

# Management of Carotid Disease

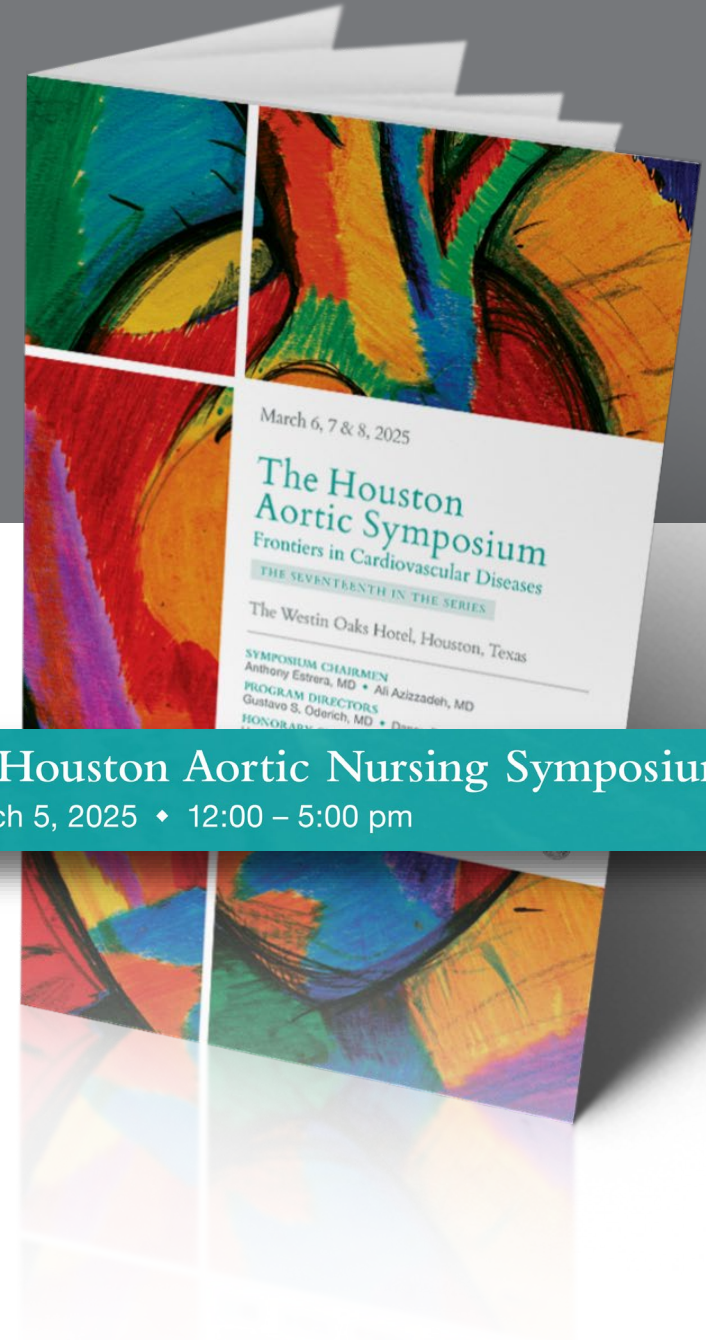
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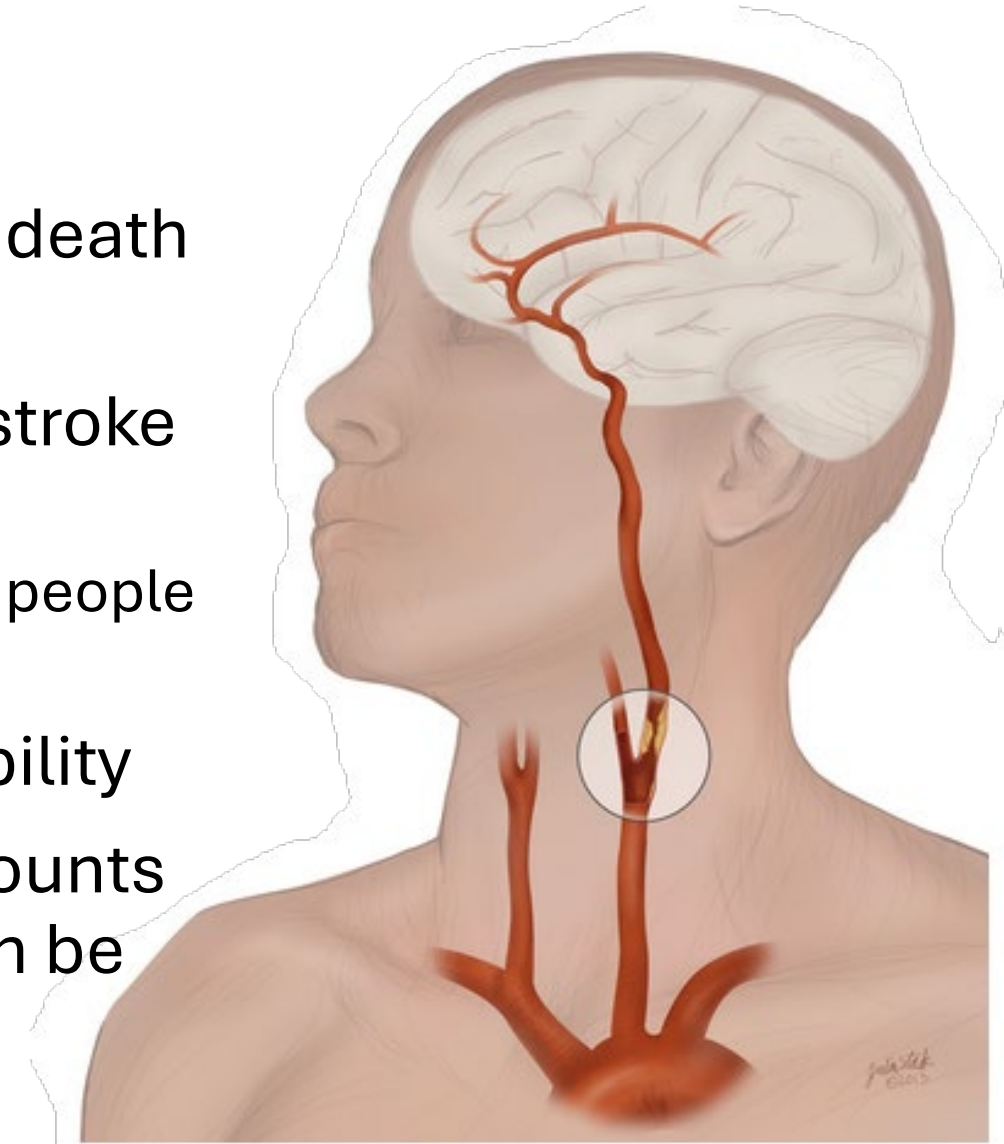
 **UTHealth Houston**  
McGovern Medical School



