Classification of Coronary Lesions

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Value ??

prediction of the course of the procedure and complications
Multiple classification was used to classify different lesions.

1- The Mayo Clinic Risk Score

2- ACC/AHA lesion classification

3- The Society for Cardiovascular Angiography and Interventions (SCAI) risk score
The Mayo Clinic Risk Score used eight morphologic variables

1. Length
2. Total occlusion
3. Ostial lesion
4. Bifurcational lesion
5. SVG lesion
6. Thrombus containing lesion
7. Calcified lesion
8. Angled lesion
(1) Lesion Length

• **Focal - Discrete:** below (10 mm)
• **Tubular:** from (10-20 mm)
• **Diffuse – long** (>20 mm)

*Long lesions increases the procedure and post procedure risk.*

• *(More metal = higher risk of instent restenosis)*
• *(More like hood to have overlapped stents)( not only metal but overlapped metal)*
• *(More like hood to miss lesion segment)*
• *(more likehood for stent mal-deployment)*
• *Long lesion indicates large atherosclerotic burden and so more cardiac events*
Incomplete plaque coverage: Prone for edge lesion and stent exit block

- Plan well before deploying a stent
- To err on longer stent is always better
- Realise, normal segments do not start abruptly!
- Consider a safety margin of at least 5mm
- Give allowance for minor degrees of stent migration

*Please remember current technology does not allow stent repositioning!*

www.drsvenkatesan.co.in
• A tandem lesion: is two lesions close to each others with a normal segment in between. *(Like the bullets loaded in a tandem fashion in a gun)* ... متتتابع

*Multiple tandem lesions with ectasia*
Tandem vs Long lesion

Long, diffuse lesions often well covered by stent than lesions in tandem!
(2) Ostial lesion

- **Defined as** a lesion arising within 3 mm
- **classified by location**
  - aorto-ostial (more RCA)
    - (more with radio link but actually atherosclerotic)
  - non aorto-ostial,
  - or branch-ostial
What's the challenge of Ostial location??

1. Usually fibrotic or calcified and prone to recoil due to the greater thickness of muscular and elastic tissue in the aortic wall. *(usually dilatation is advisable).*

2. Misinterpreted with Ostial spasm *(IC nitrates- small cath-cusp gram- IVUS –CT)*

3. More liable to in-stent restenosis.

4. Retrograde dissection is a life threatening condition and requires immediate surgical consultation.

5. Difficult visualization of the coronary ostium on cath removal and cuspogram.
Aorta free-floating wire technique
(for aorta-ostial lesion only)

“Sepal Wire Technique” — A Novel Technique for Aorto-ostial Left Main Stenting

Chan et al. J INVASIVE CARDIOLOGY 2011;23:211–212
The guide catheter is backed out of the ostium and the second wire is advanced into the aorta. This second wire acts as a marker for the ostium and prevents the guide from deeply engaging the vessel.
(a) The stent is advanced on the target vessel wire beyond the lesion; (b) a balloon is advanced over the second wire opposite the ostium of the target vessel; (c) the balloon is then inflated at low pressure (6-8 atm); (d) the undeployed stent catheter is pulled back against the inflated balloon until a dent is seen; (e) both balloons are deflated.

Szabo or ‘tail-wire’ or ‘anchor-wire’ technique

(a) proximal end of the anchor wire in the Cx is threaded through the most proximal strut of the crimped LAD stent; (b) stent advanced into lesion until the anchor wire prevents further onward motion. Stent balloon is then inflated at 6-8 atm to allow easy removal of anchor wire; (c) after high-pressure inflation showing satisfactory position.

3- Thrombus burden lesion

**More risk of**

- No reflow
- Distal embolization.
- Thrombus shift to aside branch.
- Thrombus prolapse and lemon seed effect.
- Increase the risk of instent thrombosis.

Although conventional angiography is a relatively insensitive method for detection of coronary thrombus.
4- calcified lesions

• **More risk of:**
  Non dilatable lesion

Risk of dissection and perforation

Conventional angiography is moderately sensitive for the detection of extensive lesion calcification but is less sensitive for detection of milder degrees of lesion calcification •
(5) TOTAL OCCLUSION

- Difficulty in passage of a guidewire across the occlusion depends on the occlusion duration and on certain lesion morphologic features, such as bridging collaterals, occlusion length of more than 15 mm, and absence of a “nipple” to guide advancement of the guidewire. Presence of a total occlusion remains one of the major reasons for referral of patients for coronary bypass surgery.
• Higher Failure Rate
(6) Angulated Lesions

• **Risk for:**

✓ Dissections.
✓ Inability to deliver the stent.
✓ Straightening of the vessel that may predispose to late stent fracture.
↑ complexity

- Angel \leq 45
- Angel () 45- 90
- Angel \geq 90
(7) Bifurcation Lesions

- **The optimal strategic approach for bifurcation lesions remains controversial. But In general, placement of one stent is preferable to stent placement in both the parent vessel and side branch.**

- **Risk for**
  
  Side branch occlusion during PCI with plaque shift.

