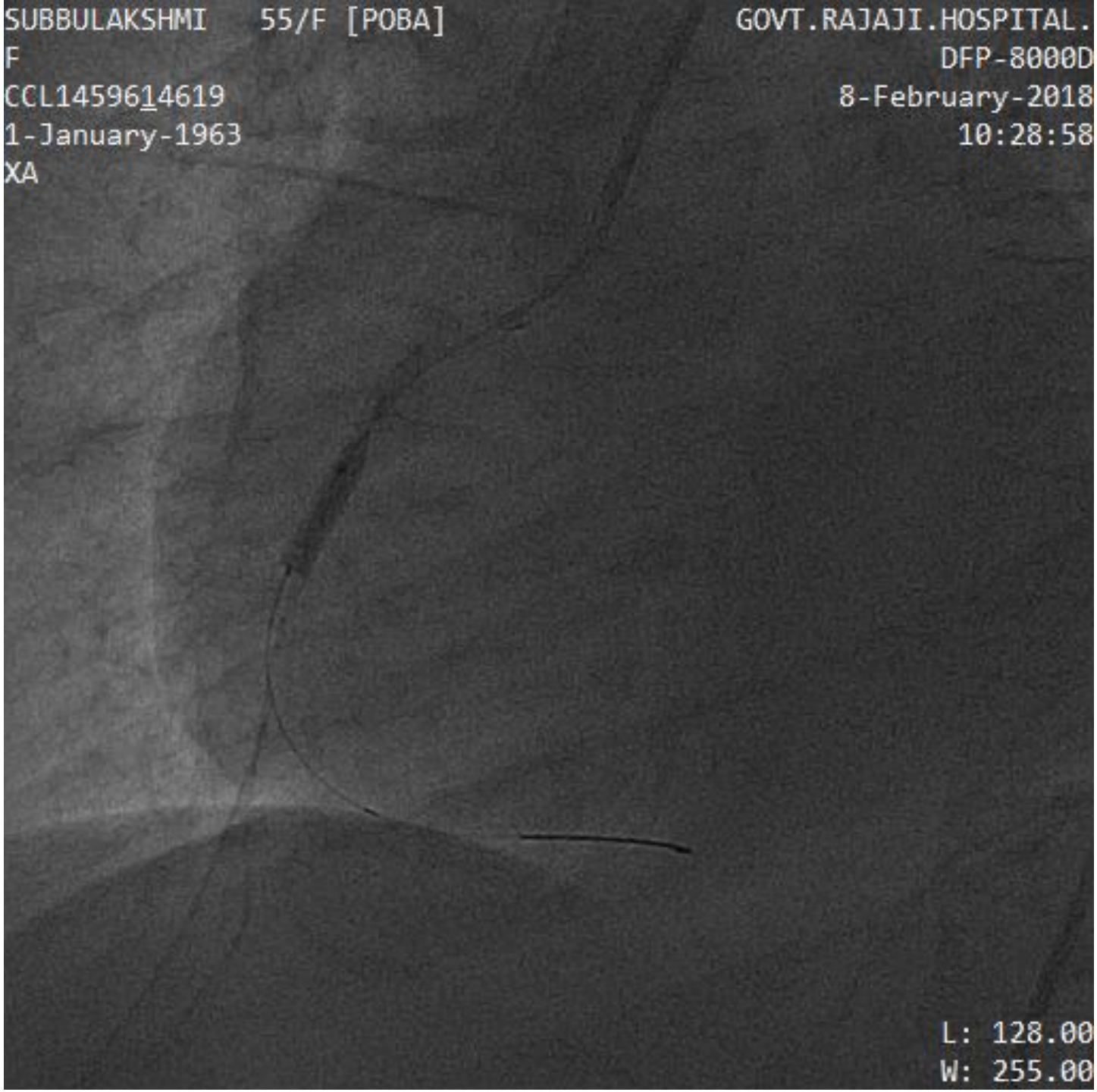
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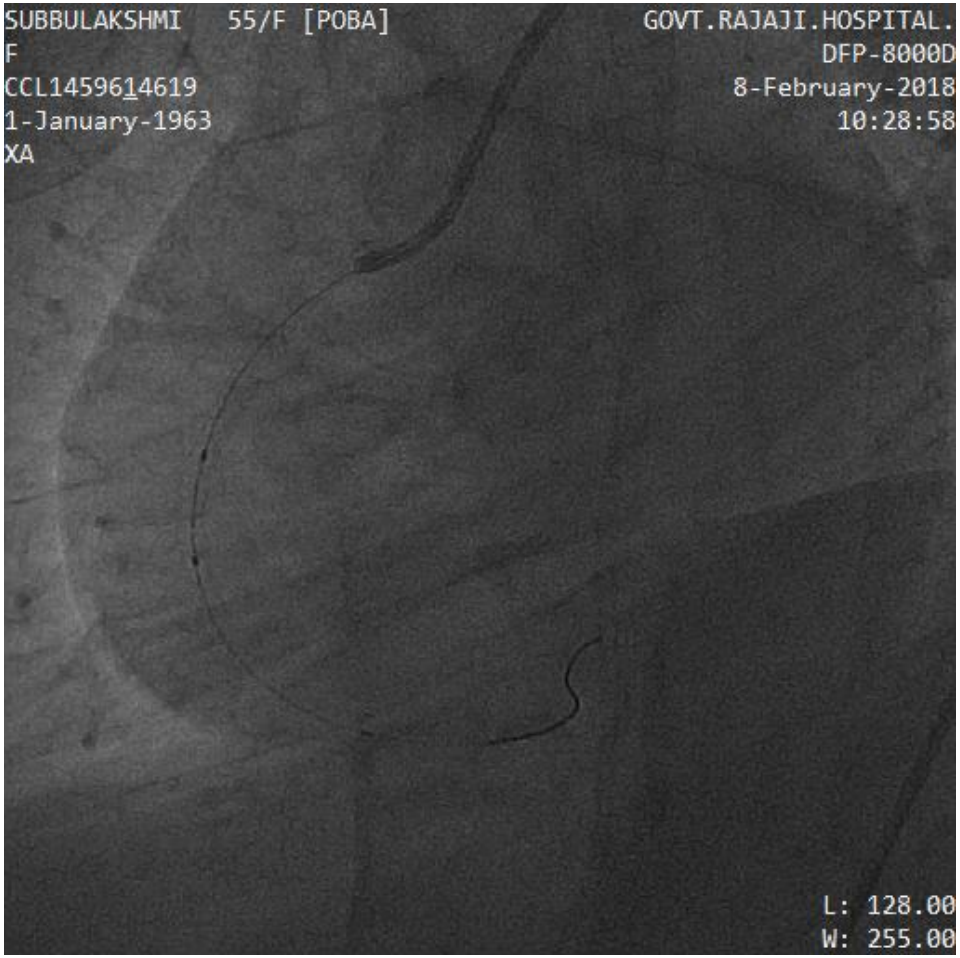
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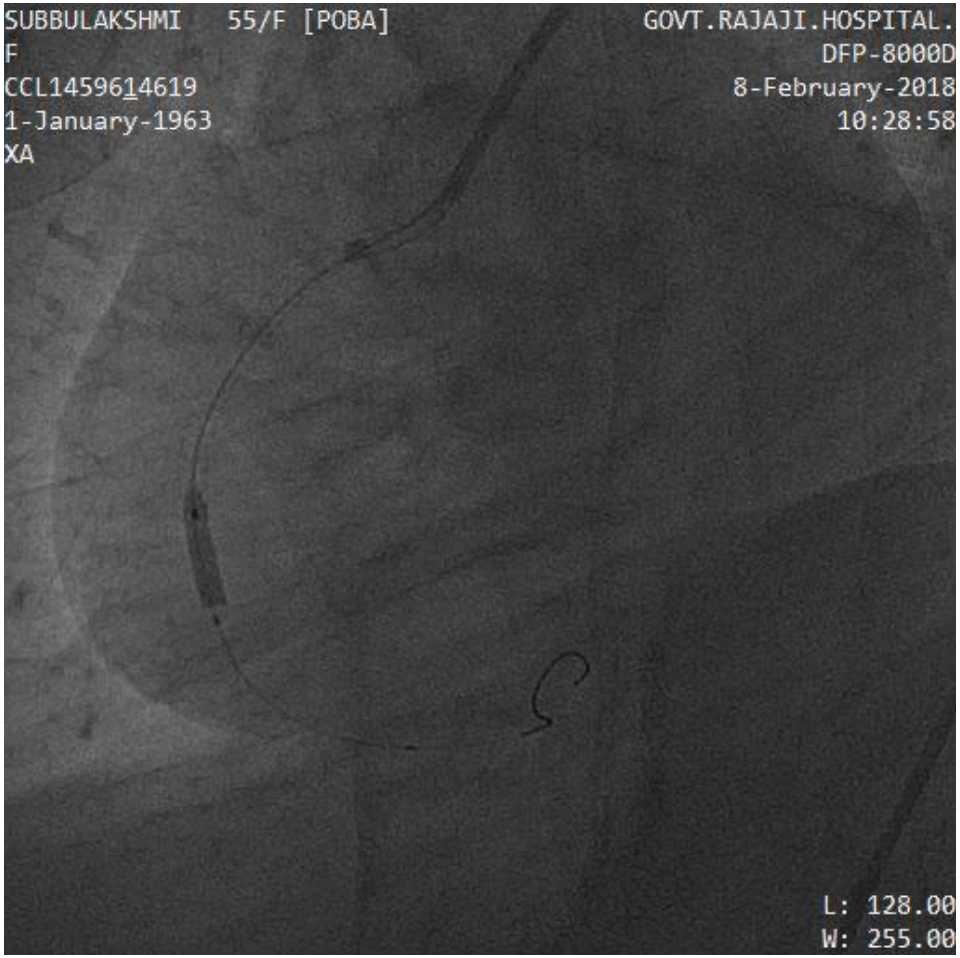