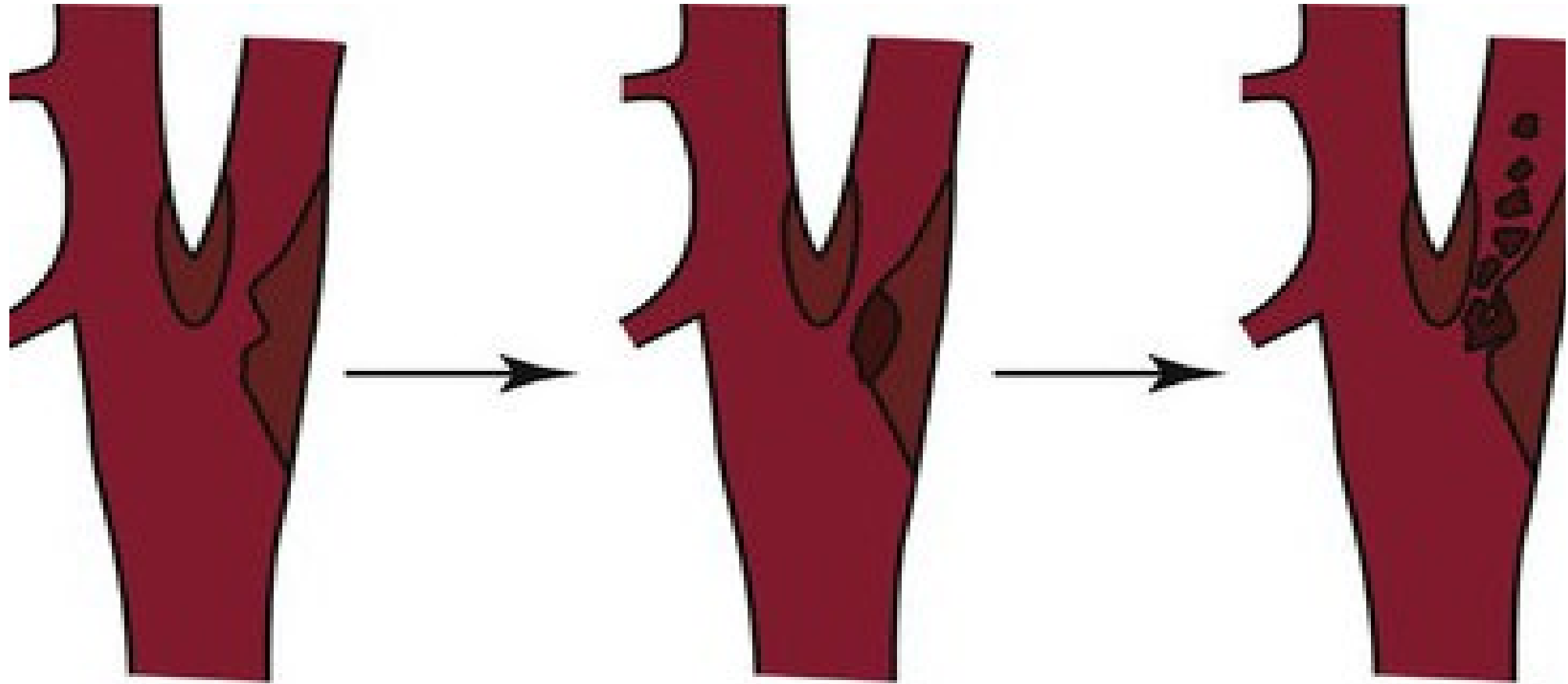
**7th Annual Houston Aortic Nursing Symposium**  
Wednesday, March 5, 2025 ♦ 12:00 – 5:00 pm

# Epidemiology

- Stroke is the 4th most common cause of death in the US in 2023
- Every year 795,000 people suffer from a stroke in the United States
  - In 2022, stroke resulted in the deaths of ~40 people out of 100,000
- Leading cause of serious long-term disability
- Extracranial atherosclerotic disease accounts for 8-15% of all ischemic strokes, and can be prevented



