Carotid and vertebral atherosclerosis

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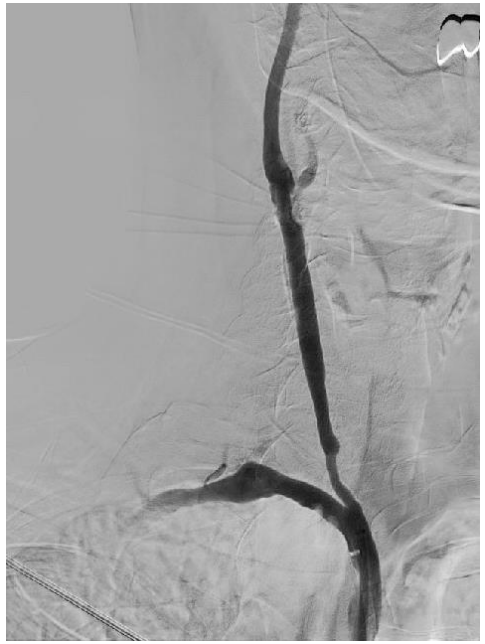
HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

Carotid stenosis

- Ischemic stroke
  - ~800,000 strokes annually in the United States
  - 10-20% attributed to carotid disease



CMS indications

- March 2005
  - ≥70% stenosis, symptomatic
- April 2007
  - Petition to expand indications denied
- October 2008
  - Petition to expand indications denied
- June 2022
  - Formal request from Multispecialty Carotid Alliance for expansion of CAS indications
    - In favor: SCAI, SIR, SNIS
    - Opposed: SVS
  - October 2023 guideline revision:
    - ≥50% stenosis, symptomatic
    - ≥70% stenosis, asymptomatic

Hakimi 2025, *Annals Vasc Surg*

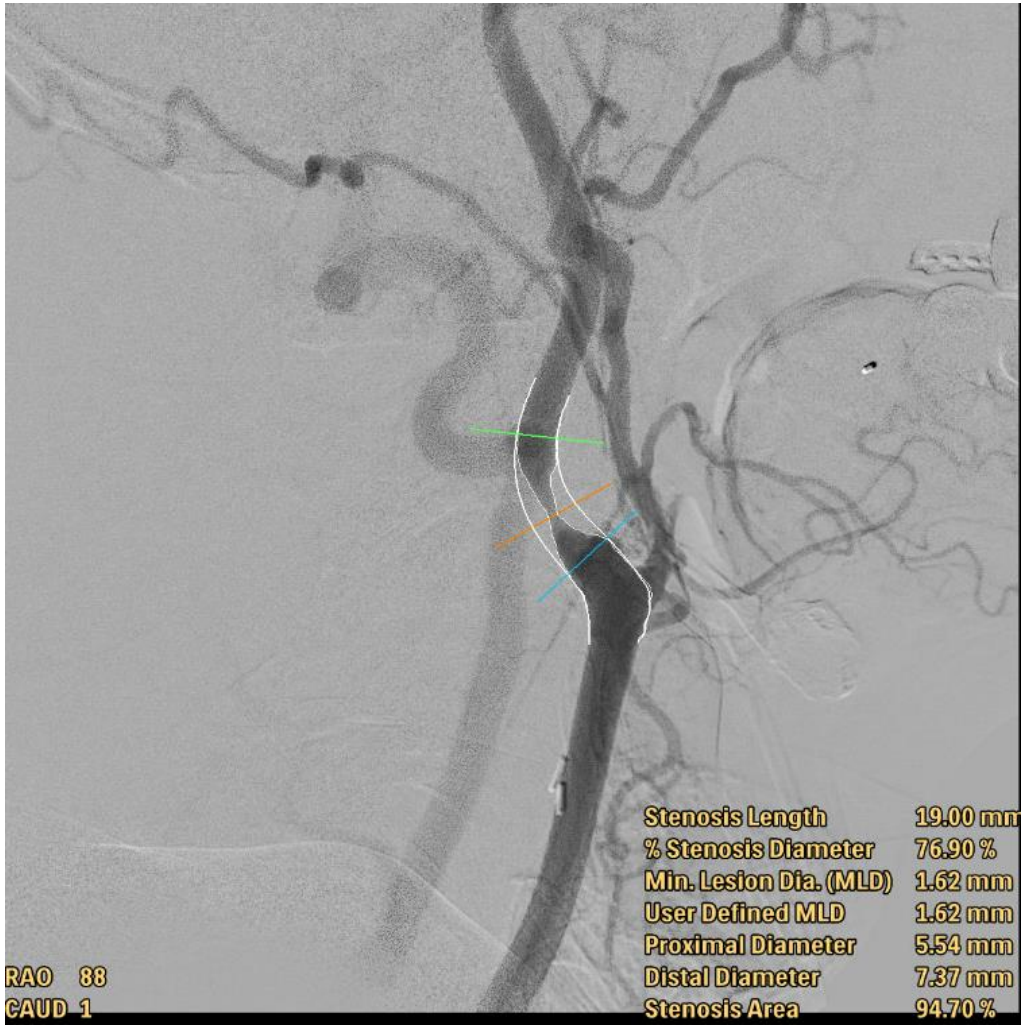
Carotid stenosis

- Atherosclerotic disease
  - Symptomatic
  - Stroke, TIA, dizziness, syncope, vision loss…