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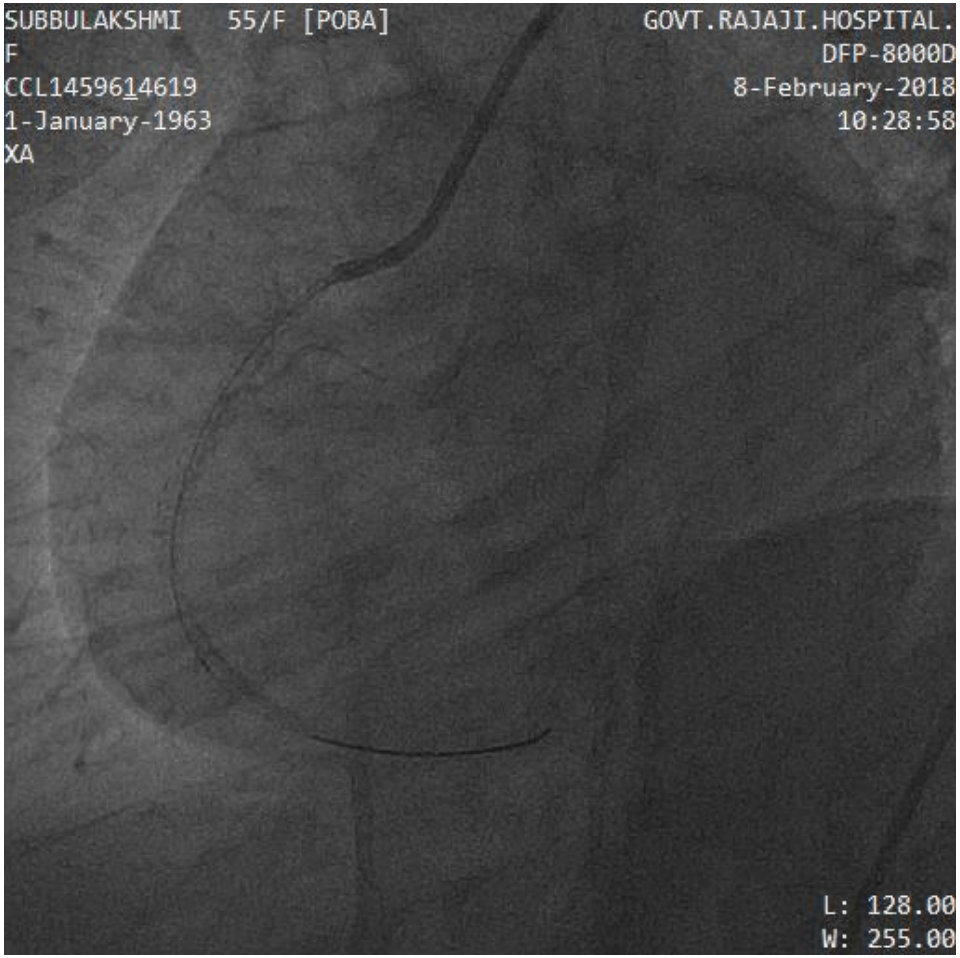
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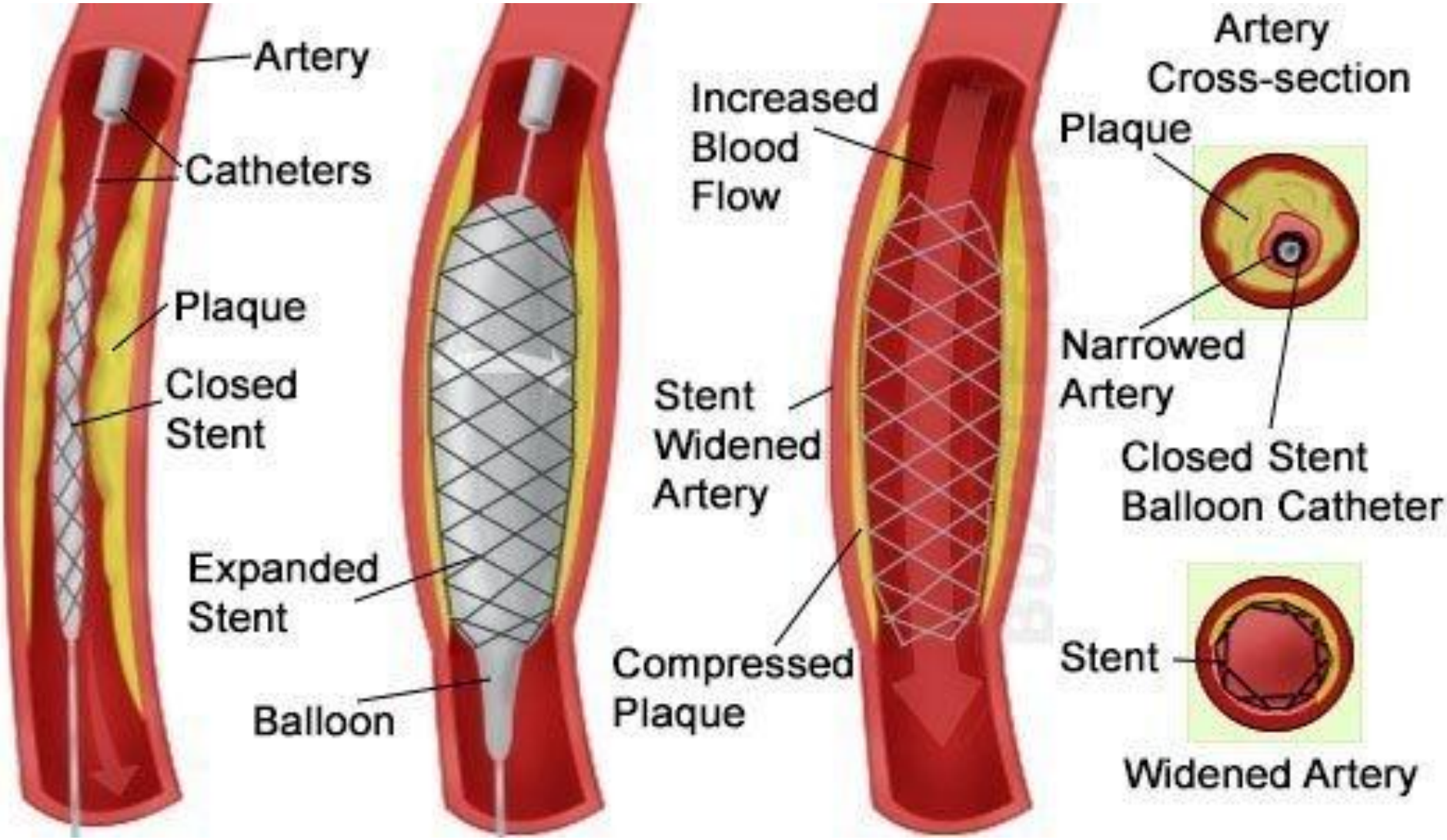
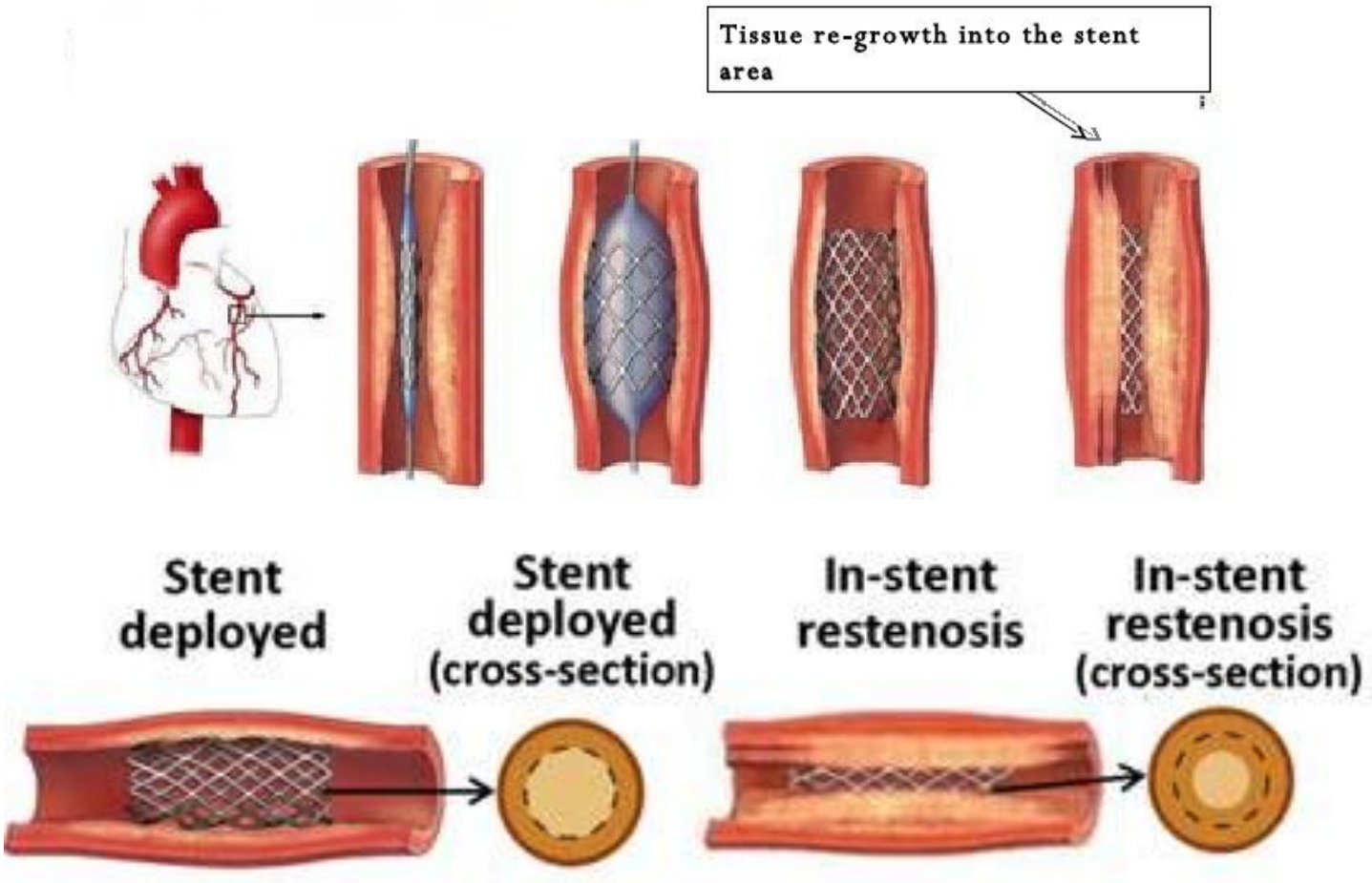
# The need for a Coronary Stent