# Pathophysiology



Ulcer

Platelet  
deposition

Platelet  
emboli

# Risk Factors



## Modifiable

- HTN
- Smoking
- Hyperlipidemia
- Diabetes

## Non-Modifiable

- Age
- Gender: Males
- Family History

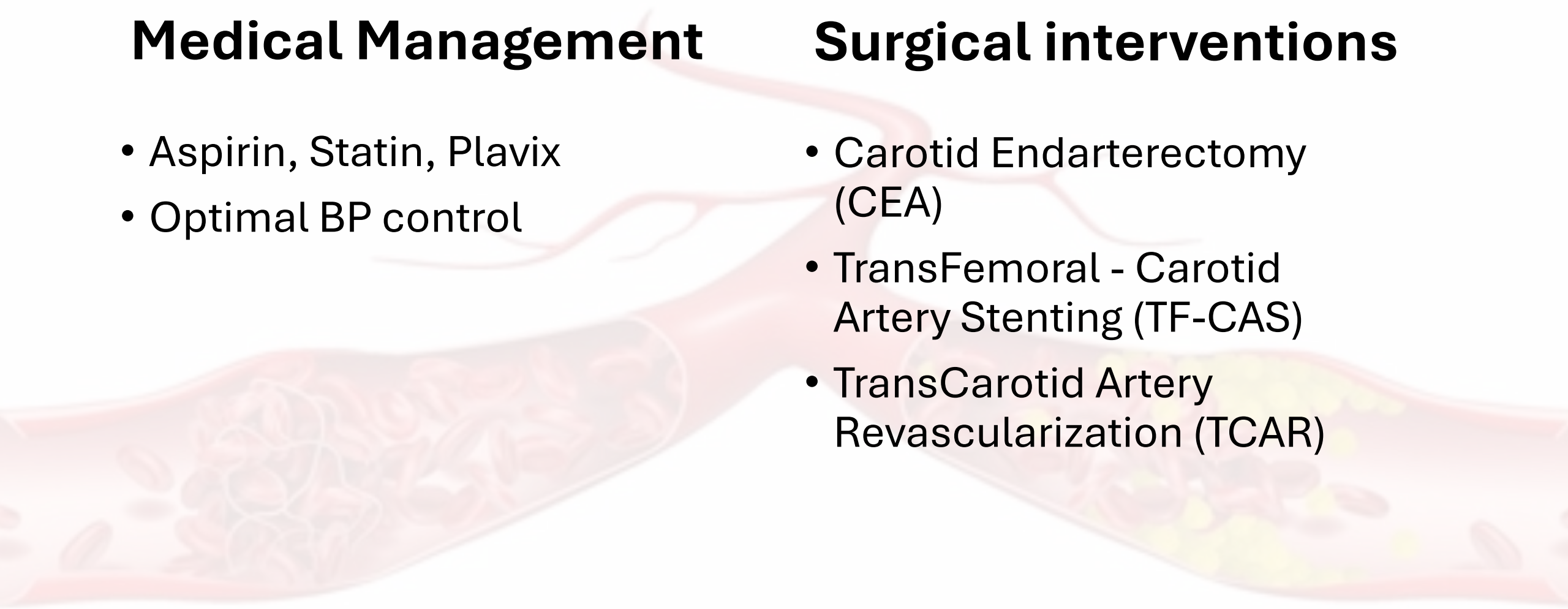
# Treatment Options

## Medical Management

- Aspirin, Statin, Plavix
- Optimal BP control

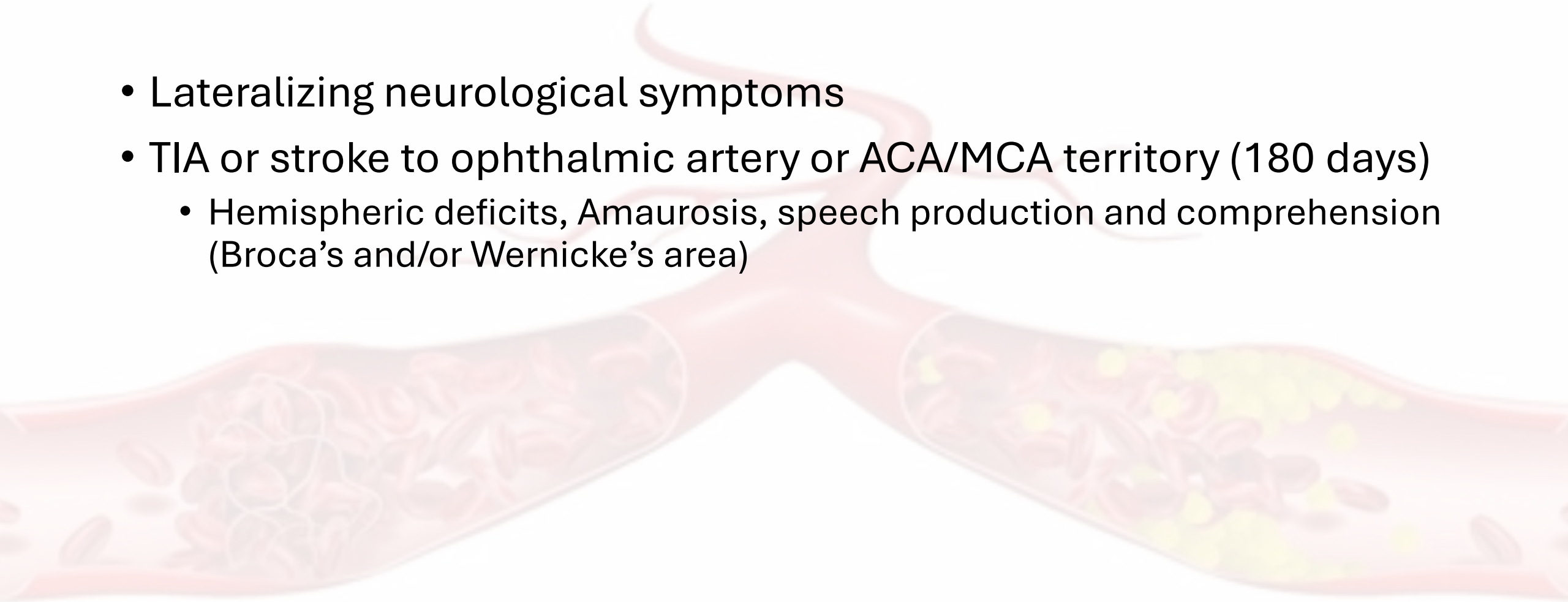
## Surgical interventions

- Carotid Endarterectomy (CEA)
- TransFemoral - Carotid Artery Stenting (TF-CAS)
- TransCarotid Artery Revascularization (TCAR)

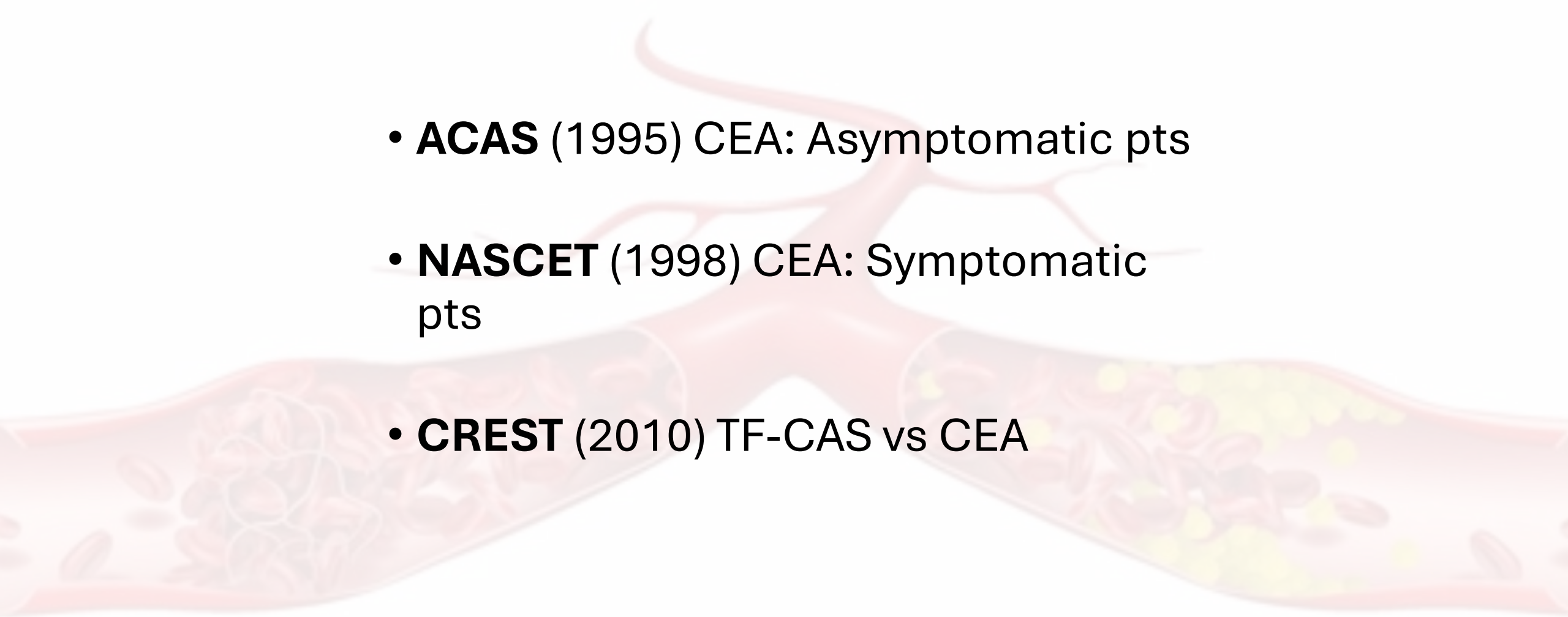


# Symptomatic Carotid Artery Stenosis

- Lateralizing neurological symptoms
- TIA or stroke to ophthalmic artery or ACA/MCA territory (180 days)
  - Hemispheric deficits, Amaurosis, speech production and comprehension (Broca's and/or Wernicke's area)



# Landmark Trials

- **ACAS** (1995) CEA: Asymptomatic pts
  - **NASCET** (1998) CEA: Symptomatic pts
  - **CREST** (2010) TF-CAS vs CEA
- 
- A detailed illustration of a blood vessel bifurcation. The vessel is shown in cross-section, with a central trunk that splits into two branches. The vessel walls are depicted in shades of red and pink. On the left branch, there is a large, irregular mass of white and yellowish material, representing a thrombus or plaque. On the right branch, there is a smaller, more organized mass of yellow and white material, also representing plaque. The overall scene is set against a light, hazy background.