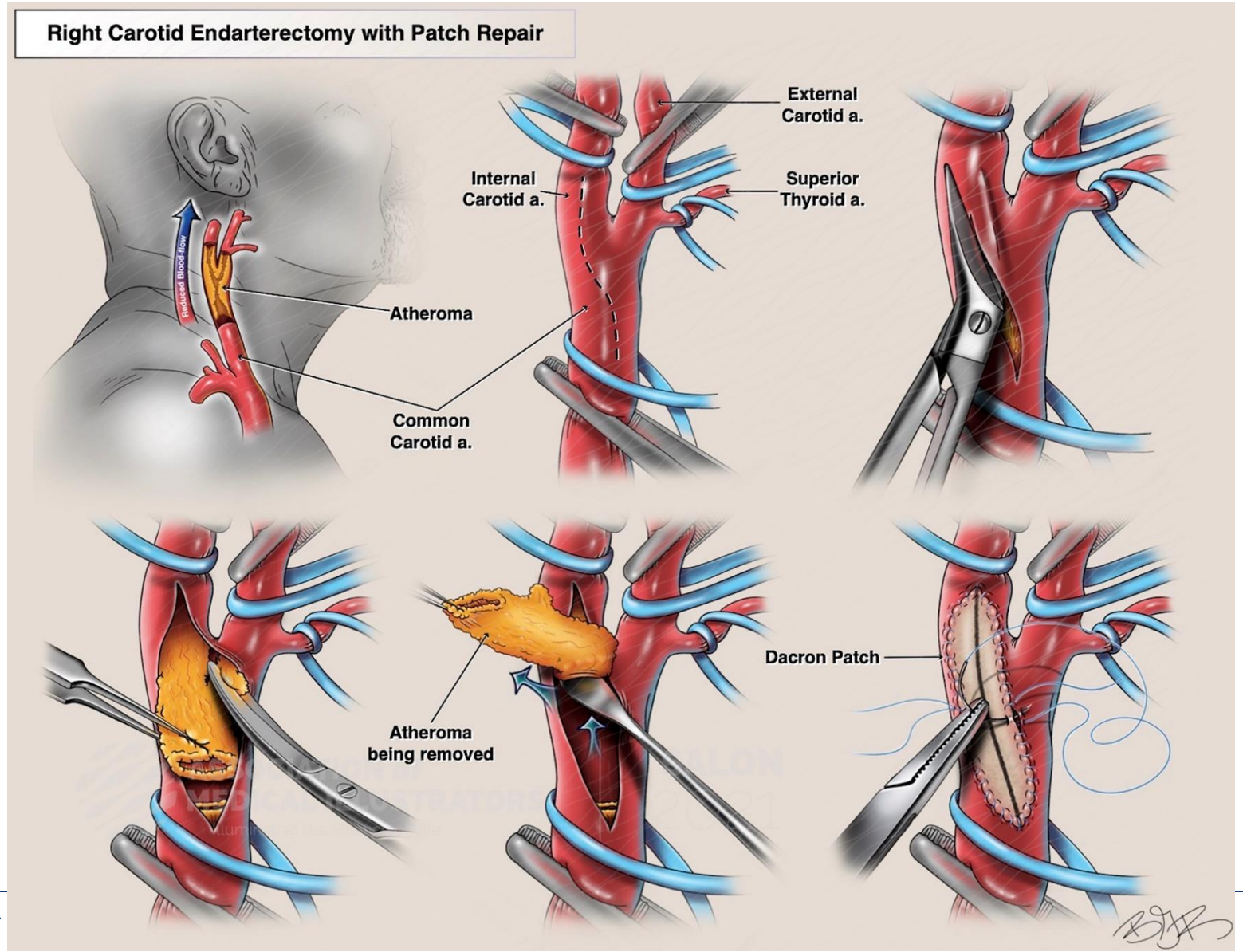
Carotid stenosis

- Treatment options
  - Medical management
  - Antiplatelet, lipid lowering agents, HTN management
  - Lifestyle modification