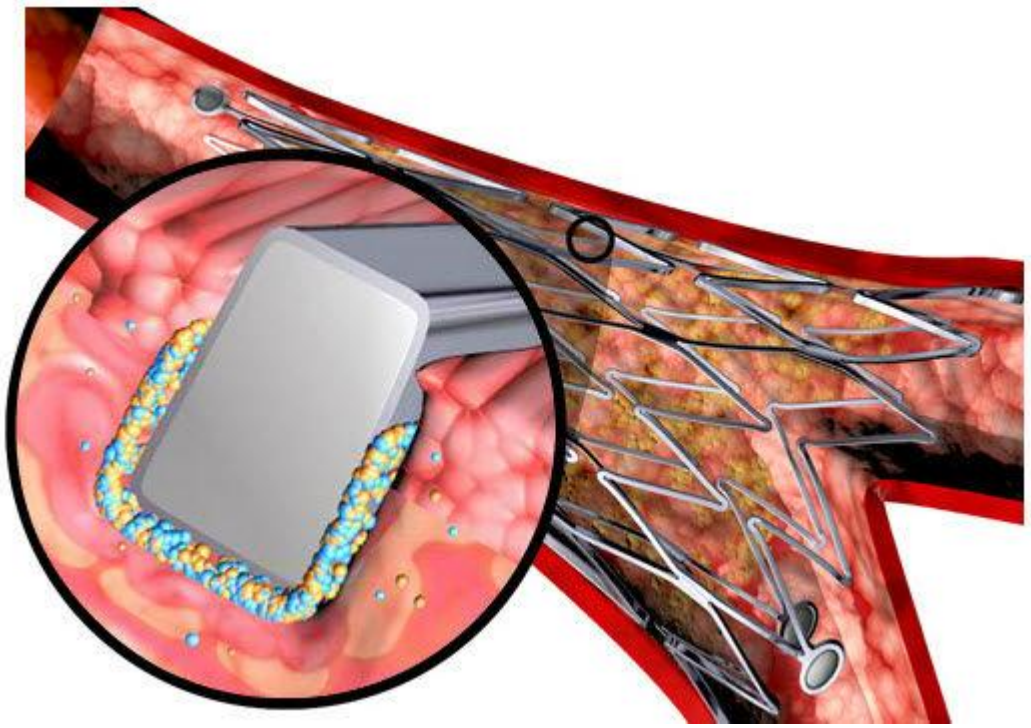
# Bare Metal Stents [BMS]