# Asymptomatic Carotid Atherosclerosis Study (ACAS)

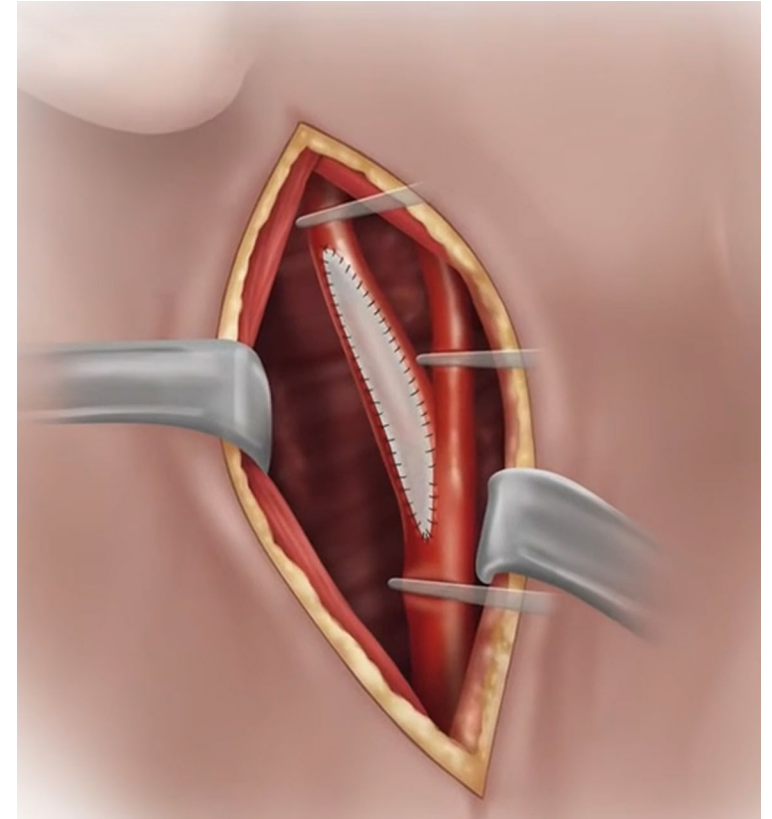
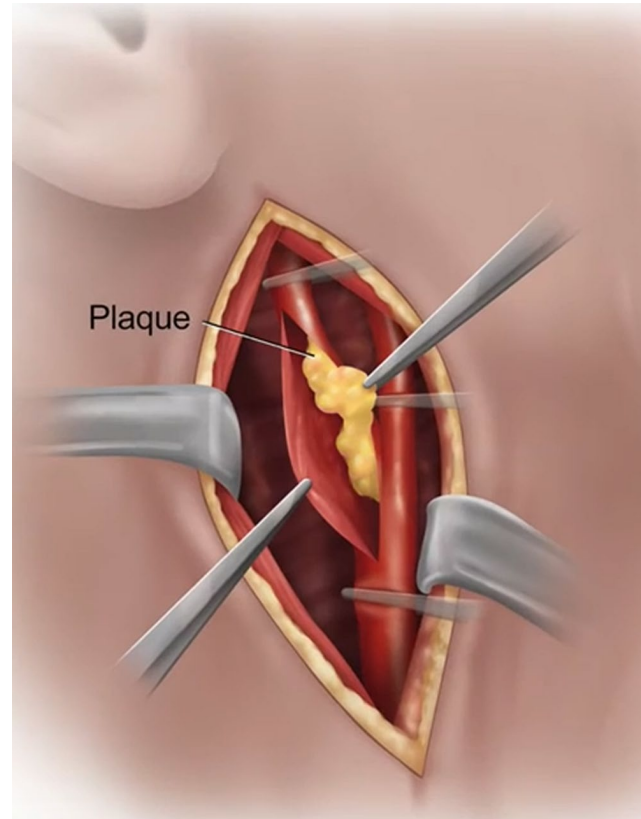
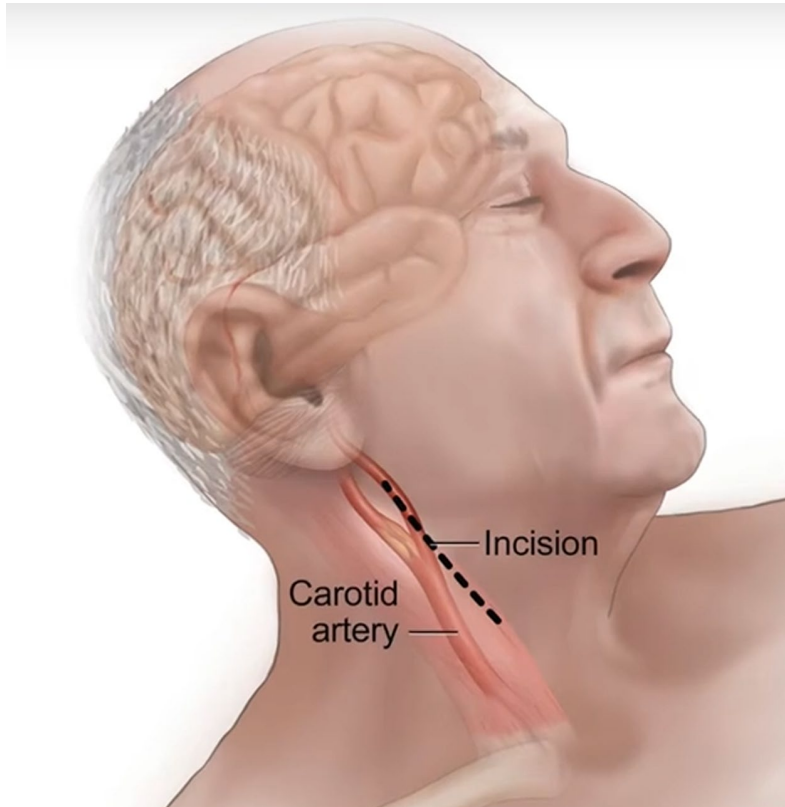
- 39 Medical Centers
- 1,662 patients
- Patients with ***asymptomatic*** carotid artery stenosis of 60% or greater who are good surgical candidates have reduced 5-year risk of ipsilateral stroke



