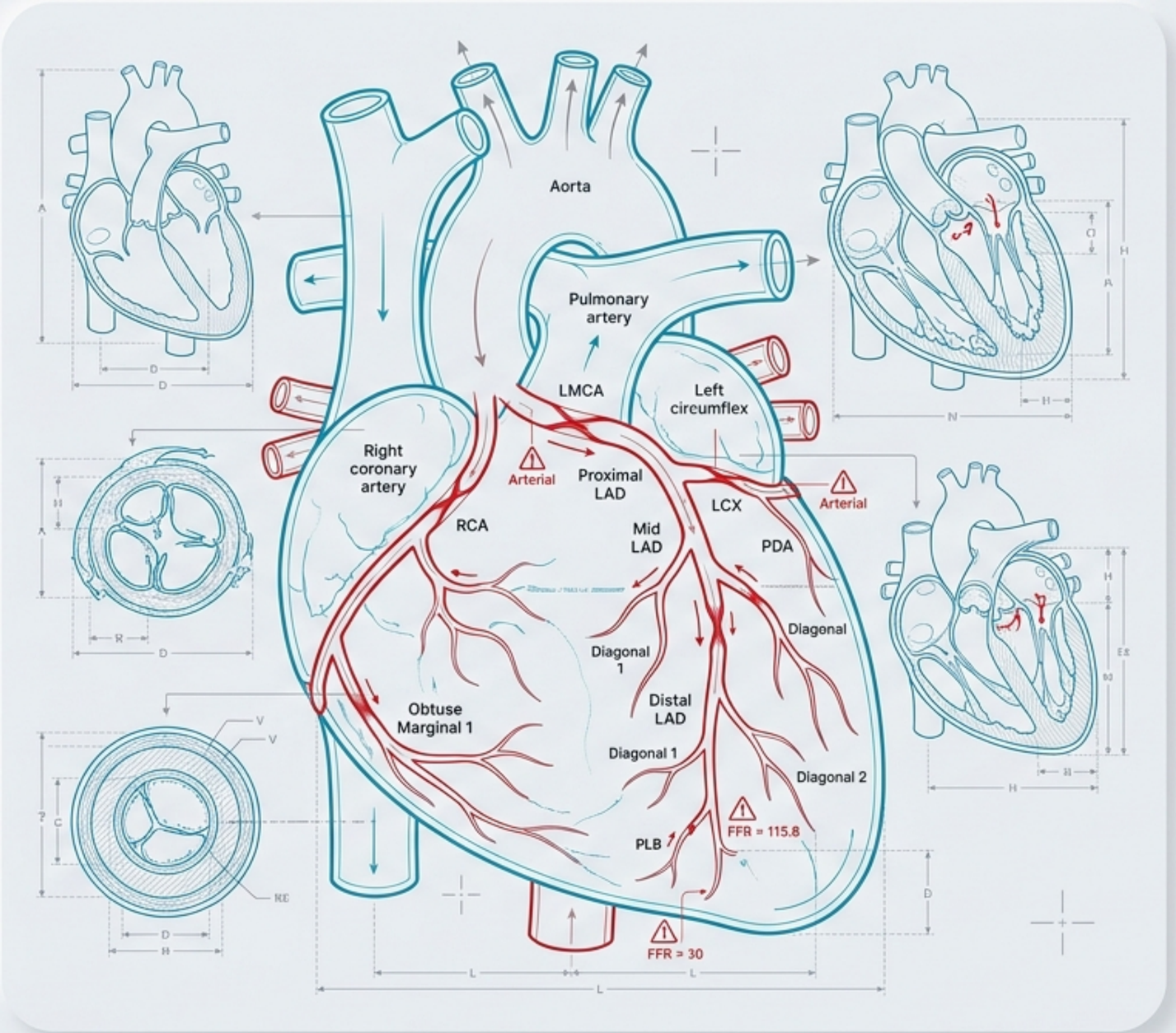
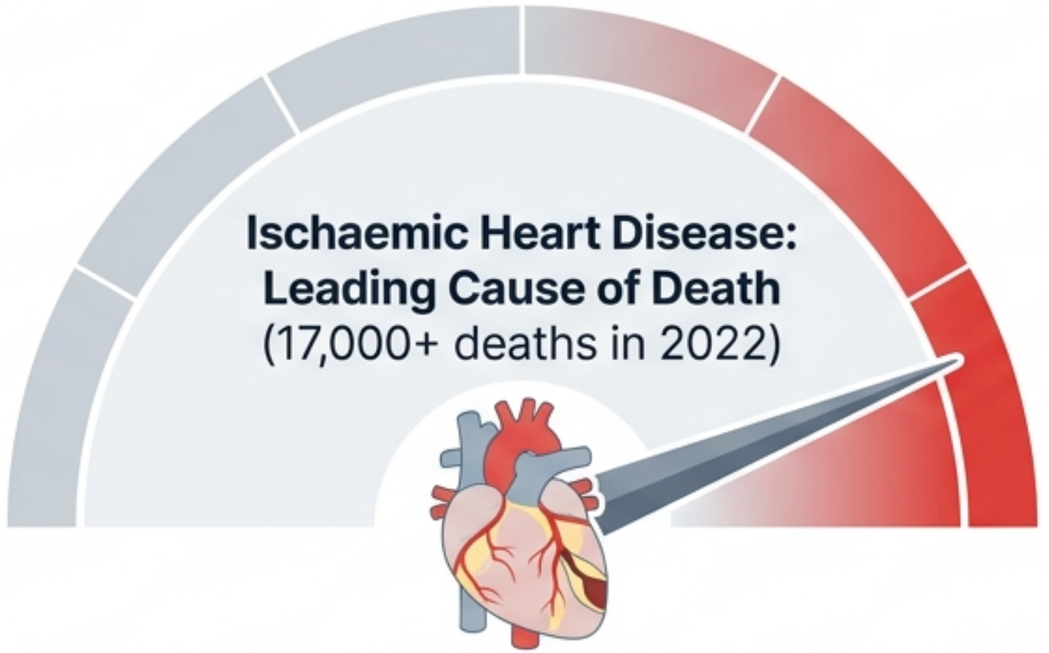
The Precision Revascularization Paradigm