- It is relates to the relative size of the parent and branch vessel, the location of the disease in the parent vessel, and the stenosis severity in the origin of the side branch.
(8) Degenerated Saphenous Vein Grafts

- 25% of SVGs occlude within the 1st year after CABG.

**Risk of**
- Restenosis
- Distal embolization
- Perforation and rupture

So DES and embolic protection devices are needed
### Characteristics of ACC/AHA Type A, B and C lesions

**TYPE A LESIONS**: (High success, > 85%; low risk)

- Discrete (<10 mm length)
- Concentric
- Readily accessible
- Nonangulated segment <45 degrees
- Smooth contour
- Little or no calcification
- Less than totally occlusive
- Notostial in location
- No major branch involvement
- Absence of thrombus

**TYPE B LESIONS** (Moderate success, 60 to 85%; moderate risk)

- Tubular (10-20 mm length)
- Eccentric
- Moderate tortuosity of prox. segment
- Moderately angulated, 45-90°
- Irregular contour
- Moderate to heavy calcification
- Ostial in location
- Bifurcation lesions requiring double guidewires
- Some thrombus present
- Total occlusion < 3 months old

**TYPE C LESIONS** (low success, < 60%; high risk)

- Diffuse (>2 cm length)
- Excessive tortuosity of prox. segment
- Extremely angulated, >90 degrees
- Inability to protect major side branch
- Degenerated vein grafts with friable lesions.
- Total occlusion > 3 months old
What ACC/AHA classification added to The Mayo Clinic Risk Score

- Accessibility
- Eccentricity
- Proximal lesion tortuosity
Coronary lesion Accessibility

Starting from iliac vessels to coronary ostia orientation.

- A Normal origin
  - Standard choice
  - Judking Right
  - Poor back up
  - Amplatz Left 1, 2
  - or Amplatz Right 1, 2

- B Shepherd's crook origin
  - Standard choice
  - Internal Mammary
  - or Amplatz Left 1, 2

- C Low origin with horizontal course
  - Standard choice
  - Judking Right
  - or Amplatz Right 1, 2
Eccentricity

- **Concentric:**
  - circumferential

- **Eccentric:**
  - One side
  - **I:** smooth and broad neck.
  - **II:** Irregular surface and/or narrow neck

- **Complex or irregular**

![Concentric stenosis](image)

- Concentric stenosis

![Eccentric stenosis (Type I)](image)

- Eccentric stenosis (Type I)

![Eccentric stenosis (Type II)](image)

- Eccentric stenosis (Type II)

![Multiple irregularities](image)

- Multiple irregularities
Tortousity

- **Risk for:**

  ✓ Dissections.

  ✓ Inability to deliver the stent.

  ✓ Straightening of the vessel that may predispose to late stent fracture.
Characteristics of SCAI Type I-IV lesions

SCAI Type I (Highest success expected, Lowest risk)
  Does not meet criteria for ACC/AHA Type “C” Lesion Patent

SCAI Type II
  Diffuse (>2 cm length)
  Excessive tortuosity of proximal segment
  Extremely angulated segments, >90 degrees
  Inability to protect major side branches
  Degenerated vein grafts with friable lesions.
  Patent

SCAI Type III
  Does not meet criteria for ACC/AHA Type “C” Lesion Occluded

SCAI Type IV
  Diffuse (>2 cm length)
  Excessive tortuosity of proximal segment
  Extremely angulated segments, >90 degrees
  Inability to protect major side branches
  Degenerated vein grafts with friable lesions.
  And Occluded
  Or “Occluded more than 3 months” alone
SCAI classification

- Patent^{non c}
- Patent^{C}
- CTO^{non C}
- CTO{- C}
Coronary artery aneurysm
Ulcerated lesion and intimal flap
Summary

• Assessment of the lesion criteria and so its complexity is an ideal predictor of the procedure course and post procedure outcome.

• As any pathological description
  
  **Size** ( L&W) – **Site** ( ostial - bifurcational – Graft ) – **shape** ( ulcerated, falp, aneurysm) - **surface** – **Cut section** ( eccentricity) – **Content** ( Thrombus or calcification) – **course** ( accessibility – tortuosity – angulation )