# North American Symptomatic Carotid Endarterectomy Trial (NASCET)

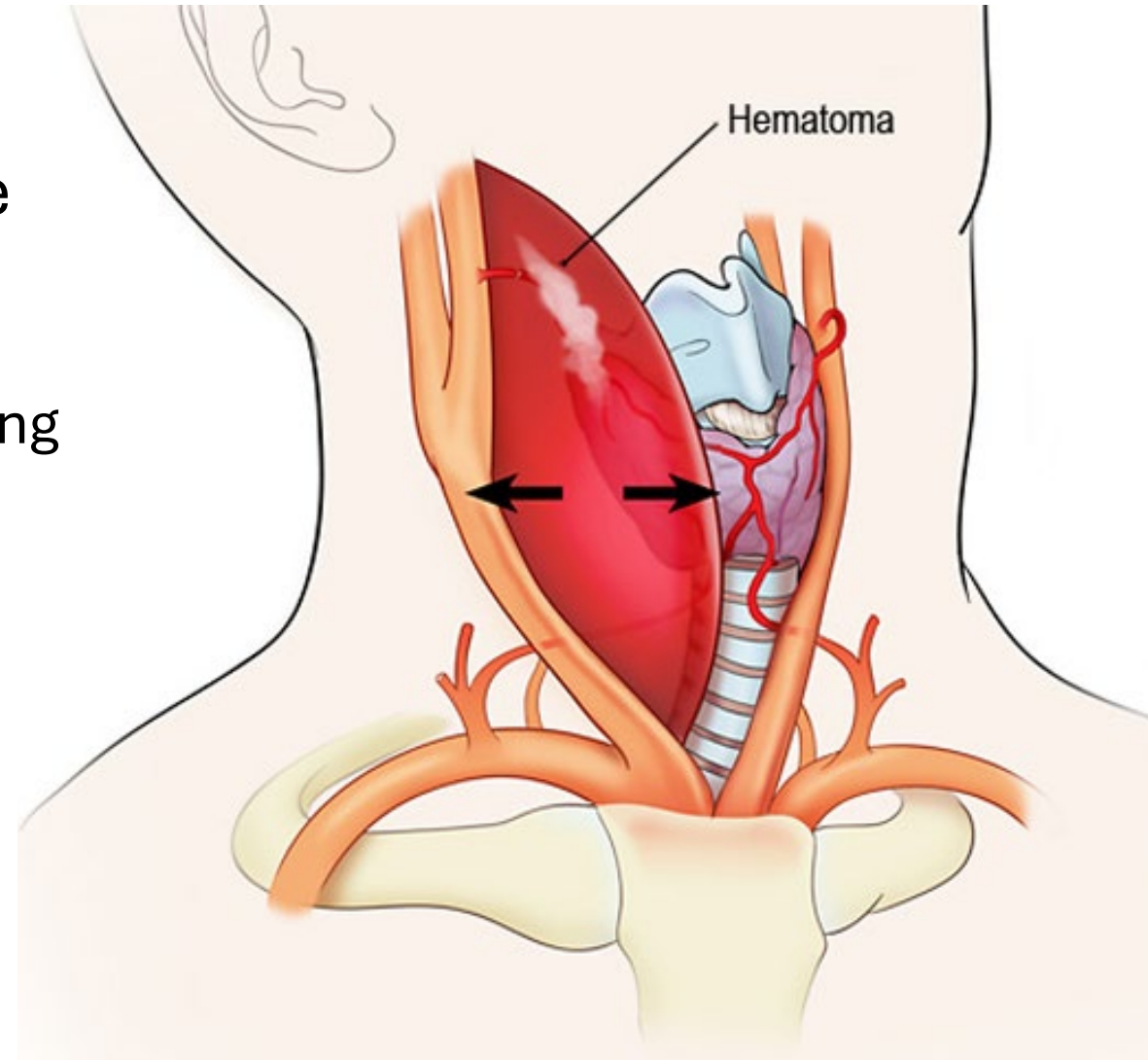
- 106 Medical Centers
- 2,226 patients
- CEA reduces the 5-year risk of death or stroke by 29% among patients with ***symptomatic*** high-moderate (50-69%) carotid stenosis.