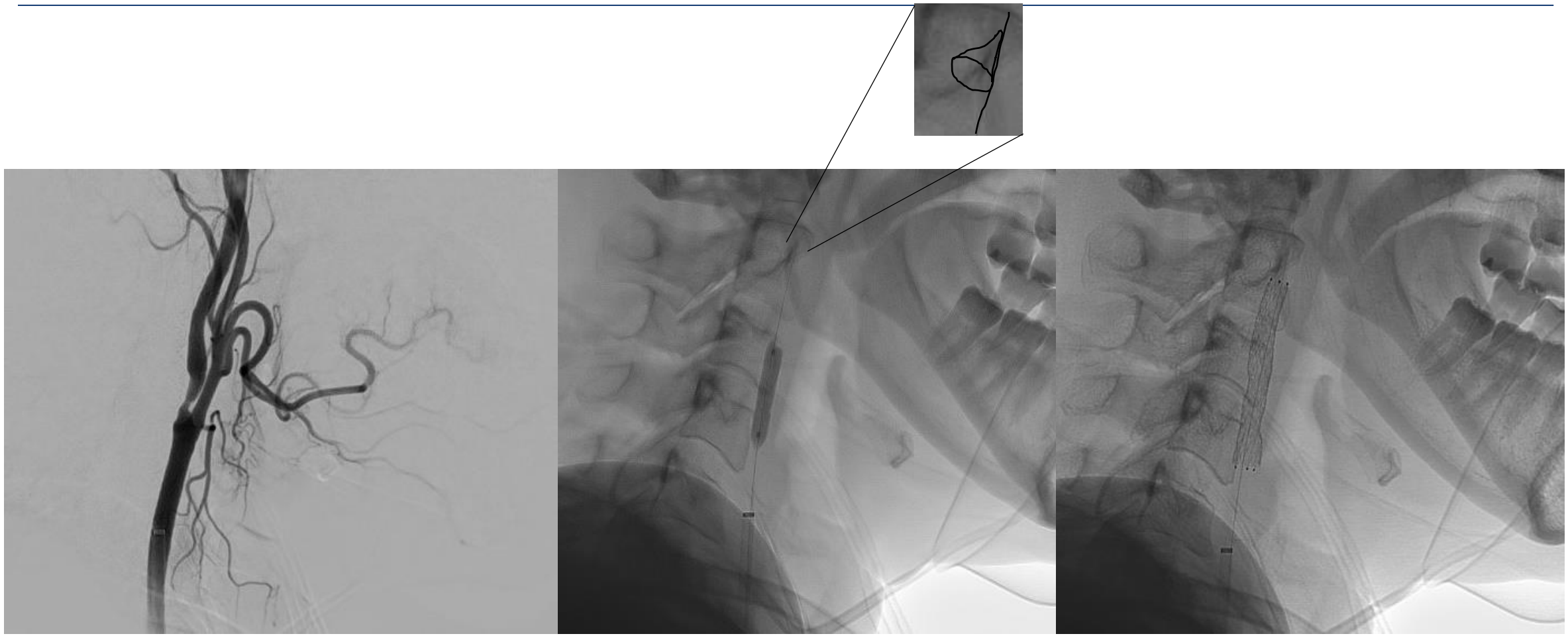
  - Carotid endarterectomy (CEA)
  - Carotid angioplasty and stenting (CAS)
  - Transcarotid artery revascularization (TCAR)



Carotid endarterectomy (CEA)



Carotid angioplasty and stenting (CAS)

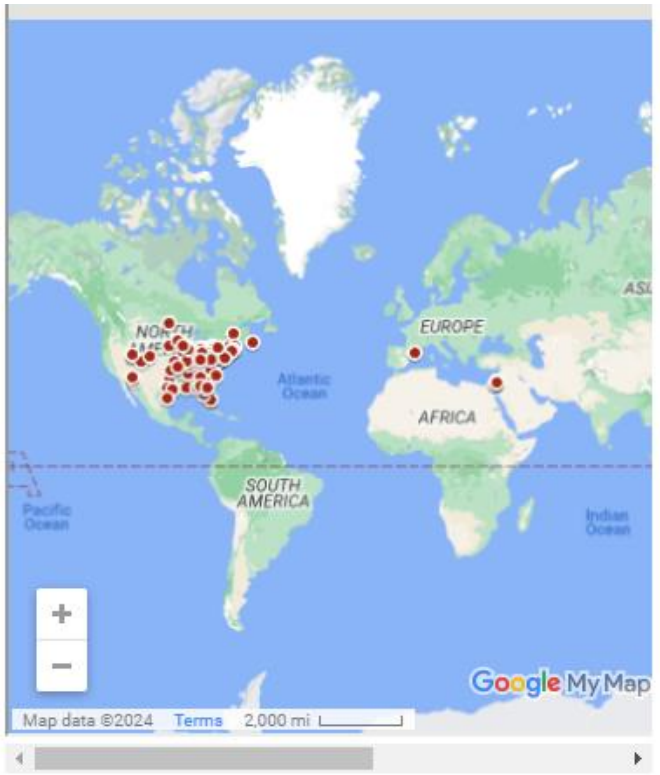


The Great Debate

- CAS vs CEA (+MMM)
  - NASCET 1991
    - 659 patients ipsilateral stroke within 6 months
    - CEA 17% ARR stroke at 2 years vs medical management
  - CREST 2010
    - 2502 patients moderate to high-grade asymptomatic stenosis
      - 30 days: CAS higher risk of stroke (4.1% vs 2.3%) and death (0.7% vs 0.3%), CEA higher risk of MI (1.1% vs 2.3%)
      - 4 years: Composite risk (stroke/MI/death in 30 days plus stroke thereafter) 7.2% vs 6.8% *p*=0.51; stroke-only risk equivalent (2.0% vs 2.4% *p*=0.85)
  - ACT-1 2016
    - 1453 patients asymptomatic stenosis with EPD, randomize 3:1 CAS vs CEA
    - Composite periprocedural stroke/MI/death or stroke at 5 years equivalent (3.8% vs 3.4%, p=0.69)