Restenosis and
Neo-Intimal Hyperplasia

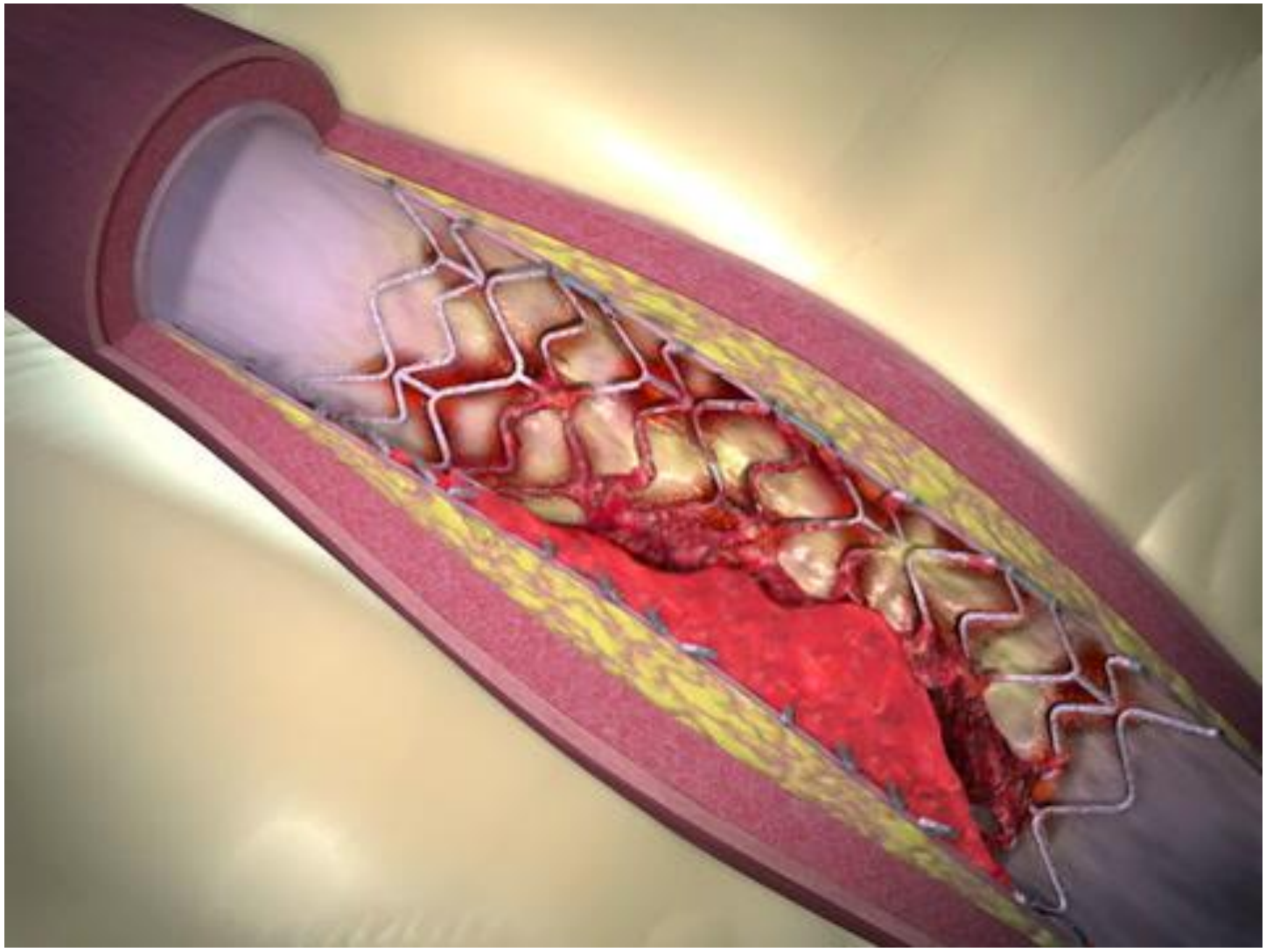


# Drug Eluting Stents [DES]

- Sirolimus Eluting Stents
- Paclitaxel Eluting Stents

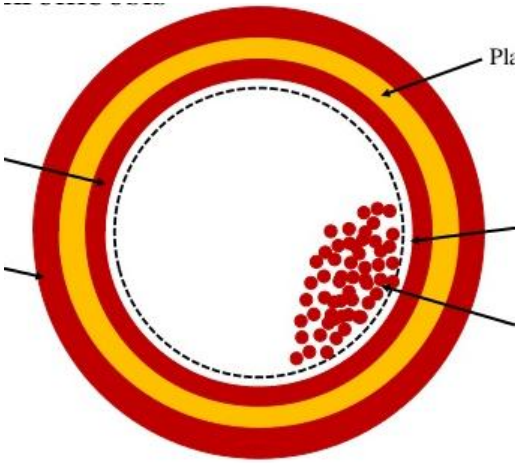


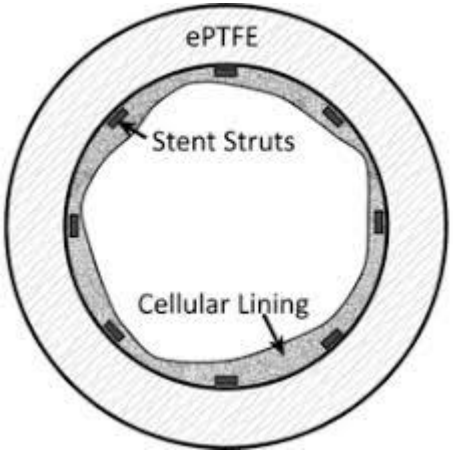
# Stent Thrombosis



# Stent Thrombosis

- Both BMS and DES induce platelet adhesion, activation and thrombus formation





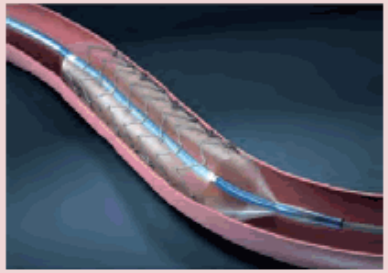

- Gradually stents are covered with endothelial cells

- BMS are rapidly enothelialised – 4 weeks of Dual Antiplatelet therapy [DAPT]

- DES are slowly endothelialised – 12mths of DAPT
  - Cytotoxic effect of the drugs
  - Polymers used causes inflammation

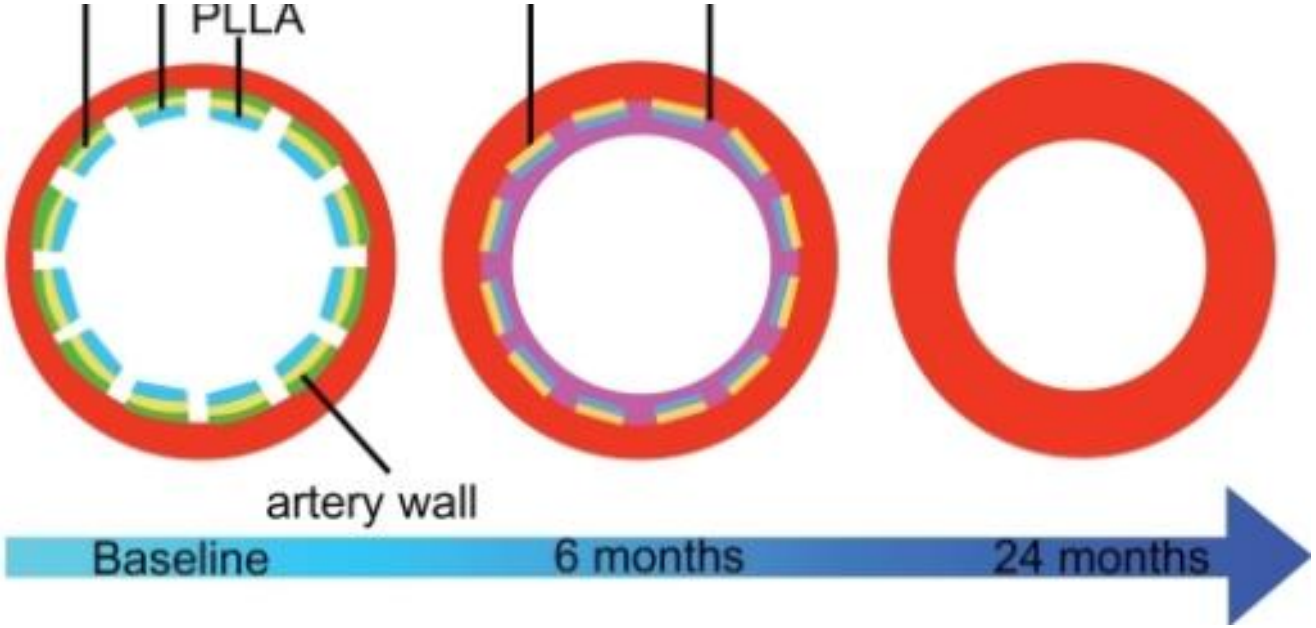
# Second Generation DES

- Everolimus
- Zotarolimus

| Generation | Appearance | Characteristics |
|---|---|---|
| 1st generation |  | – Reduction in in-stent stenosis and repeat revascularization compared to BMS<br>– Increased inflammation, fibrin deposition and very late ST |
| 2nd generation |   | – Decreased stent strut thickness compared to G1-DES<br>– Decreased inflammation, fibrin deposition and very late ST |

# Biovascular Stents

- Biodegradable material
- Critical period of luminal narrrowing = 3mths
- Gradually absorbed after the criitical period



| TABLE 1. ARC CLASSIFICATION OF ST INCLUDING MODIFIED POSSIBLE CRITERIA | |
|---|---|
| **Classification** | **Criteria** |
| Definite | Acute coronary syndrome with angiographic or pathologic confirmation of thrombus |
| Probable | Unexplained death within 30 d or MI involving target vessel territory without angiographic confirmation |
| Possible | Any unexplained death beyond 30 d |
| **Timing*** | |
| Early | 0–30 d<br>• 0–24 h = acute<br>• > 24 h–30 d = subacute |
| Late | 31 d–1 y |
| Very late | > 1 y |
| **Timing begins after completion of the procedure. Intraprocedural thrombotic events are not considered ST.* | |

# Stent Thrombosis

- **Definite**: ACS and angiographic or autopsy evidence of a thrombus 5mm proximal or distal to the stent
- **Probable**:
  - Unexplained death within 1mth of stent implant
  - Any MI in the same territory of the stent (CAG not performed)
- **Possible**: any unexplained death beyond 30days of stent implant

# Classification

- Early [0-30days post stent implant]
  - Acute - <24hrs
  - Subacute – 1 to 30days
- Late: 30days to 12 mths
- Very Late: > 12mths

# Presentation

- Stent Restenosis: ANGINA
  - Gradual escalation of anginal symptoms 6-12mths after the procedure
- Stent Thrombosis: ACUTE CORONARY SYNDROME
  - Mortality as high as 45%