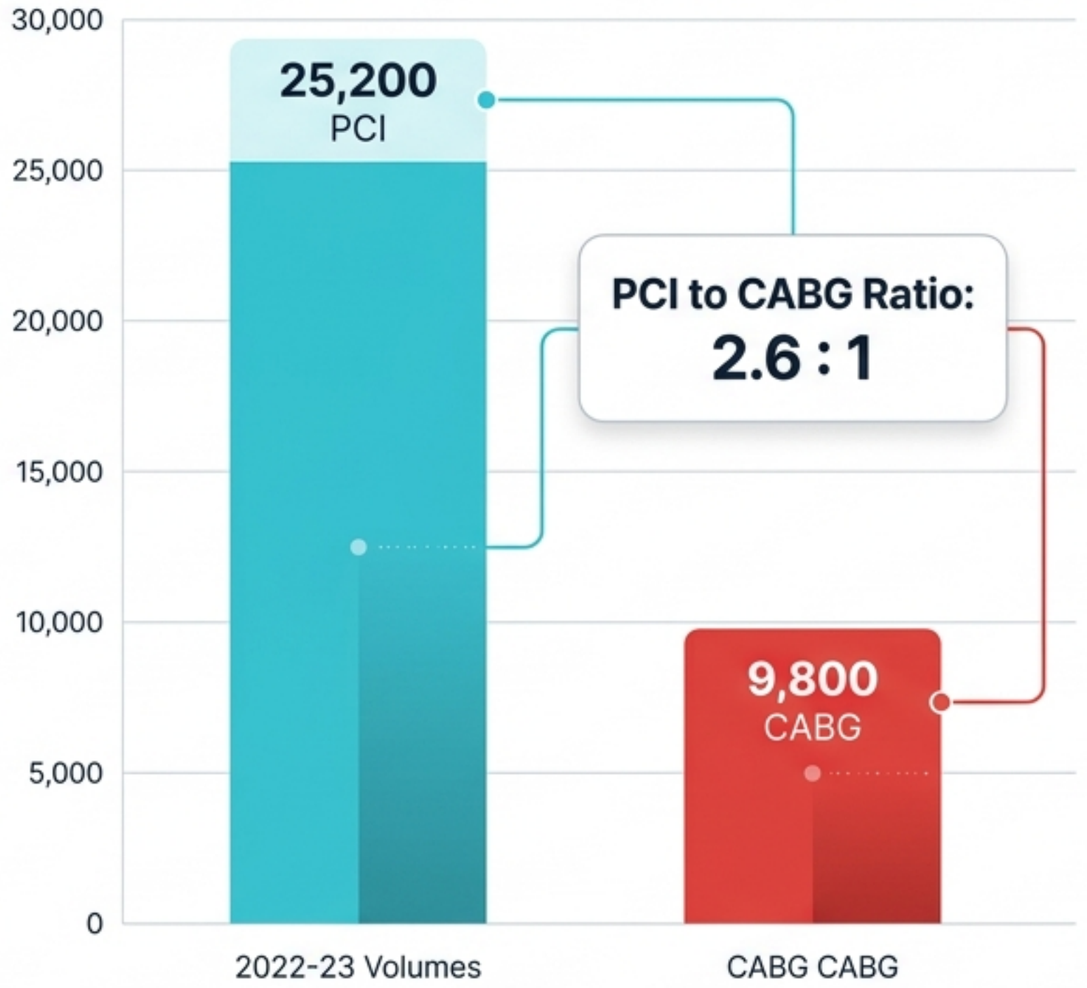
A Clinical Playbook for Coronary Artery Disease