The Great Debate

- CREST-2
  - Moderate/long-term equivalence of composite outcomes CEA and CAS
  - Maximal medical therapy vs intervention (CEA or CAS) for asymptomatic stenosis?
    - Enrollment complete: 2,486 patients CEA and CAS



142 CREST-2 Centers

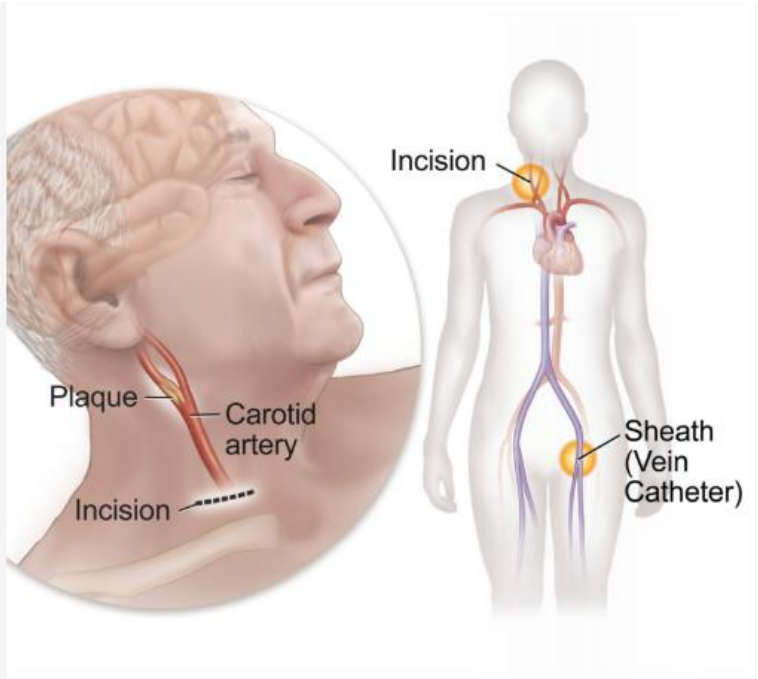
have enrolled a total of

2,486 of 2,480

CREST-2 Participants

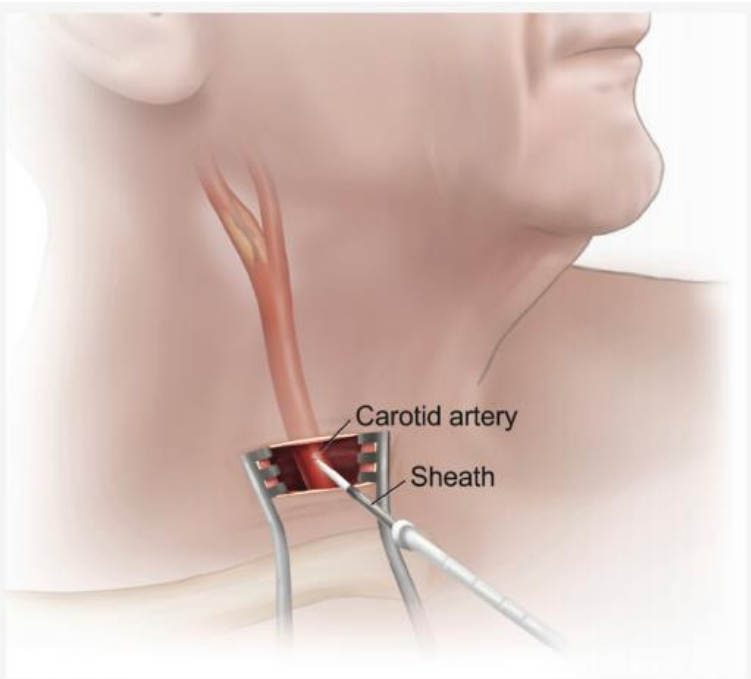
New player

- Transcarotid revascularization (TCAR)



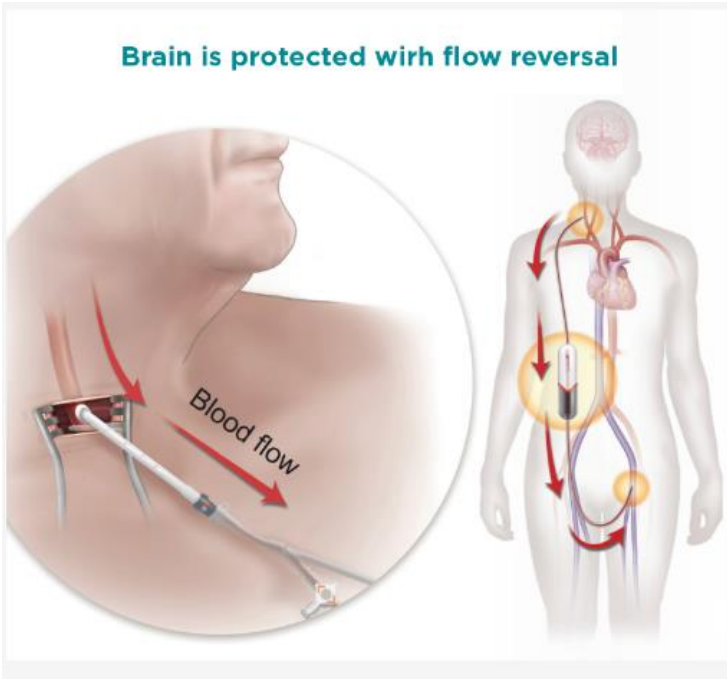
TCAR – Step 1

The surgeon exposes your carotid artery through a small incision in the side of your neck.