# Carotid Endarterectomy



# Post-Operative Management

- Cardiac monitoring
- Neuro exams every few hours in the immediate post-operative period
  - Should include motor, strength in bilateral extremities, smile, and sticking out their tongue
- Pain
- JP drain output (if in place)
- Neck circumference



# Complications of CEA

- Stroke
  - 1-2%
- Nerve Injury
  - Most common complication
  - 5-20% in most retrospective studies
- Myocardial infarction
  - 25-50% of all perioperative deaths
- Hyperperfusion syndrome
  - Infrequent but carries 75-100% mortality





# Long-Term Results of CEA

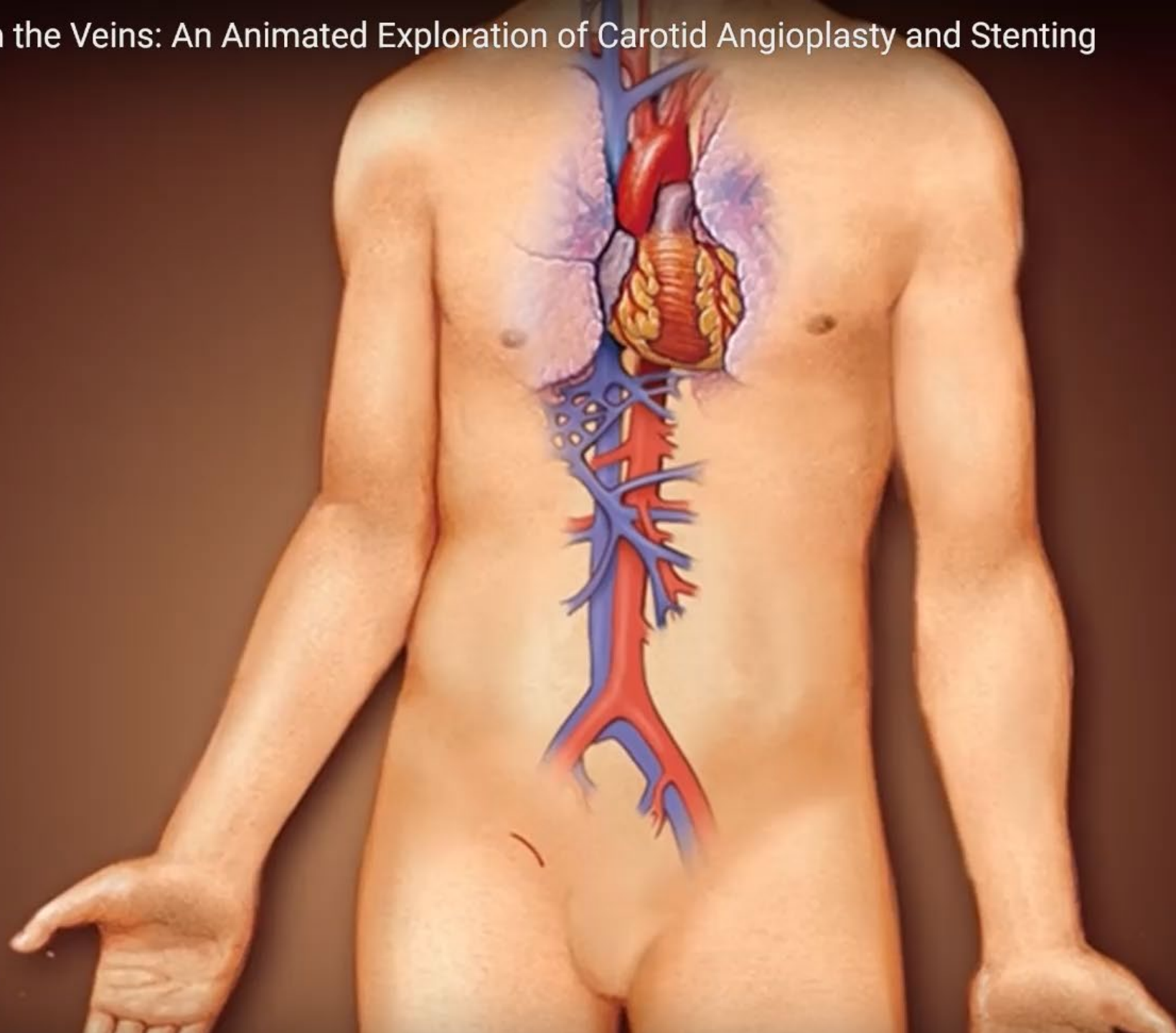
- CEA has been proven to provide excellent long-term clinical and anatomic results
- 5-year stroke free survival reported to be 92-96%
- Durable intervention

# TransFemoral - Carotid Artery Stenting

- 1989 first balloon-expandable stent was deployed in the carotid artery
- Development of cerebral protection devices
- Carotid Artery Stenting deemed a feasible alternative to CEA
- Proponents: simple, quick, minimally invasive
- Pitfalls: embolization prior to deploying cerebral protection device

# Carotid Revascularization Endarterectomy vs. Stenting Trial (CREST)

- 117 Medical Centers
- 2,502 patients
  - Stenting: 1,262
  - CEA: 1,240
- Among both ***symptomatic*** and ***asymptomatic*** patients with carotid stenosis, stenting and endarterectomy (CEA) were associated with similar rates of stroke, MI, and death, although stenting was associated with fewer periprocedural MIs and endarterectomy with fewer periprocedural strokes.