The Australian Revascularisation Landscape



Transradial Access: >80% default at metropolitan centres.



The Spectrum of PCI Indications

Red Zone (STEMI)

Primary PCI.

Target: <=90 mins door-to-balloon at capable centres, <=120 mins for transfer.

Orange Zone (NSTEACS)

Early invasive strategy.

Target: Angiography <2 hours for very-high-risk (haemodynamic instability); <24 hours for high-risk (GRACE >140, dynamic ECG).

Yellow Zone (LMS)

Ostial/shaft LMS disease or distal bifurcation with low-intermediate SYNTAX.

Blue Zone (Stable CAD)

Refractory angina despite Optimal Medical Therapy (OMT).

Requires functional testing confirmation (FFR ≤0.80 or iFR ≤0.89).

Routine PCI without ischaemia assessment is assessment is not recommended.

Contemporary Stent Arsenal in Australia

DES (The Default)

In-stent restenosis 3-8%, 3-12mo DAPT

BMS (The Exception)

In-stent restenosis 20-30%, 1mo DAPT. Reserved only for active bleeding or imminent major surgery.

XIENCE (Abbott)

Everolimus 100 ug/cm2 | Cobalt-chromium (81 um) | Fluorinated copolymer.

Data: Low stent thrombosis <0.5%/yr.

Resolute Onyx (Medtronic)

Zotarolimus 1.6 ug/mm | Cobalt-chromium (81 um) | BioLinx polymer.

Data: Safe for 1-3mo short DAPT in select patients.

SYNERGY (Boston Scientific)

Everolimus | Platinum-chromium (74 um) | PLGA bioabsorbable polymer.

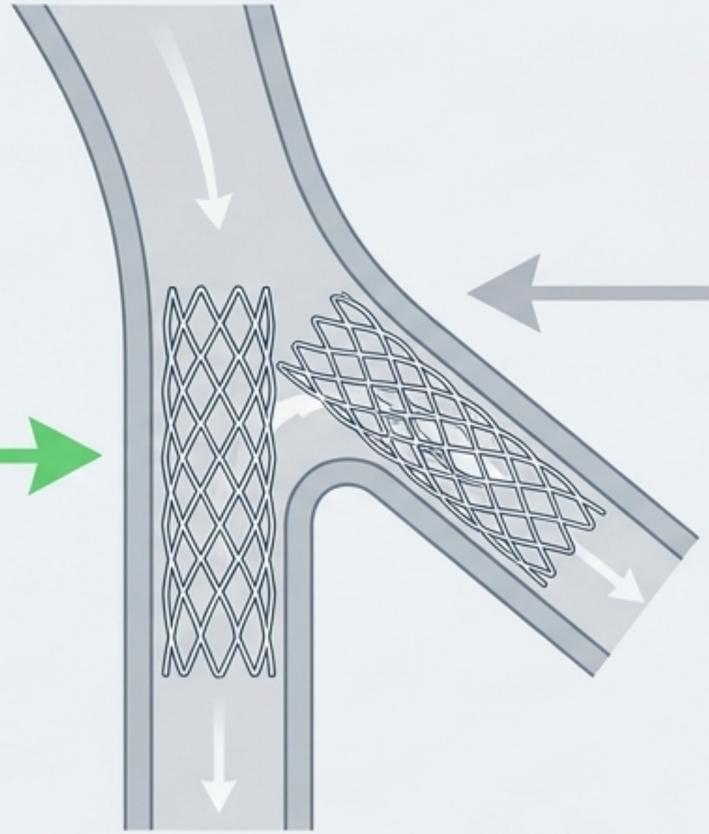
Data: Polymer absorbs within 4 months, reducing late thrombosis.