TCAR – Step 2

Your surgeon will cut and pull back the skin and muscles in your neck to access your carotid artery.

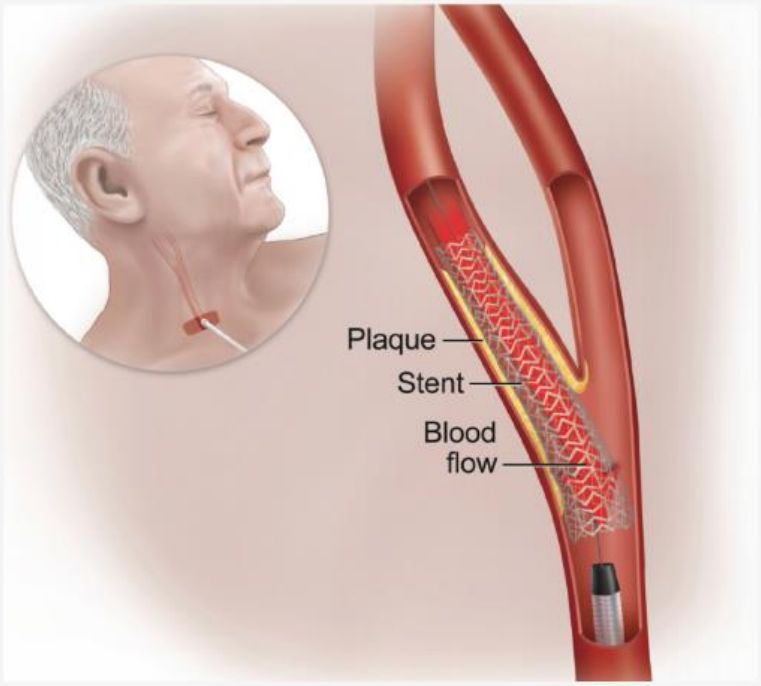


TCAR – Step 3

Blood flow is reversed away from the brain, and the blood is filtered and returned through the femoral vein in the thigh.

New player

- Transcarotid revascularization (TCAR)

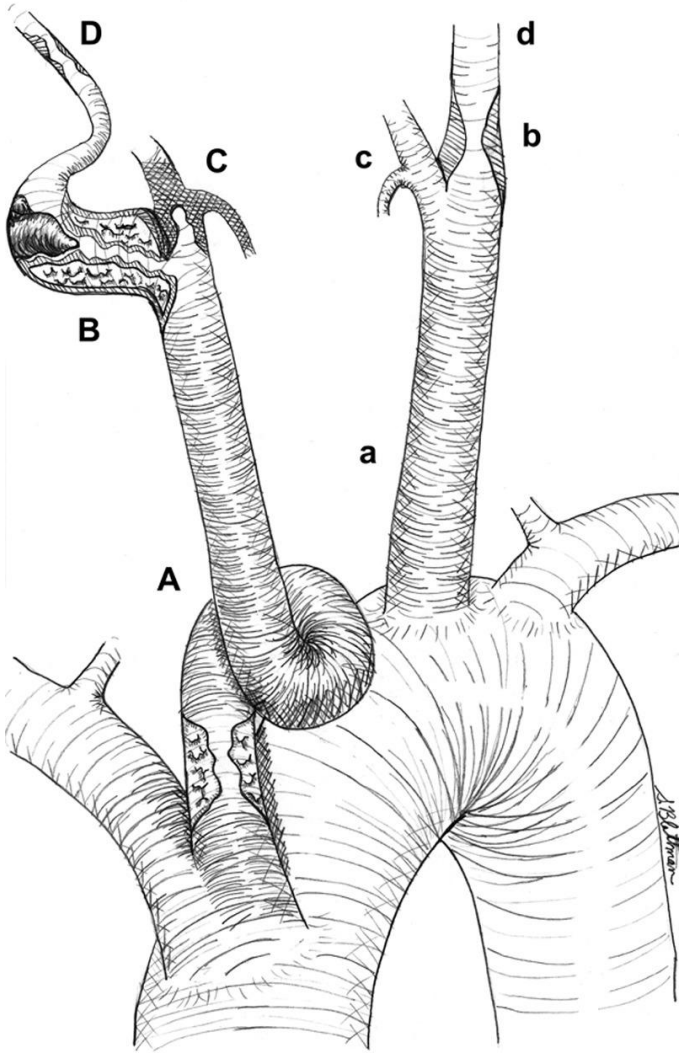


TCAR – Step 4
While blood flow is reversed, a stent is placed to stabilize plaque and minimize the risk of a future stroke.

TCAR – Step 5
Flow reversal is turned off, blood flow to the brain resumes its normal direction, and the incision is stitched.