# Causes of Stent Thrombosis

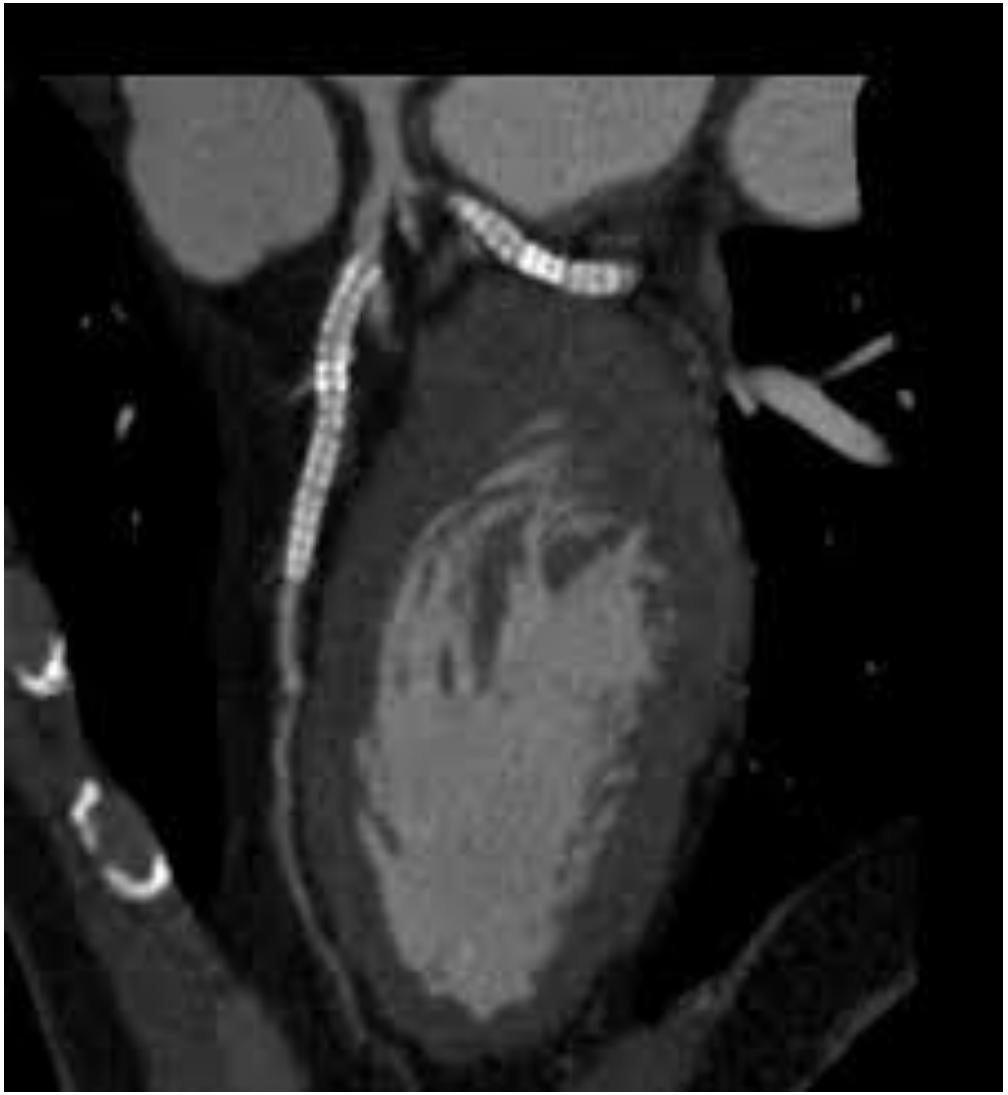
- Patient characteristics
- Procedure and Lesion Related
- Antiplatelet therapy related

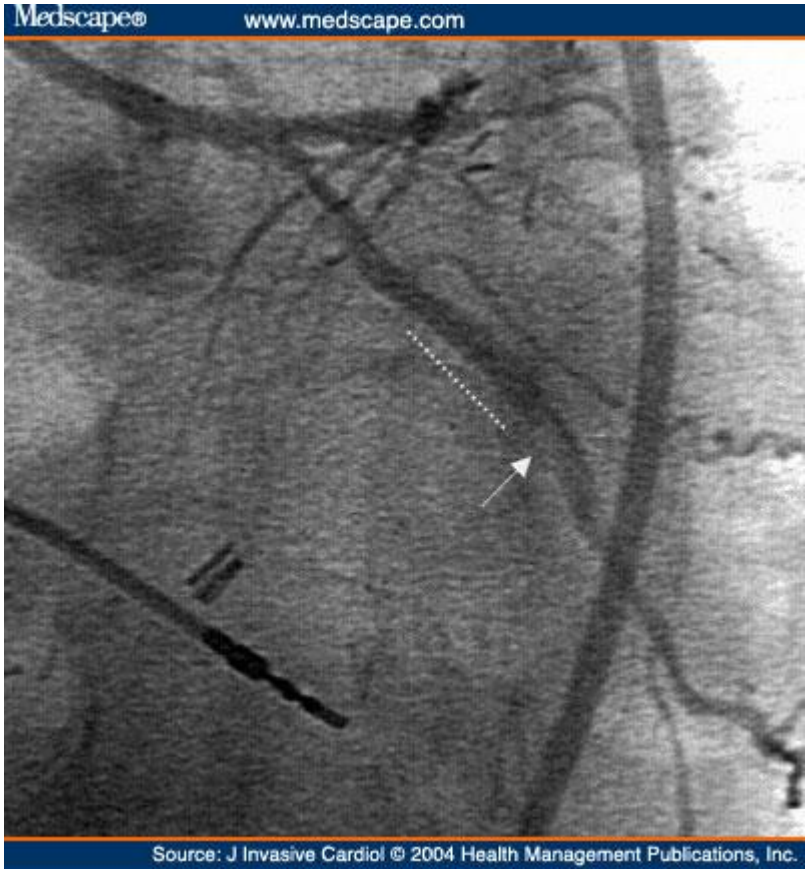
# Causes of Stent Thrombosis

- Patient Characteristics:
  - Diabetes
  - Acute Coronary Syndromes
  - Left ventricular Dysfunction
  - Renal failure
  - Advanced age
  - High platelet reactivity
  - Drug resistance to clopidogrel or aspirin

# Causes of Stent Thrombosis

- Procedure and lesion related:
  - Multiple stents
  - Small vessel diameter
  - Coronary dissection
  - Slow flow
  - Long lesions
  - Stent malapposition
  - Underexpansion of stent
  - Bifurcation lesions