Bifurcation Strategy: Provisional by Default

Path A: Provisional Stenting (15-20% of all PCIs)

Default approach. Stent main vessel first. Only stent side branch if >70% residual stenosis, reduced TIMI flow, or dissection.

Final kissing balloon inflation (FKBI) recommended if side-branch treated.



Path B: Planned Two-Stent (DK-Crush / Culotte / T-Stent)

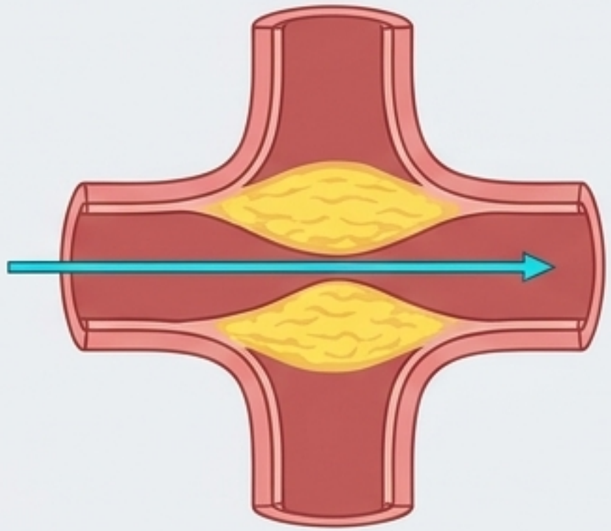
Reserved for true bifurcations with large side branches (>=2.5 mm) and disease extending >5 mm.

DK-crush has best evidence for LMS (DKCRUSH-V).

Warning: IVUS or OCT strongly recommended to optimise expansion and confirm ostial coverage.

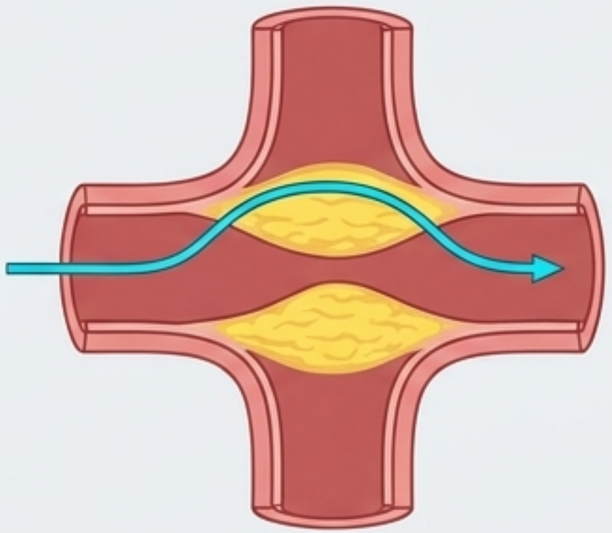
Navigating the Chronic Total Occlusion

Australian tertiary centre success rates: **80-90%.**



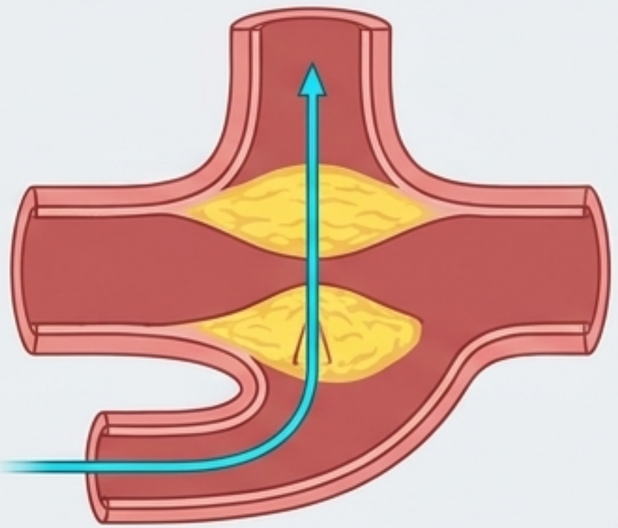
Antegrade Wire Escalation (AWE)

First-line for short (<20mm), non-calcified stumps. Sequential wires from soft (Fielder XT) to stiff (Confianza Pro 12).



Antegrade Dissection Re-entry (ADR)

Controlled subintimal tracking (Stingray system). For long occlusions or failed AWE.



Retrograde Approach

Essential for blunt proximal caps or ambiguity. Requires dual guide catheter setup.

Severe Calcification: The 'Peck and Go' Protocol

135,000 - 180,000 RPM

Avoid slow speeds or aggressive burring.

15 - 20 Seconds

Max per run.

Starts at 1.25mm.

