ACC/AHA LESION CLASSIFICATION OF CAD

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I INTRODUCTION AND CLINICAL UTILITY

- **The Core Principle:** The ACC/AHA lesion classification was developed to predict the procedural success and complication rates of percutaneous coronary intervention (PCI) based entirely on the anatomical and morphological features visible on 2D invasive coronary angiography.
- **The Clinical Target:** It grades lesions by assessing length, angulation, calcification, tortuosity, and thrombus burden to determine the risk of acute vessel closure or failure to cross the lesion with a guidewire or balloon.

II THE CLASSIFICATION CRITERIA (THE EXACT MORPHOLOGICAL PARAMETERS)

A Type A Lesions (Historical Success > 85%, Low Risk < 2%)

- **Length:** Discrete (less than 10 mm length).
- **Morphology:** Concentric, smooth contour, and readily accessible.
- **Angulation:** Non-angulated segment (less than 45 degrees).
- **Calcification:** Little or no calcification.
- **Location:** Non-ostial, with no major side branch involvement.
- **Thrombus:** Absence of thrombus.

B Type B Lesions (Moderate Success 60–85%, Moderate Risk)

- **Length:** Tubular (10 to 20 mm length).
- **Morphology:** Eccentric, irregular contour, or moderate tortuosity of the proximal segment.
- **Angulation:** Moderately angulated segment (greater than 45 degrees, less than 90 degrees).
- **Calcification:** Moderate to heavy calcification.
- **Location:** Ostial in location, or bifurcation lesions requiring double guidewires.
- **Thrombus:** Some thrombus present.
- **Total Occlusions:** Total occlusions less than 3 months old.
- **Sub-Classification:**
  - **Type B1:** Only 1 adverse characteristic from the Type B list.
  - **Type B2:** 2 or more adverse characteristics from the Type B list.

C Type C Lesions (Historical Success < 60%, High Risk > 10%)

- **Length:** Diffuse (greater than 20 mm length).
- **Morphology:** Excessive tortuosity of the proximal segment, or degenerated saphenous vein grafts (SVG) with friable lesions.
- **Angulation:** Extremely angulated segments (greater than 90 degrees).
- **Total Occlusions:** Chronic Total Occlusions (CTO) greater than 3 months in duration.
- **Location:** Inability to protect major side branches.

Parameter	Type A Lesion	Type B Lesion (B1 = 1 feature; B2 >= 2 features)	Type C Lesion
Historical Success / Risk	Success > 85%, Low Risk < 2%	Success 60–85%, Moderate Risk	Success < 60%, High Risk > 10%
Length	Discrete (< 10 mm)	Tubular (10 to 20 mm)	Diffuse (> 20 mm)
Angulation	Non-angulated (< 45 degrees)	Moderately angulated (> 45 to < 90 degrees)	Extremely angulated (> 90 degrees)
Morphology & Tortuosity	Concentric, smooth, readily accessible	Eccentric, irregular, moderate proximal tortuosity	Excessive proximal tortuosity; friable degenerated SVG
Calcification & Thrombus	Little/none; no thrombus	Moderate to heavy calcification; some thrombus	CTO > 3 months duration
Location & Side Branches	Non-ostial; no major side branch involvement	Ostial; bifurcation requiring double guidewires	Inability to protect major side branches

III THE PARADIGM SHIFT: ACC/AHA TO SYNTAX SCORE

- **The Past Paradigm:** The ACC/AHA criteria were designed during the era of plain balloon angioplasty. With modern ultra-thin strut Drug-Eluting Stents (DES) and advanced guidewires, procedural success for Type B and C lesions now routinely exceeds 90 to 95 percent, making the historical success percentages obsolete.
- **The Present Paradigm (ESC 2018: Class I to calculate SYNTAX in left main / multivessel CAD):** The **SYNTAX Score** has superseded the standalone ACC/AHA classification for guiding revascularization strategies in complex, multi-vessel disease or Left Main CAD. The SYNTAX score mathematically grades the complexity of the entire coronary tree, utilizing the original ACC/AHA morphological features as its building blocks.
- **The Landmark Evidence (SYNTAX Trial):** Demonstrated that in patients with a high SYNTAX score (33 or greater), CABG offers a significant survival and freedom-from-MACE advantage over PCI, whereas for low scores (22 or less), PCI and CABG are non-inferior.

IV RECENT ADVANCES AND CALCIUM MODIFICATION

- **Plaque Modification Tools:** Complex Type C calcified lesions historically resulted in severe stent under-expansion and stent thrombosis. Modern plaque modification tools, specifically **Intravascular Lithotripsy (IVL)** and **Rotational Atherectomy**, are used to safely fracture deep intimal and medial calcium, converting untreatable Type C lesions into treatable ones.
- **The Landmark Evidence (DISRUPT CAD III Trial):** Demonstrated the safety and high clinical success rate of IVL for severely calcified coronary lesions prior to DES deployment, transforming the management of heavily calcified lesions.

V THE INDIAN CLINICAL CONTEXT

- **The Diabetic Morphology:** Indian patients present almost a decade earlier than Western cohorts with an aggressive, diffuse, and heavily calcified CAD phenotype driven by uncontrolled diabetes and metabolic syndrome, frequently presenting with Type B2/C diffuse disease.
- **Intravascular Imaging Guidance:** Complex Type B2 and Type C diffuse diabetic lesions should not be stented blindly based on 2D angiography alone. The use of **Intravascular Ultrasound (IVUS)** or **Optical Coherence Tomography (OCT)** (ESC 2024: Class I for complex lesions; ACC/AHA 2021: Class IIa) accurately maps the calcium arc, properly sizes the vessel, and ensures optimal stent expansion, reducing in-stent restenosis rates in the diabetic population.

KEY REFERENCES

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