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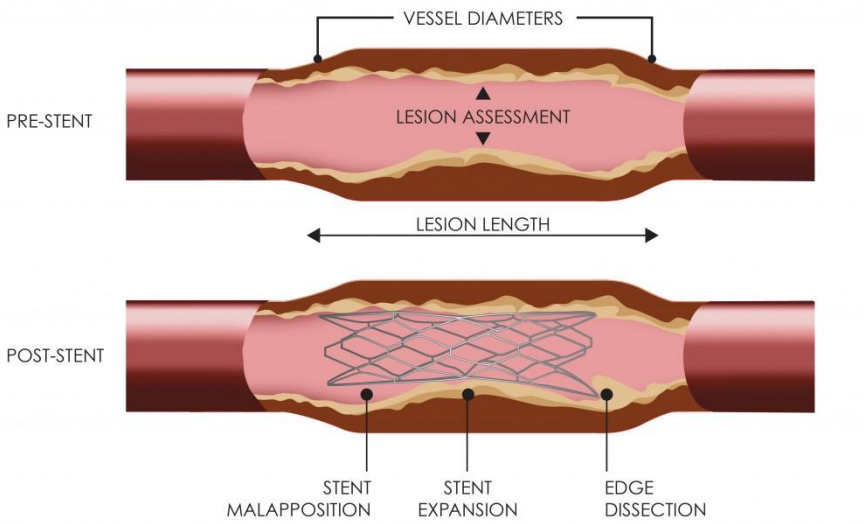
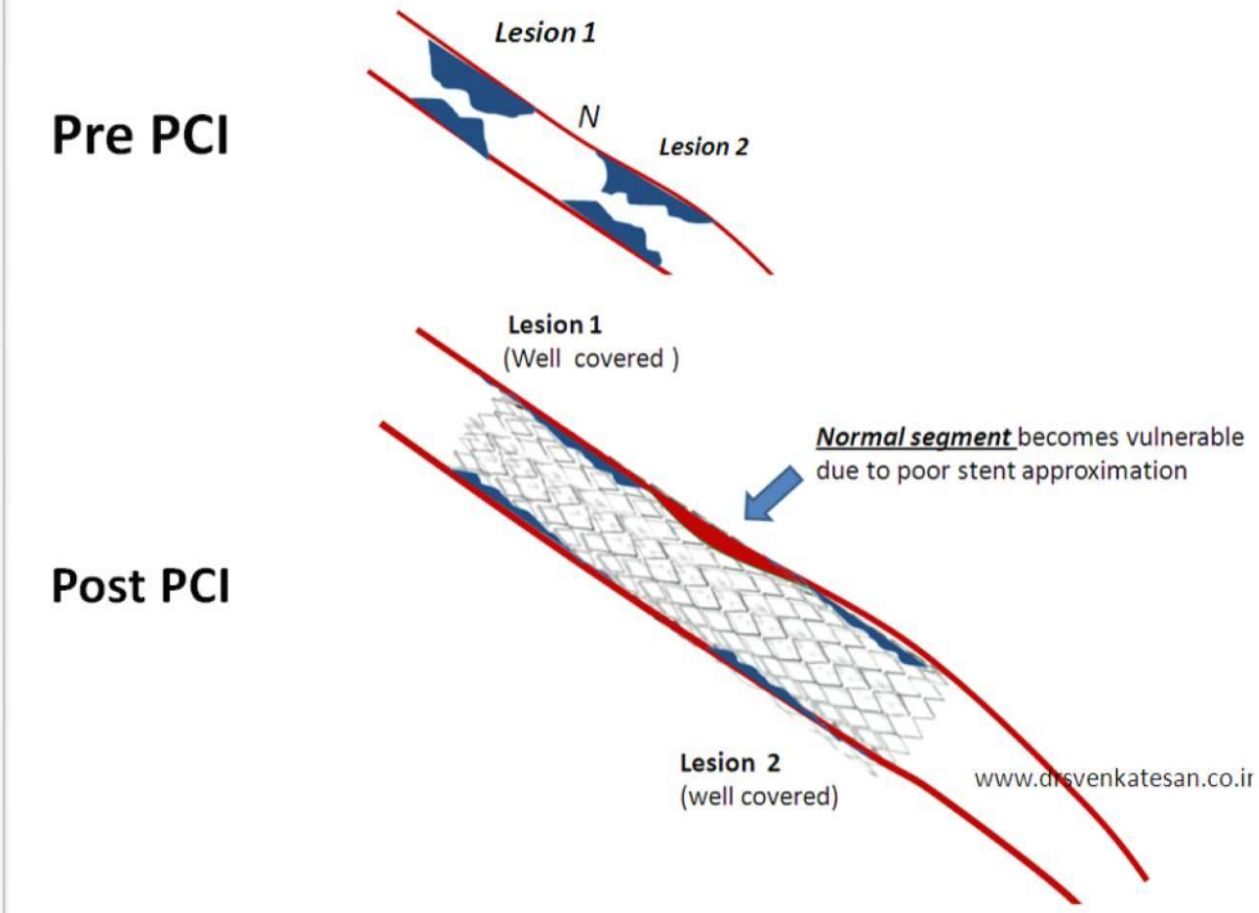
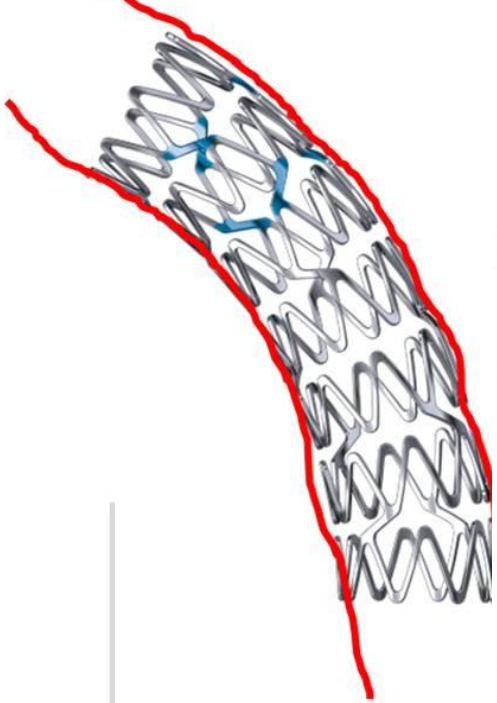
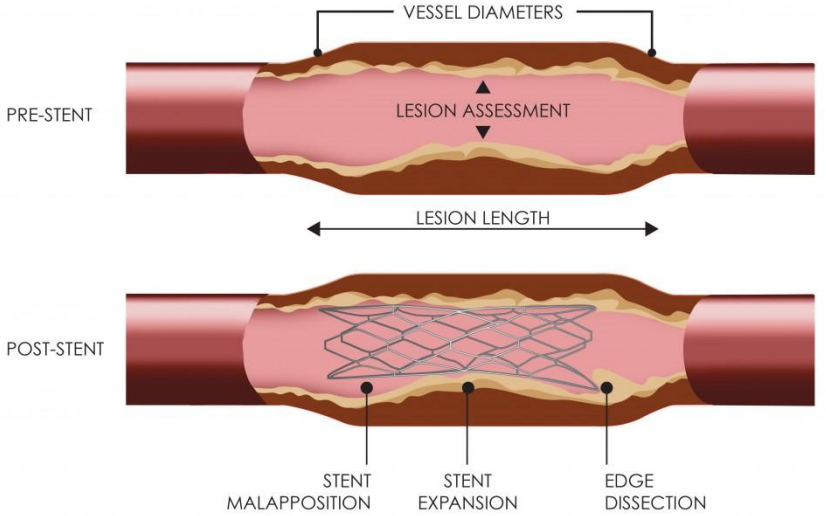
Source: J Invasive Cardiol © 2004 Health Management Publications, Inc.

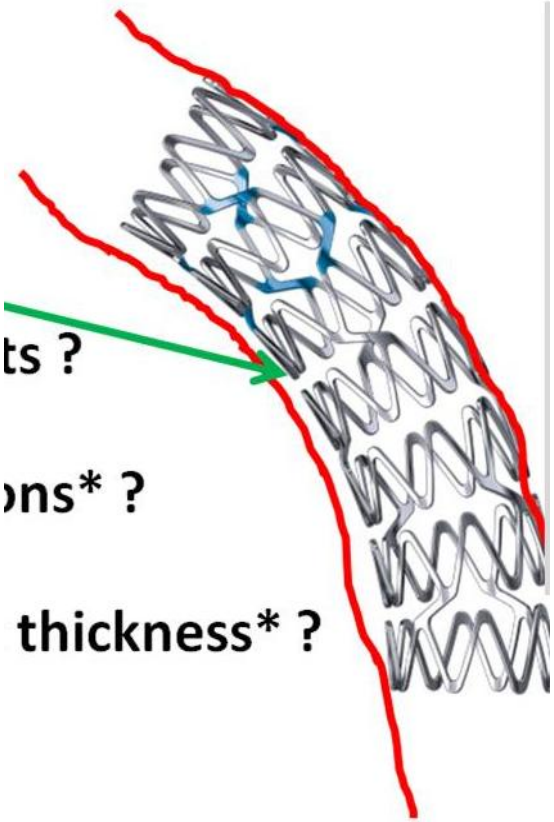

VESSEL DIAMETERS
PRE-STENT
LESION ASSESSMENT
LESION LENGTH
POST-STENT
STENT MALAPPOSITION
STENT EXPANSION
EDGE DISSECTION

# Issues in tandem lesions





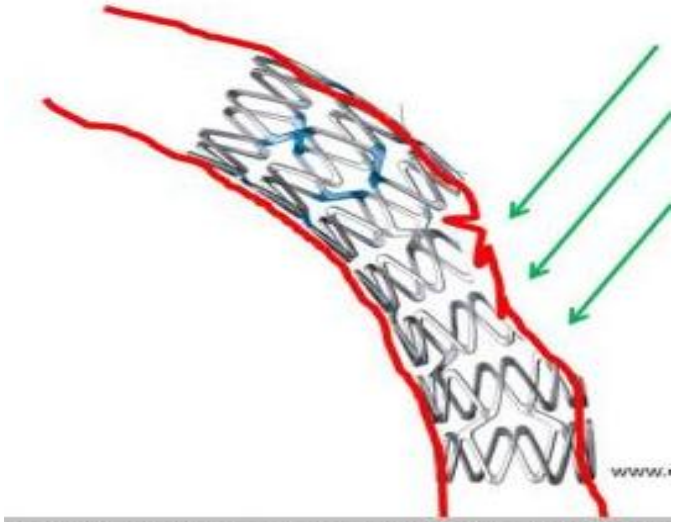


ts ?

ons* ?

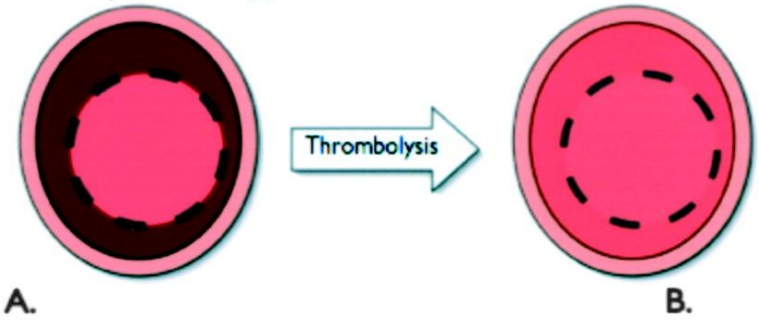
thickness* ?