Burr-to-artery ratio must remain <=0.6-0.7.

Mechanism: Ablates plaque into <5 um microparticles. Uses Rotaglide (Heparin + Nitroglycerin + Verapamil) to reduce friction/spasm.

Complication Risks: No-reflow (2-6%), Perforation (<1%), Burr entrapment.

Beyond Angiography: Intravascular Guidance

IVUS

- **Resolution: 100-200 um.**
- **Strength:** Cross-sectional vessel sizing, plaque characterisation, LMS assessment.
- Does not require contrast flush.

OCT

- **Resolution: 10-20 um** (10x higher).
- **Strength**: Superior for stent strut coverage, dissection flaps, and thrombus detection.
- **Limitation:** Requires contrast flush, limited in large vessels (>3.0mm).

Physiology: FFR/iFR

- **FFR <=0.80 / iFR <=0.89.**
- **FAME 3** trial proves FFR-guided PCI superiority in multivessel disease.
- iFR improves comfort by skipping adenosine.

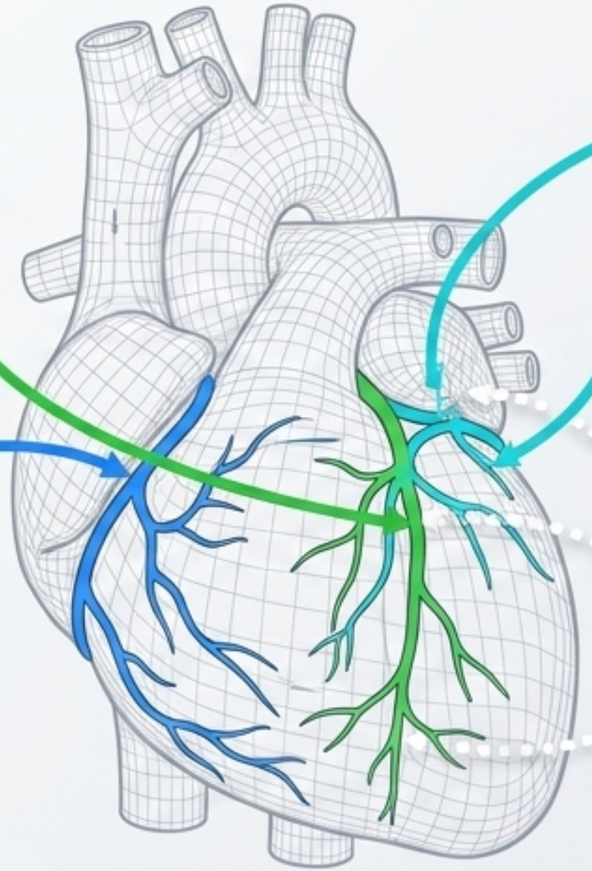
The CABG Arsenal & Conduit Mapping

The Gold Standard

- LIMA to LAD.
- 90-95% 10-year patency. Documented survival benefit.

BIMA Strategy

- RIMA to RCA/Circumflex.
- 85-90% patency. Slightly higher sternal wound risk in diabetics.



Arterial Alternative

- Radial Artery to Circumflex/Diagonal.
- 85-90% patency. Mandatory pre-op Allen test.

Venous Conduit

- Saphenous Vein Graft (SVG) to any target.
- 50-60% patency. Attrition from intimal hyperplasia.

Class I Indications Panel

- LMCA stenosis >=50%, Triple-Vessel Disease (SYNTAX >=23), Diabetes with MVD (FREEDOM trial),
- Ischaemic Cardiomyopathy with viability (STICHES trial).

Defining Anatomical Complexity: The SYNTAX Score

Low Complexity (Score 0-22)

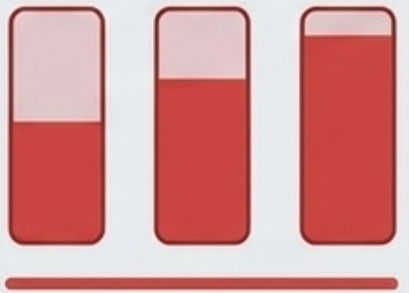
Intervention: PCI and CABG have equivalent outcomes.

Heart Team: Either acceptable; driven by comorbidity and patient preference.

Intermediate Complexity (Score 23-32)

Intervention: CABG generally preferred, especially for 3-vessel disease. PCI considered for highly selected patients.

Heart Team: Individualised assessment utilizing SYNTAX II 2020.



