CAROTID ARTERY REVASCULARIZATION IN CORONARY ARTERY DISEASE

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I CORE CLINICAL PARADIGM AND PATHOPHYSIOLOGY OF POST-CABG STROKE

- **Reversal of Routine Prophylactic Carotid Surgery:** Concomitant severe (>70 percent) internal carotid artery (ICA) stenosis is present in 6 to 8 percent of patients undergoing Coronary Artery Bypass Grafting (CABG). Historically, routine prophylactic Carotid Endarterectomy (CEA) or Carotid Artery Stenting (CAS) was performed before or during CABG; contemporary **ESC (2018 Myocardial Revascularization / 2024 PAAD) and ACC/AHA Guidelines** establish that **routine prophylactic carotid revascularization in neurologically asymptomatic patients with unilateral carotid stenosis does NOT reduce perioperative stroke and is NOT recommended (Class III)**.
- **Why Routine Prophylactic Carotid Intervention Fails to Prevent CABG Stroke:**
  - **Predominance of Aortic Atheroembolism and Atrial Fibrillation (>85 to 90 Percent):** The vast majority of strokes complicating CABG occur either **outside the territory of the stenosed carotid artery** or more than 24 hours post-operatively, driven by (1) **atheroembolism from surgical manipulation, cannulation, and cross-clamping of a calcified/atherosclerotic ascending aorta**, and (2) **post-operative Atrial Fibrillation**.
  - **Rarity of Ipsilateral Hemodynamic Watershed Hypoperfusion (<10 Percent):** Less than 10 percent of post-CABG strokes result from low-flow watershed hypoperfusion distal to an asymptomatic unilateral carotid stenosis during cardiopulmonary bypass.

II LANDMARK CLINICAL TRIAL EVIDENCE

- **CABACS Trial (Weimar et al., *Stroke* 2017 & 5-Year Follow-Up — Knipp et al., *Stroke* 2022):**
- **Design:** Multicenter randomized controlled trial comparing **synchronous CEA + CABG versus isolated CABG alone** in patients with **high-grade (>=80% ECST / >=70% NASCET) asymptomatic carotid artery stenosis**.
- **Results:** The 30-day rate of composite non-fatal stroke or death was numerically **higher with combined CEA + CABG than with isolated CABG alone (18.5 percent vs. 9.7 percent)**, and at **5-year follow-up**, there was **no significant difference in stroke or death** —confirming that prophylactic synchronous CEA in asymptomatic carotid stenosis adds procedural hazard without neuroprotection.
- **CREST Trial (Brott et al., *NEJM* 2010 — CEA vs. CAS Periprocedural Trade-Off):**
- **Key Finding Crucial for CAD Patients:** While overall 4-year composite endpoints were similar between CEA and CAS, during the 30-day periprocedural period, **CEA carried a significantly higher risk of Myocardial Infarction (2.3 percent vs. 1.1 percent; p = 0.03)**, whereas **CAS carried a significantly higher risk of periprocedural Stroke (4.1 percent vs. 2.3 percent; p = 0.01)**.
- **ACST-2 Trial (*Lancet* 2021):** Confirmed in 3,625 asymptomatic patients without imminent cardiac surgery that CEA and CAS have comparable 1% disabling stroke/death risk and identical 5-year non-procedural stroke rates.

III GUIDELINE INDICATIONS FOR CAROTID REVASCULARIZATION IN PATIENTS UNDERGOING CABG (ESC 2018 / 2024 PAAD GUIDELINES)

- **Mandatory Multidisciplinary Heart-Brain Team Consultation (Class I):** Every patient scheduled for CABG with severe carotid disease must be evaluated by a multidisciplinary team including a **neurologist**, cardiologist, cardiac surgeon, and vascular specialist.

Neurological Status (TIA or Stroke Within Past 6 Months)	Carotid Anatomy (NASCET Criteria)	ESC Guideline Class & Level of Evidence	Clinical Recommendation & High-Risk Modifiers
Symptomatic (TIA or retinal/hemispheric stroke within 6 months)	**70% to 99% Carotid Stenosis**	**Class IIa (Level B)** — *Should Be Considered* (ESC 2018 covers 50–99%)	Carotid revascularization (**CEA preferred over CAS** or staged/synchronous per urgency) is indicated to prevent recurrent ipsilateral stroke
Symptomatic (TIA or stroke within 6 months)	**50% to 69% Carotid Stenosis**	**Class IIa (Level B)** — *Should Be Considered*	Consider carotid revascularization depending on patient-specific surgical/clinical risk
Asymptomatic (No neurologic symptoms in past 6 months)	**Unilateral 70% to 99% Carotid Stenosis**	**Class III (Level B)** — *Routine Prophylactic Revascularization NOT Recommended*	Proceed directly to **CABG alone** with optimal medical therapy and mean arterial pressure >70 mmHg on bypass (**CABACS Trial**)
Asymptomatic (Bilateral Severe or Contralateral Occlusion)	**Bilateral 70% to 99% Stenosis**, OR **70% to 99% Stenosis + Contralateral Total Occlusion**	**Class IIb (Level C)** — *May Be Considered*	May be considered selectively **only** if >=1 high-risk stroke feature is present (**silent ipsilateral infarct on brain CT/MRI, intraplaque hemorrhage/ulceration, impaired cerebral vascular reserve, or progression**)