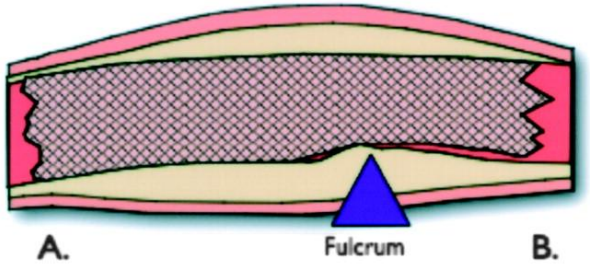
der-expansion can also be associated with malapposition .
acceptable under-expansion as in mal-apposition ? . . .
w is not limited and FFR is > .9 , MLA > 6mm² UES may be

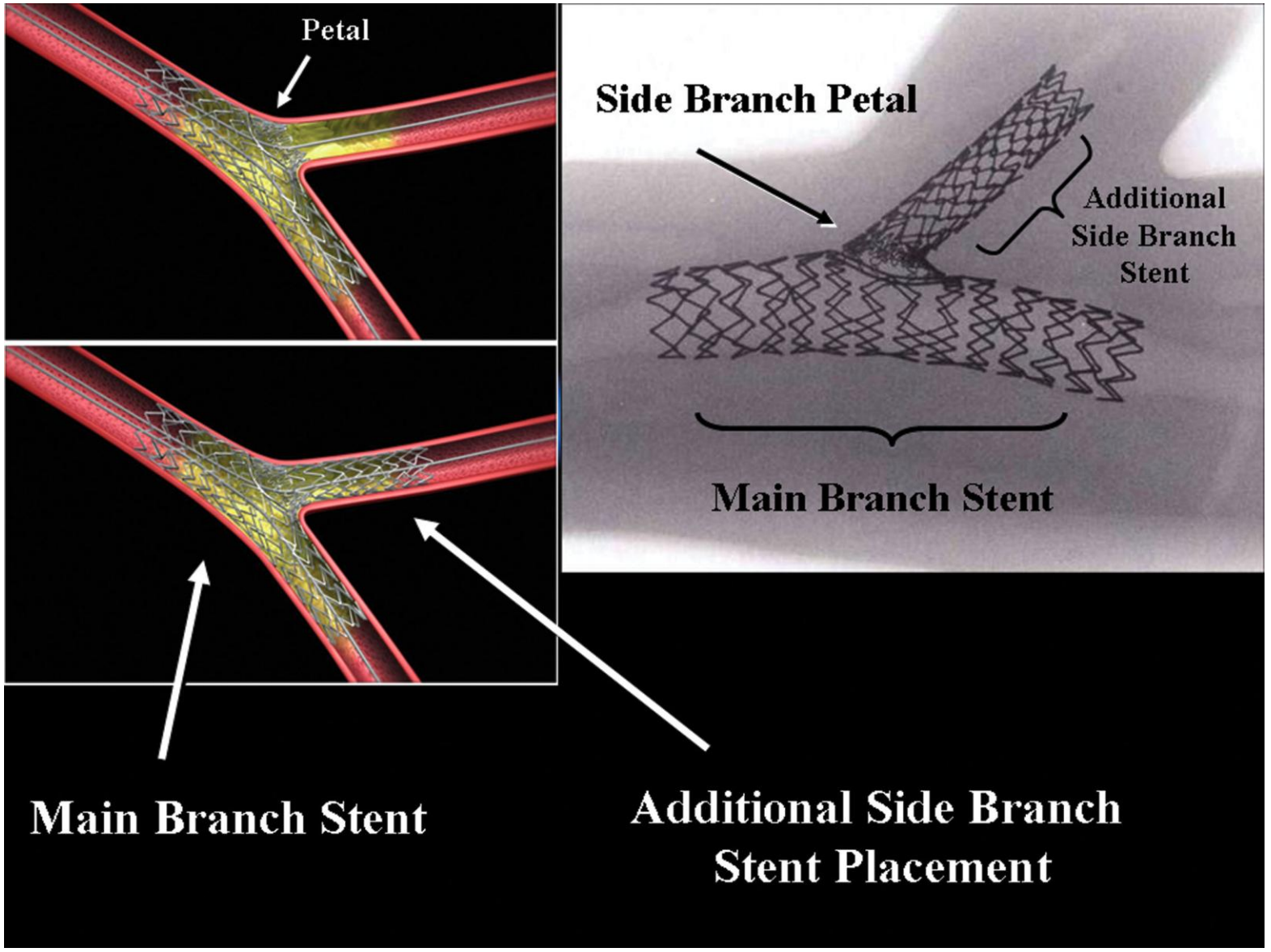
I. Incomplete stent apposition due to positive vessel remodeling


II. Incomplete stent apposition due to thrombus dissolution




III. Incomplete stent apposition due to stent underexpansion




Petal
Side Branch Petal
Additional
Side Branch
Stent
Main Branch Stent
Main Branch Stent
Additional Side Branch
Stent Placement

# Causes of Stent Thrombosis

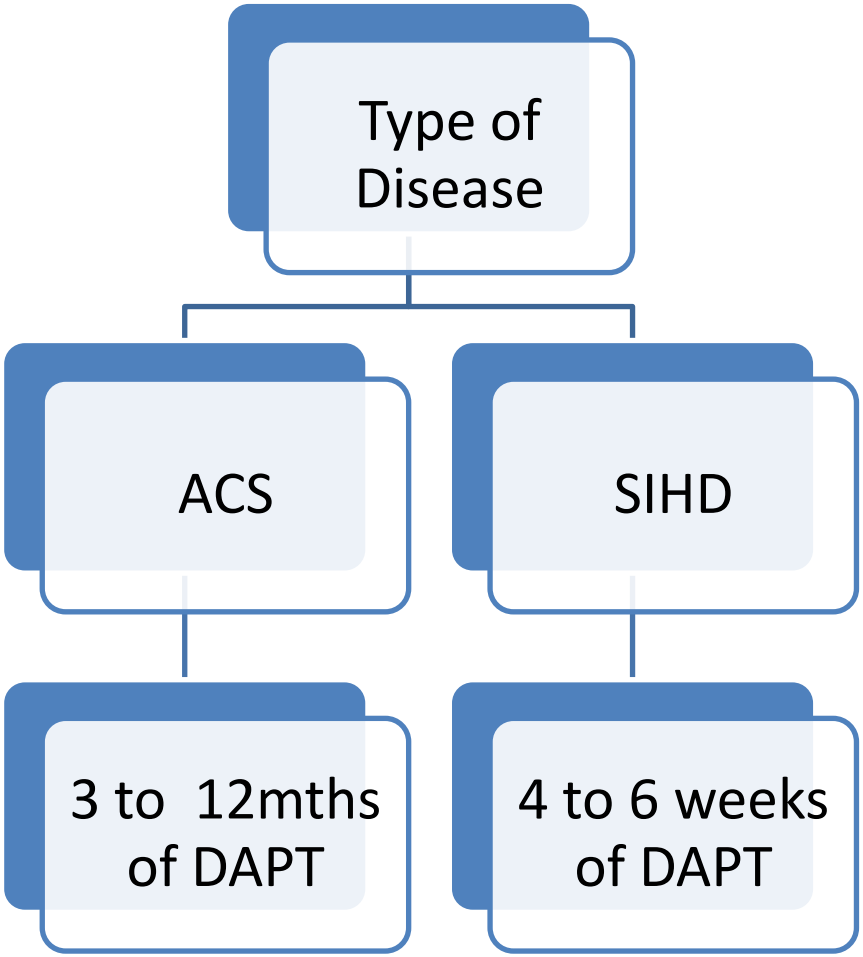
- Antiplatelet therapy related:
  - Inadequate intensity of therapy
  - Non-compliance
  - Premature cessation of DAPT

# Management

- Immediate: like ACS, early reperfusion with thrombolytics or PCI
- Long term:
  - DAPT
  - Compliance and patient education
  - Replacing clopidogrel with more potent ADP receptor antagonists (prasugrel, ticagrelor)

# Management During Perioperative Period

# Bare Metal Stents



# BMS

- Postpone elective surgeries until the above mentioned period
- Then clopidogrel can be stopped
- Aspirin must be maintained during the perioperative period [***except very delicate surgeries like intracranial, intraspinal, posterior chamber of eye***]
- Emergency surgeries: proceed to the OR with DAPT

# Drug Eluting Stents

Delay elective surgeries for 12mths

Clopidogrel can be stopped after that.