High Complexity (Score >=33)

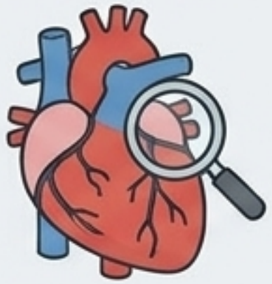
Intervention: CABG clearly superior. Multiple bifurcations, CTOs, CTOs, diffuse disease.

Heart Team: PCI generally avoided unless prohibitive surgical risk/inoperable.

The SYNTAX II 2020 Equation

[Variable 1: The Angiogram]

Anatomical SYNTAX Score



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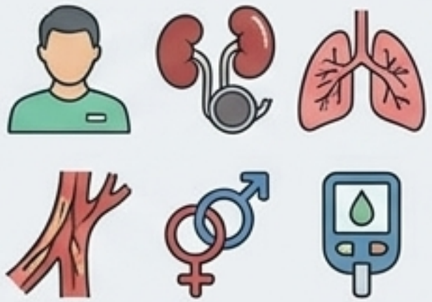
[Variable 2: The Patient]

Clinical Variables Dashboard
(Age, CrCl, LVEF, COPD, PVD, Sex, Diabetes)



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[Variable 3: The Surgeon]

Risk Scores
(EuroSCORE II & STS Score >5%)

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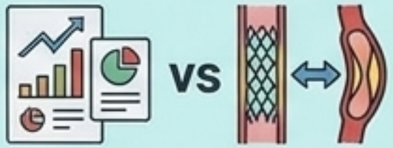
[The Output]

Individualised 4-year & 10-year Mortality Prediction.
A predicted PCI mortality greater than predicted CABG mortality decisively favours surgery.

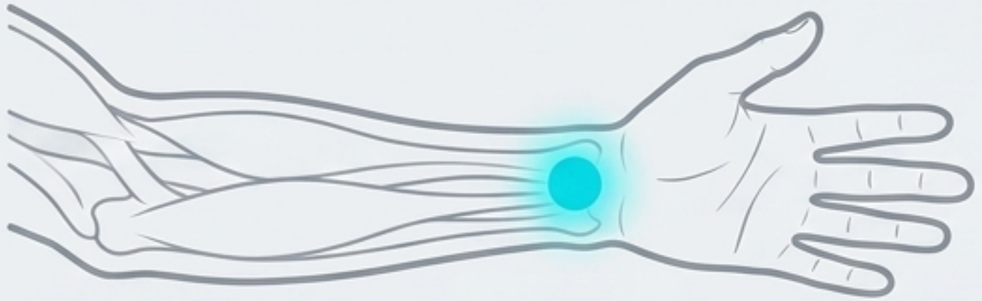


The Mandate: ESC/EACTS guidelines require ALL left main or multivessel disease be discussed by a **multidisciplinary Heart Team** prior to intervention.

The Grand Debate: PCI vs. CABG

	PCI	CABG
Recovery Time	1-2 weeks	6-12 weeks sternal healing
Stroke Risk (EXCEL trial)	<0.5%	1-2%, higher in elderly/ aortic atherosclerosis
Repeat Revascularisation	5-15% at 5 years	2-5%
Medication Burden	Mandatory prolonged DAPT	No DAPT post-op unless recent ACS
Angina Relief (ISCHEMIA / FAME 3)	Improves QoL	More complete and durable relief

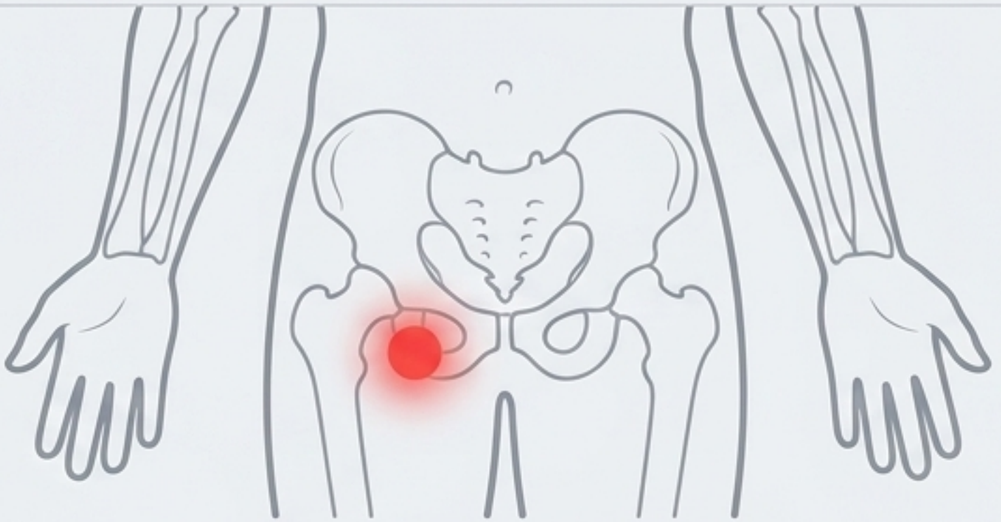
Vascular Access Showdown



Transradial (TRA)

Status: The default approach (MATRIX, RIVAL trials). Reduces major bleeding 40-60%.