Additional considerations

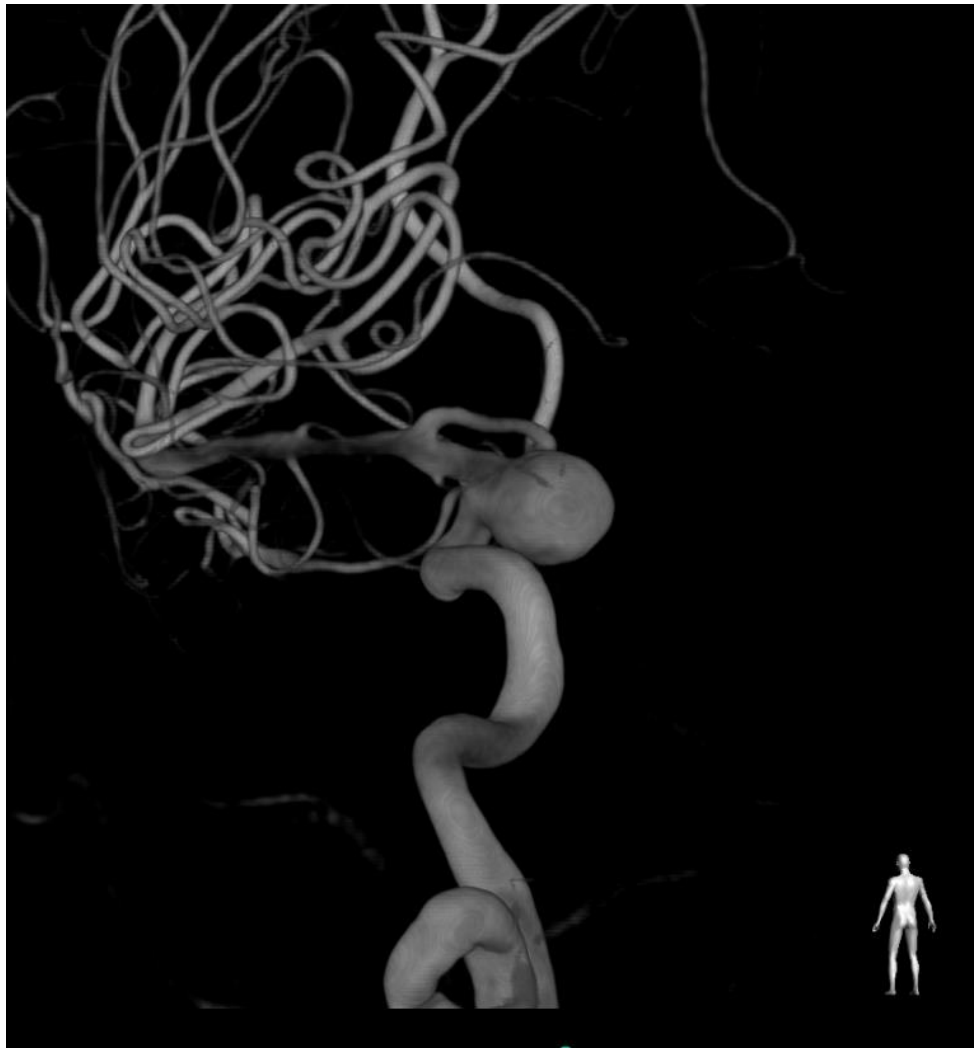
- Operative risk
- Anatomy
  - Aortic arch angles
  - Carotid/innominate tortuosity
  - High/low bifurcation
  - Distal disease
  - Contralateral disease
- AHA guidelines