IV STRATEGIC TIMING AND MODALITY SELECTION WHEN BOTH REQUIRE REVASCULARIZATION

- **Clinical Principle:** When carotid revascularization is indicated (e.g., recent symptomatic TIA/stroke with 70–99% ICA stenosis), the choice between **staged vs. synchronous** and **CEA vs. CAS** is dictated by **which vascular bed is more clinically unstable**:
- **Staged CEA First, Followed by CABG:** Preferred when the patient has **acute/recent neurological symptoms (crescendo TIA or minor stroke)** with **stable multivessel CAD**; carries a risk of **perioperative myocardial infarction during the CEA** if severe Left Main or unstable angina is present.
- **Synchronous (Simultaneous) CEA + CABG Under Single Anesthesia:** Performed by completing the carotid endarterectomy prior to sternotomy/cardiopulmonary bypass when **both territories are unstable** (e.g., recent TIA/stroke **plus** ACS, critical Left Main stenosis, or refractory angina).
- **Staged or Hybrid Carotid Artery Stenting (CAS) + CABG (The DAPT Bleeding Trap):**
  - **The Pharmacological Dilemma:** Carotid Artery Stenting mandates **4 weeks of Dual Antiplatelet Therapy (DAPT: Aspirin + Clopidogrel)** to prevent acute carotid stent thrombosis. Deferring CABG for 4 weeks exposes an unstable CAD patient to fatal MI, whereas performing on-pump CABG under full DAPT markedly increases **major perioperative bleeding and re-exploration**.
  - **When CAS is Considered:** Reserved for patients with **hostile neck anatomy** (prior neck irradiation, radical neck dissection, high cervical bifurcation above C2, or contralateral vocal cord palsy) or when **single-stage hybrid CAS immediately followed by CABG** is performed in expert centers using carefully bridged antiplatelet/intravenous cangrelor or GP IIb/IIIa protocols.

V PERIOPERATIVE STROKE PREVENTION AND THE INDIAN CLINICAL CONTEXT

- **Selective Carotid Duplex Screening Before CABG (ESC 2018):** Routine carotid ultrasound in all CABG patients is not indicated; **Duplex Ultrasound is Class I in patients with TIA or stroke within 6 months**, and **may be considered (Class IIb) in those with a carotid bruit, age >=70 years, multivessel CAD or concomitant Peripheral Arterial Disease (PAD)**.
- **Addressing the True Culprit — Epiaortic Ultrasound and "Anaortic / No-Touch" Off-Pump CABG:** Because ascending aortic atheroma is the primary source of post-CABG stroke in Indian patients with diffuse calcific atherosclerosis, performing **intraoperative Epiaortic Ultrasound** before cannulation/clamping and utilizing **"Anaortic" (No-Touch Aorta) Off-Pump CABG with bilateral internal mammary artery (BIMA) composite T/Y grafts** is far more effective at preventing perioperative stroke than prophylactic CEA.
- **Excluding Takayasu Arteritis in Young Indian Patients:** In young Indian patients (especially women under 40 years) presenting with **concomitant carotid stenosis/bruits and ostial coronary angina**, **Takayasu Arteritis (Type I / Type V aortoarteritis)** must be excluded via CTA/PET-CT and inflammatory markers (ESR/hs-CRP). Performing surgical or endovascular revascularization during **active vascular inflammation** carries a very high rate of graft occlusion and anastomotic pseudoaneurysm; inflammation must first be suppressed with **corticosteroids and steroid-sparing immunosuppressants** unless an acute life- or organ-threatening emergency mandates intervention.

KEY REFERENCES

- **Neumann FJ, Sousa-Uva M, Ahlsson A, et al.:** 2018 ESC/EACTS Guidelines on myocardial revascularization, *European Heart Journal*, 2019.
- **Mazzolai L, Teixido-Tura G, Lanzi S, et al.:** 2024 ESC Guidelines for the management of peripheral arterial and aortic diseases, *European Heart Journal*, 2024.
- **Weimar C, Bilbilis K, Rekowski J, et al. & Knipp SC, et al. (CABACS Trial Investigators):** Safety of Simultaneous Coronary Artery Bypass Grafting and Carotid Endarterectomy Versus Isolated Coronary Artery Bypass Grafting: A Randomized Clinical Trial (and 5-Year Follow-Up), *Stroke*, 2017 / 2022.
- **Brott TG, Hobson RW II, Howard G, et al. (CREST Investigators):** Stenting versus Endarterectomy for Treatment of Carotid-Artery Stenosis, *New England Journal of Medicine*, 2010.