Complications: Radial artery occlusion (1-10% - manage with patency haemostasis/TR Band)
Spasm (5-15% - manage with nitroglycerin/verapamil).



Transfemoral (TFA)

Status: Reserved for large-bore devices, dual-access CTOs, or haemodynamic support.

Complications: Large haematoma (2-6%)
Retroperitoneal haemorrhage (0.5-1.0% - needs CT/resuscitation)
Pseudoaneurysm (0.5-2.0% - manage with ultrasound thrombin injection).

Emergency Protocol: Stent Thrombosis

Trigger Panel: Medical Emergency: 20-45% Mortality. Presents as STEMI/Shock. Rates <1% with newer DES.

Step 1: Emergent Angiography

Aspiration thrombectomy (Export catheter) to restore flow.

Step 2: Intravascular Imaging

Mandatory IVUS/OCT to find the mechanism (underexpansion, malapposition, neoatherosclerosis).

Step 3: Mechanical Fix

High-pressure balloon dilatation or additional stenting.

Step 4: Pharmacological Escalation

Administer GP IIb/IIIa inhibitor.
Escalate P2Y12: Switch clopidogrel to ticagrelor (90mg BD) or prasugrel (10mg OD).

Step 5: Assessment

Platelet function testing (VerifyNow) and commit to extended/lifelong DAPT.

Managing Friction: Restenosis & Periprocedural MI

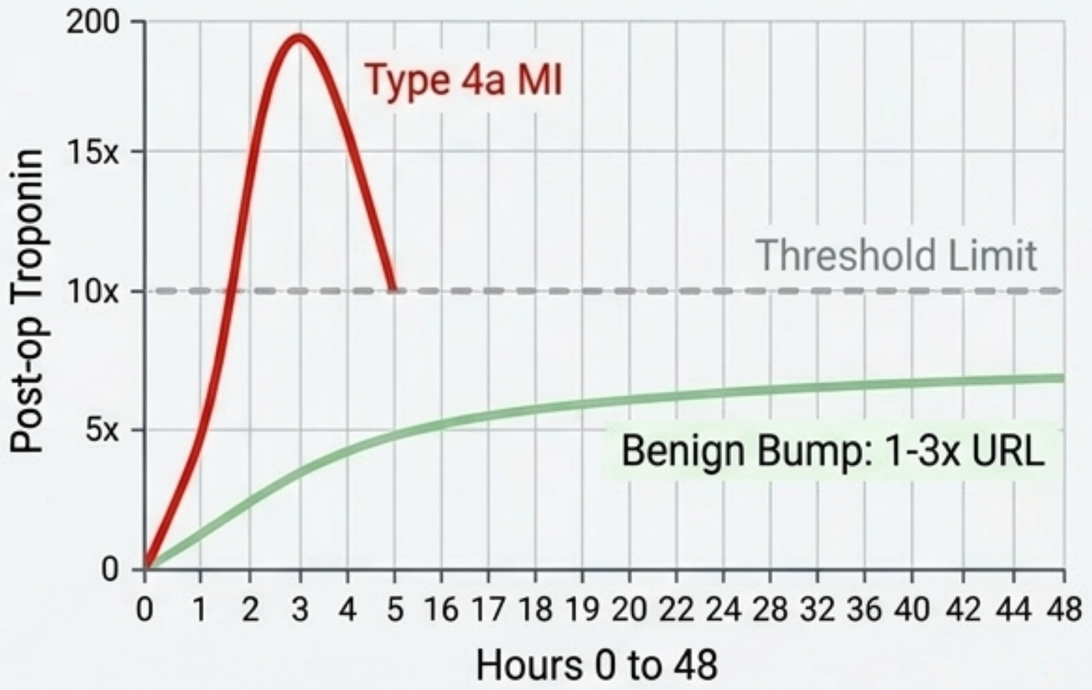
In-Stent Restenosis (ISR)

- **Rates:** DES 3-8%, BMS 20-30%.