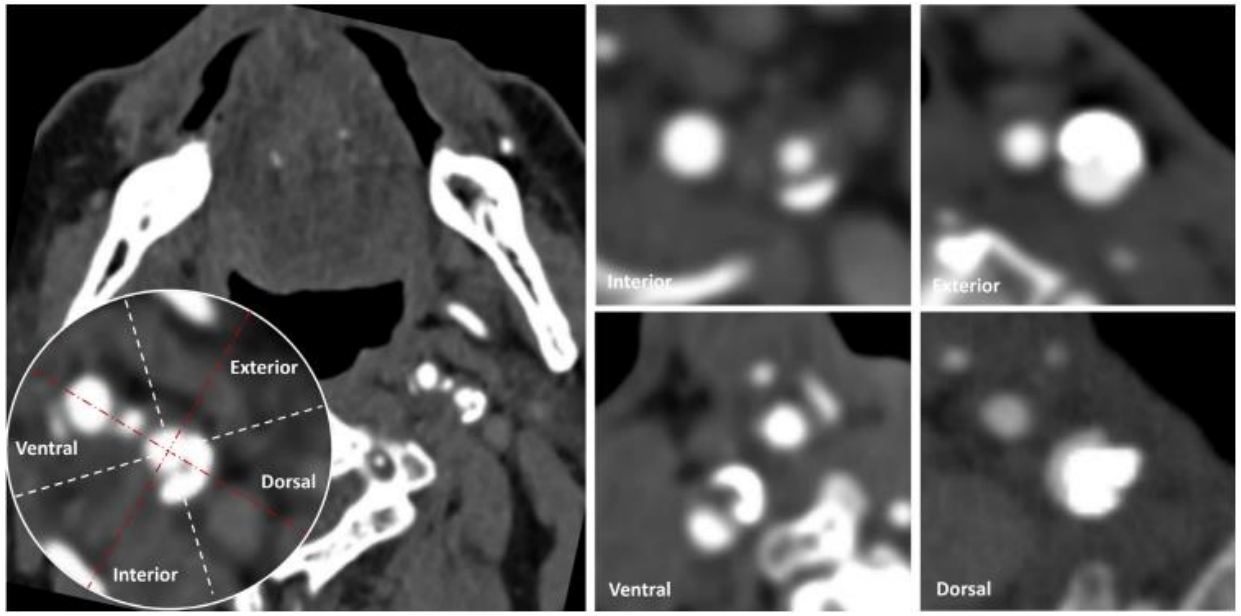
Spectrum of disease

- Traumatic
  - BCVI/Dissection
  - Transection
  - Pseudoaneurysm

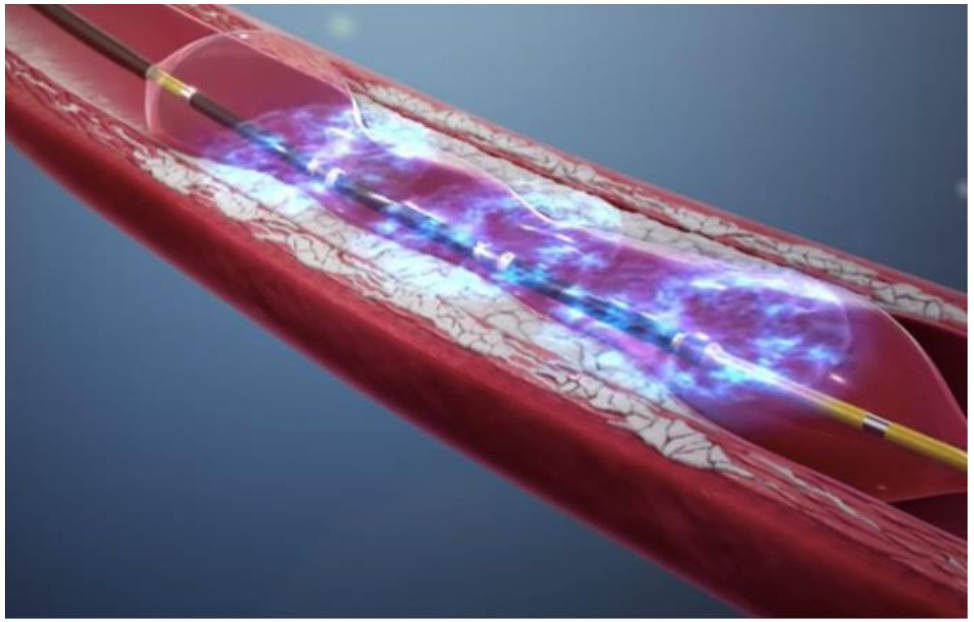
- Non-traumatic
  - Dissection
  - Atherosclerosis
  - Tandem occlusion
  - Hemorrhage
  - Aneurysm



Carotid stenosis – future directions



Geometric distribution of plaque calcification risk stratifications



Intravascular lithotripsy

Chen 2025, JNIS; Shockwave Medical

Carotid stenosis

- Ischemic stroke
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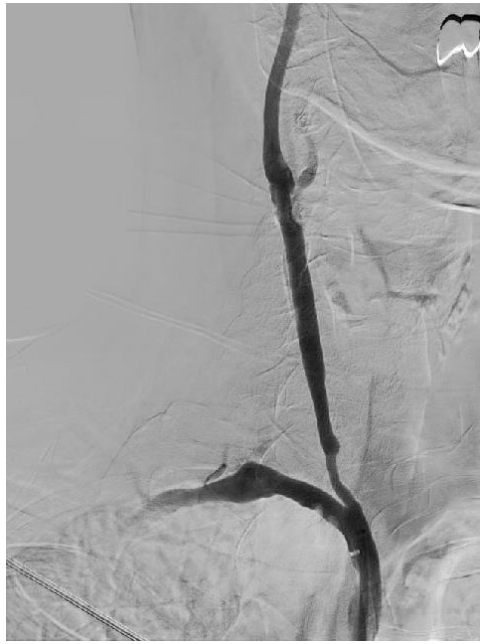
Car vs moose