Aspirin to be continued Periop

Emergency surgeries:

proceed to OR with DAPT

# Minimal discontinuation and re-implementation time frames of dual antiplatelet therapy (DAPT) for patients undergoing elective surgery

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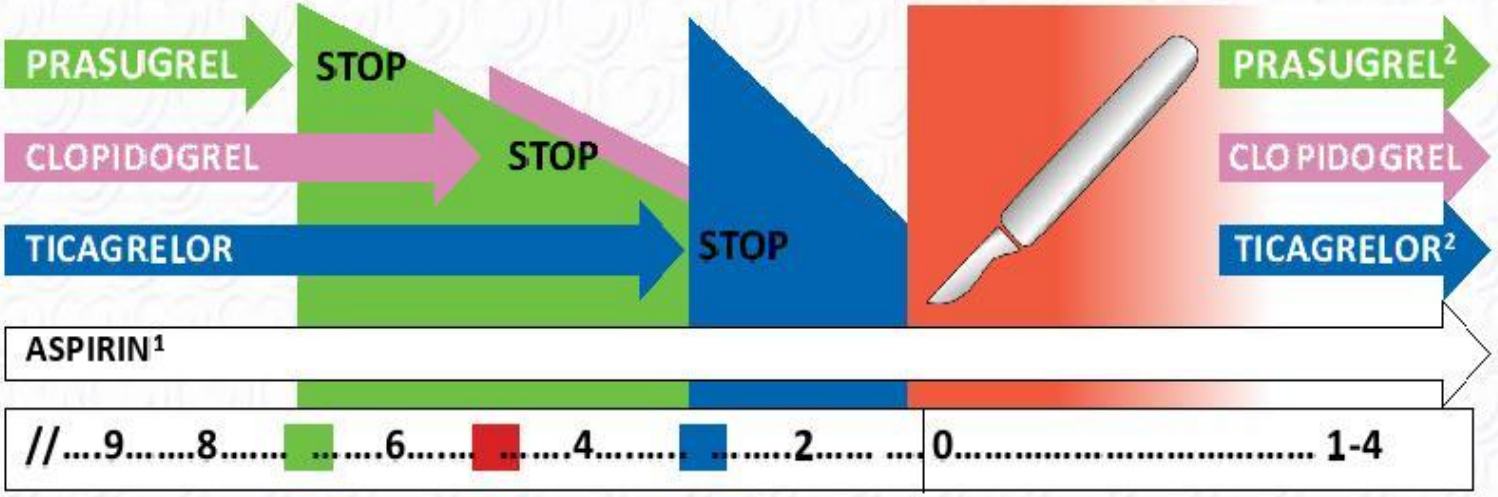


= Expected average platelet function recovery

[1] Decision to stop aspirin throughout surgery should be made on a single case basis taking into account the surgical bleeding risk.

[2] In patients not requiring OAC.



2017 ESC Focused Update on DAPT in Coronary Artery Disease, developed in collaboration with EACTS
(European Heart Journal 2017 - doi:10.1093/eurheartj/ehx419)

# Management of perioperative bleeding

# Management of bleeding episodes

# Bleeding during treatment with dual antiplatelet therapy ± OAC

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**TRIVIAL BLEEDING**

Any bleeding not requiring medical intervention or further evaluation

e.g. skin bruising or ecchimosis, self-resolving epistaxis, minimal conjunctival bleeding

- Continue DAPT.
- Consider OAC continuation or skip one single next pill.
- Reassure the patient.
- Identify and discuss with the patient possible preventive strategies.
- Counsel patient on the importance of drug-adherence.

**Legend**

**DAPT management**

**OAC management**

**General recommendations**



www.escardio.org/guidelines 2017 ESC Focused Update on DAPT in Coronary Artery Disease, developed in collaboration with EACTS (European Heart Journal 2017 - doi:10.1093/eurheartj/ehx419)

# Bleeding during treatment with dual antiplatelet therapy ± OAC

ESC European Society of Cardiology

**MILD BLEEDING**

Any bleeding that requires medical attention without requiring hospitalization

e.g. not self resolving epistaxis, moderate conjunctival bleeding, genitourinary or upper/lower gastrointestinal bleeding without significant blood loss, mild haemoptysis

- Continue DAPT.
- Consider shortening DAPT duration or switching to less potent $P2Y_{12}$ inhibitor (i.e.from ticagrelor/ prasugrel to clopidogrel), especially if recurrent bleeding occurs.

- In case of triple therapy consider downgrading to dual therapy, preferably with clopidogrel and OAC.

- Identify and possibly treat concomitant conditions associated with bleeding (e.g. peptic ulcer, haemorrhoidal plexus, neoplasm).
- Add PPI if not previously implemented.
- Counsel patient on the importance of drug-adherence.

**Legend**

**DAPT management**

**OAC management**

**General recommendations**



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# Bleeding during treatment with dual antiplatelet therapy ± OAC

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**MODERATE BLEEDING**

Any bleeding associated with blood loss (>3 g/dL HB) and/or requiring hospitalization, which is haemodynamically stable and not rapidly evolving

e.g. genitourinary, respiratory or upper/lower gastro-intestinal bleeding with significant blood loss or requiring transfusion

- SAPT, preferably with the $P2Y_{12}$ inhibitor especially in case of upper GI bleeding.
- Reinitiate DAPT as soon as deemed safe.
- Consider shortening DAPT duration or switching to less potent $P2Y_{12}$, especially if recurrence occurs.

- Consider OAC dis. or reversal until bleeding is controlled, unless very high thrombotic risk
- Reinitiate treatment within one week if clinically indicated. For VKA target INR of 2.0–2.5 unless overriding indication (i.e. mechanical heart valves or cardiac assist device) for NOAC consider the lowest effective dose.
- In case of triple therapy consider downgrading to dual therapy, preferably with clopidogrel and OAC.
- If patients on dual therapy, consider stopping antiplatelet Tx.

- Consider i.v. PPI if GI bleeding occurred.
- Identify and possibly treat concomitant conditions associated with bleeding (e.g. peptic ulcer, haemorrhoidal plexus, neoplasm).
- Counsel patient on the importance of drug-adherence.

**Legend**

- DAPT management
- OAC management
- General recommendations



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# Bleeding during treatment with dual antiplatelet therapy ± OAC

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**SEVERE BLEEDING**

Any bleeding requiring hospitalisation, associated with a severe blood loss (>5 g/dL HB) which is haemo-dynamically stable and not rapidly evolving

e.g. severe genitourinary, respiratory or upper/lower gastrointestinal bleeding

**Legend**

**DAPT management**

**OAC management**

**General recommendations**

- Consider stopping DAPT and continue with SAPT, preferably with the $P2Y_{12}$ inhibitor especially in case of upper GI bleeding.
- If bleeding persists despite treatment or treatment is not possible, consider stopping all antithrombotic medications.
- Once bleeding has ceased, re-evaluate the need for DAPT or SAPT, preferably with the $P2Y_{12}$ inhibitor especially in case of upper GI bleeding.
- If DAPT is re-started, consider shortening DAPT duration or switching to less potent $P2Y_{12}$ inhibitor (i.e. from ticagrelor/prasugrel to clopidogrel), especially if recurrent bleeding occurs.

- Consider stopping and reversing OAC until bleeding is controlled unless prohibitive thrombotic risk (i.e. mechanical heart valve in mitral position, cardiac assist device).
- Reinitiate treatment within one week if clinically indicated. For vitamin-K antagonists consider a target INR of 2.0-2.5 unless overriding indication (i.e. mechanical heart valves or cardiac assist device) for NOAC consider the lowest effective dose.
- If patient on triple therapy consider downgrading to dual therapy with clopidogrel and OAC. If patients on dual therapy, consider stopping antiplatelet therapy if deemed safe.

- Consider i.v. PPI if GI bleeding occurred.
- RBC transfusion if HB < 7-8 g/Dl.
- Consider platelet transfusion.
- Urgent surgical or endoscopic treatment of bleeding source if deemed possible..



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# Bleeding during treatment with dual antiplatelet therapy ± OAC

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**LIFE-THREATENING BLEEDING**

Any severe active bleeding putting patient's life immediately at risk

e.g. massive overt genitourinary, respiratory or upper/lower gastrointestinal bleeding, active intracranial, spinal or intraocular haemorrhage, or any bleeding causing haemodynamic instability.

- Immediately discontinue all antithrombotic medications.
- Once bleeding has ceased, re-evaluate the need for DAPT or SAPT, preferably with the $P2Y_{12}$ inhibitor especially in case of upper GI bleeding.

- Stop and reverse OAC.

- Fluid replacement if hypotension.
- Consider RBC transfusion irrespective of HB values.
- Platelet transfusion.
- Consider i.v. PPI if GI bleeding occurred.
- Urgent surgical or endoscopic treatment of bleeding source if deemed possible.

**Legend**

**DAPT management**

**OAC management**

**General recommendations**



www.escardio.org/guidelines 2017 ESC Focused Update on DAPT in Coronary Artery Disease, developed in collaboration with EACTS (European Heart Journal 2017 - doi:10.1093/eurheartj/ehx419)

# Management during Dengue

# Post PCI less than 1year

- Avoid unnecessary platelet transfusion [may precipitate stent thrombosis]

| Dengue Fever | DHF/DSS |
| --- | --- |
| Continue DAPT; monitor platelet counts | Discontinue antiplatelets; Restart once the patient is stabilised |
| Stop one antiplatelet if the count <50,000 | |