First Line (DES-ISR): Drug-Coated Balloon (DCB) angioplasty (SeQuent Please). Delivers paclitaxel without adding metal layers.

Refractory/Diffuse: Repeat DES using a heterogeneous (different drug) platform.

Type 4a MI Surveillance Curve



Threshold: >5x 99th percentile URL + ischaemic symptoms/ECG changes = Type 4a MI. Occurs in 5-30%.
Management: Re-angiography if ECG changes present.

DAPT Timelines: Balancing Ischaemia and Bleeding

1 Month - High Bleeding Risk / BMS

For BMS (rare) or newer-generation DES (SYNERGY/Onyx) in high bleeding risk patients (PRECISE-DAPT guided). Preferred: Clopidogrel.

6 Months - Stable CAD, DES

Standard for stable CAD with low bleeding risk. Preferred: Clopidogrel or Ticagrelor.

12+ Months - ACS / STEMI / Complex PCI

Mandatory post-ACS or complex LMS/SYNTAX >=23. Preferred: Ticagrelor or Prasugrel.

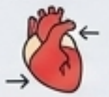
The Interventional Pharmacopeia

Aspirin

Loading: 300mg / **Maint:** 100mg OD lifelong.

(PBS General).

Ticagrelor (Brilinta)



Loading: 180mg / **Maint:** 90mg BD.

Key Side Effect: Dyspnoea (10-15%).

(PBS General for ACS).

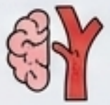
Clopidogrel (Plavix)

Loading: 600mg / **Maint:** 75mg OD.

Limitation: CYP2C19 poor metabolisers (up to 20% Asians) have reduced activation.

(PBS General).

Prasugrel (Effient)



Loading: 60mg / **Maint:** 10mg OD.

Contraindicated: Hx of Stroke/TIA, Age >=75 (relative).

(PBS Authority).

Unfractionated Heparin

70-100 units/kg IV bolus. Target ACT 250-350s.

Reversal: Protamine sulfate.

Physiological Nuance: High-Risk Populations

The Elderly (>=75 years)

Caution: Prasugrel contraindicated/dose-reduced (5mg) due to intracranial bleeding risk.

Action: Transradial mandatory. Assess Clinical Frailty Scale. Consider short DAPT (1-3mo) + PPI cover.

Renal Impairment (eGFR <30)

Caution: Contrast-Induced AKI. N-acetylcysteine has no proven benefit (ACT trial).

Action: Pre-hydrate with isotonic saline (1mL/kg/hr for 6-12h). Strict contrast volume limit (<3.7 x eGFR). CABG carries prohibitive risk for dialysis patients.

Hepatic Impairment (Child-Pugh B/C)

Caution: Ticagrelor contraindicated in severe impairment. Clopidogrel/Prasugrel require caution. High baseline bleeding risk.

Action: Transradial access and PPI cover are mandatory.

Clinical Nuance: Unique Dynamics

Pregnancy (STEMI/High-Risk ACS)

Femoral access preferred to allow abdominal lead shielding.

Avoid Ticagrelor/Prasugrel (Category B3).

Aspirin (Cat A) and **Heparin** (doesn't cross placenta) are safe.

Stent: BMS historically, but short-DAPT DES now feasible.

Paediatrics (Specialist Centers Only)

Kawasaki Disease: Giant aneurysms (>8mm) risk thrombosis requiring PCI/CABG later.

ALCAPA (Anomalous left coronary) requires surgical reimplantation.

Immunocompromised

HIV: Ritonavir (protease inhibitor) inhibits CYP3A4. Contraindicated with Ticagrelor.

Transplants: Cardiac allograft vasculopathy treated with PCI (DES). Everolimus immunosuppression may slow CAV.

Bridging the Gap: Aboriginal & Torres Strait Islander Health

1.7x higher revascularisation rate. Later presentation, **higher STEMI/Cardiogenic shock burden**. **38% live in remote/very remote regions**.

Geographic & Retrieval Infrastructure

➡ Overcoming 2-6 hour transfer times.

Statewide STEMI networks, telehealth-guided thrombolysis, and aeromedical retrieval systems.

Cultural Safety & Consent

✅ Integration of Aboriginal Health Workers.

Culturally appropriate informed consent (in language).

Recognition of family decision-making and sorry business.

Primary Care & Adherence

✅ Closing the Gap PBS co-payments for essential DAPT/Statins.

Structured 4-6 week specialist telehealth review.

ACCHO-led, culturally adapted cardiac rehabilitation.