Hanging attempt

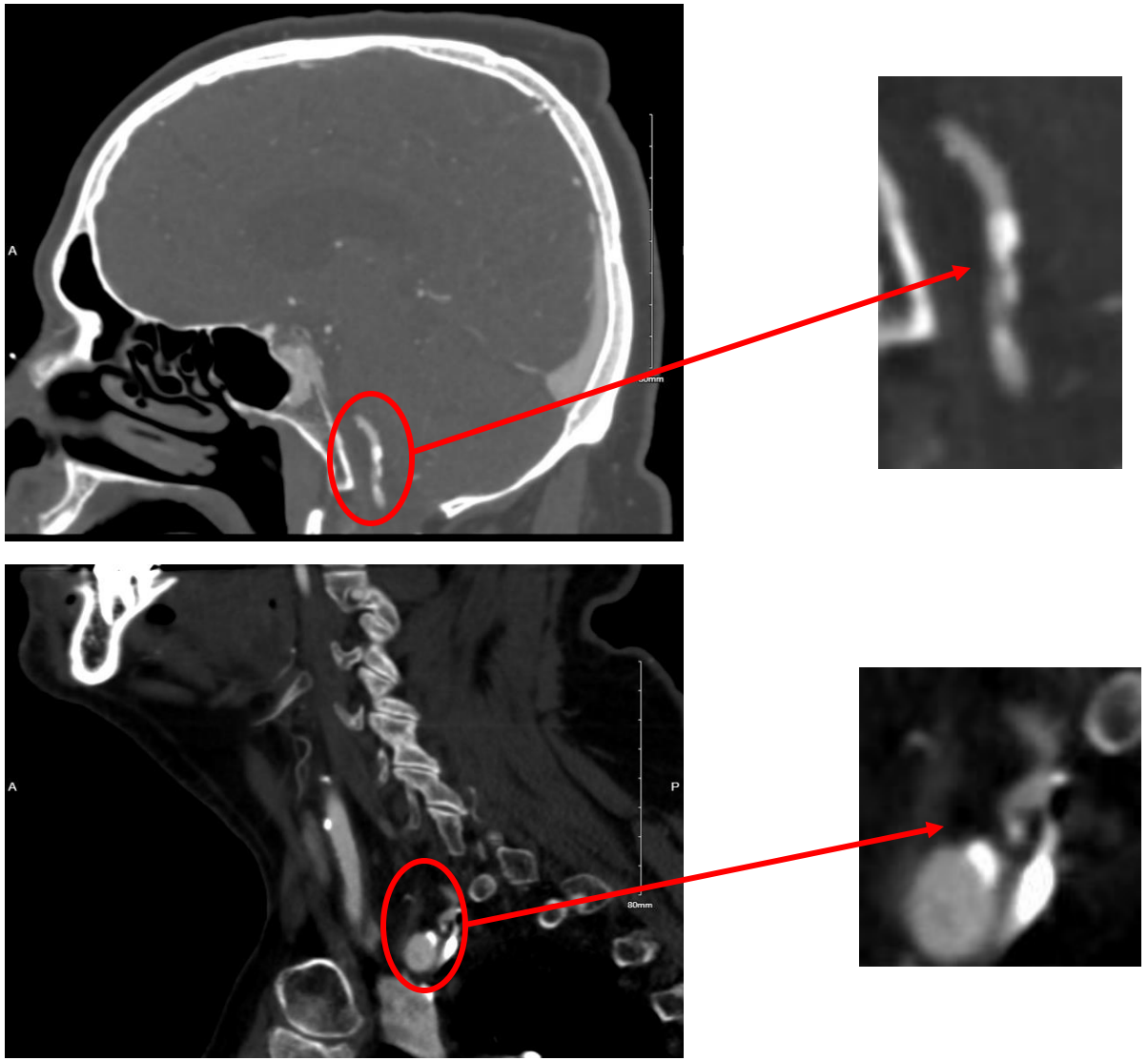
Tobacco/ICAD



Radiation

Vertebral artery disease

- Intracranial vs extracranial disease
  - VAST trial: 58 OMT, 57 stent (~80% extracranial)
    - Stroke, death, MI within 30 days: 2% OMT, 5% stent
  - VIST trial: 88 OMT, 91 stent (~80% extracranial)
    - Stroke within 3.5 months: 13.6% OMT, 5.5% stent (p=0.08)
    - Post-hoc analysis suggests per-procedural risk largely attributable to intracranial stenting



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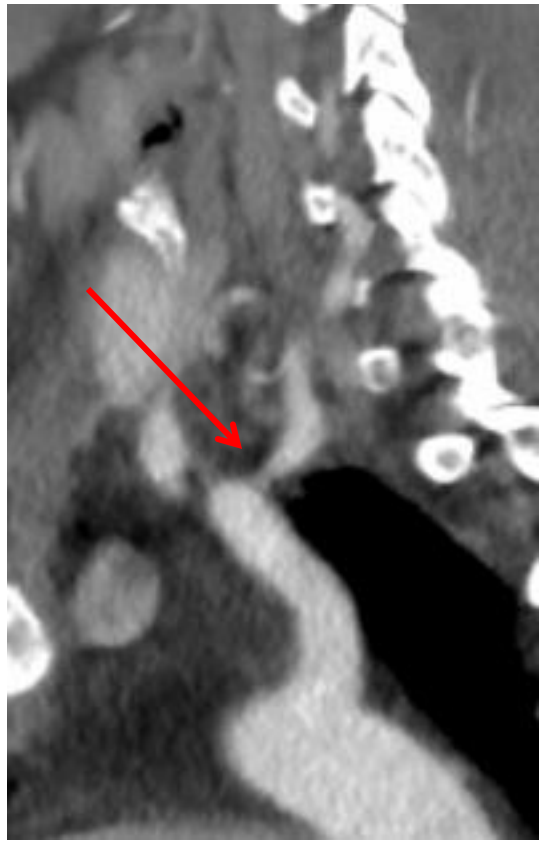

Thank you

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