# Pitfalls of Carotid Artery Stenting

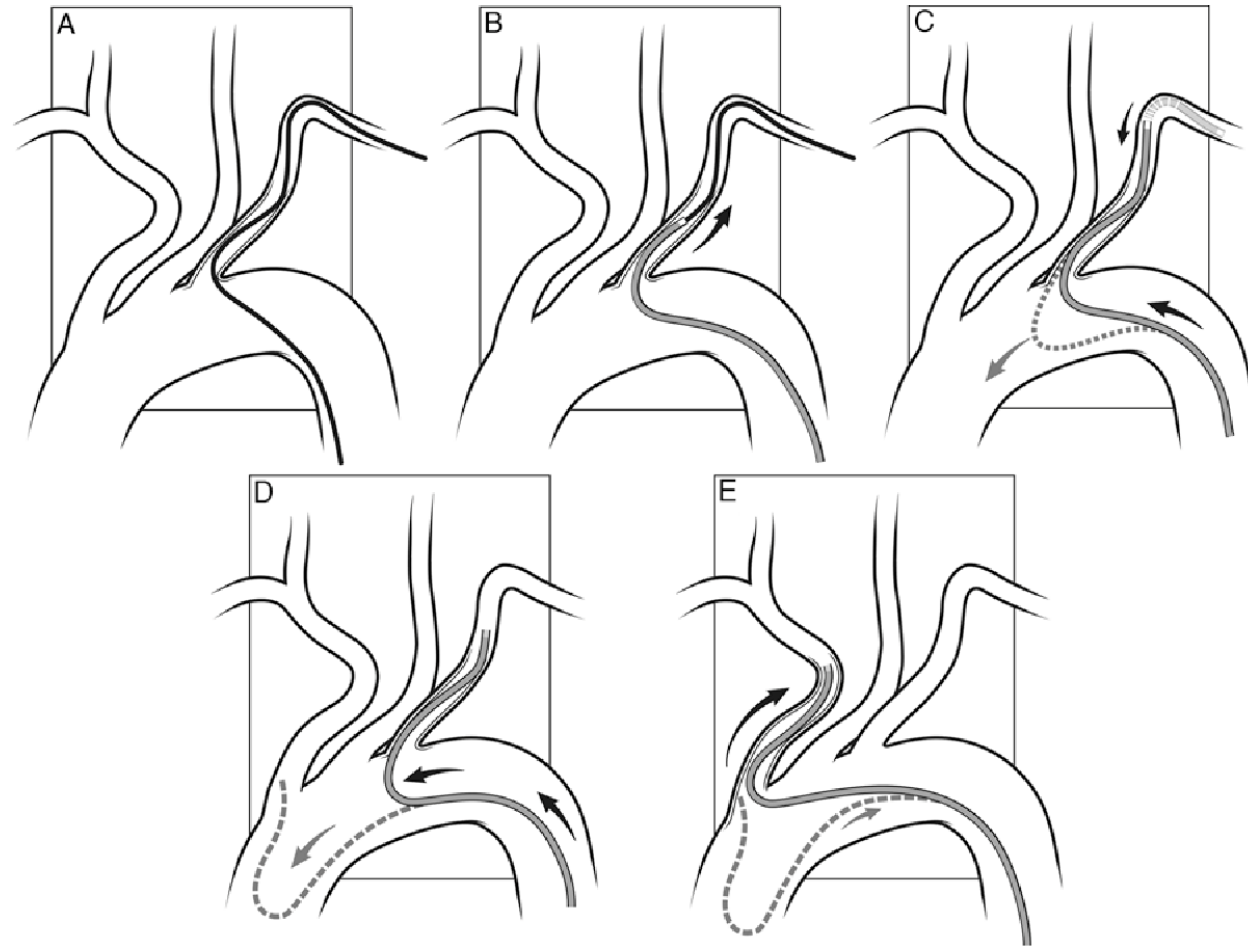
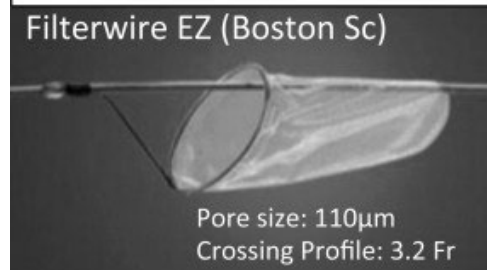
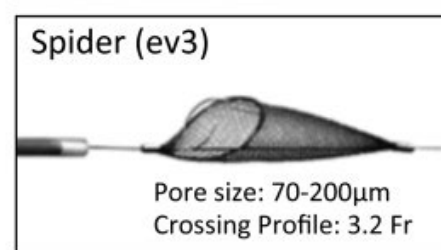
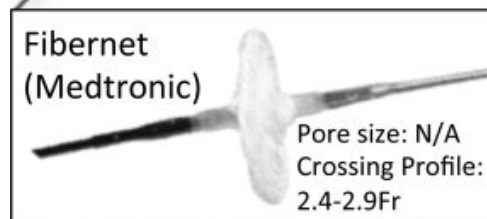
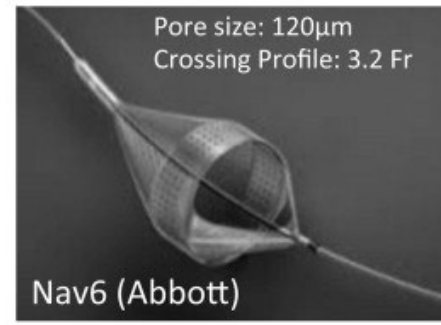
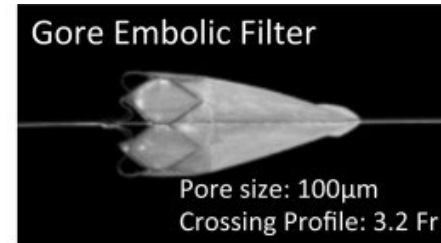
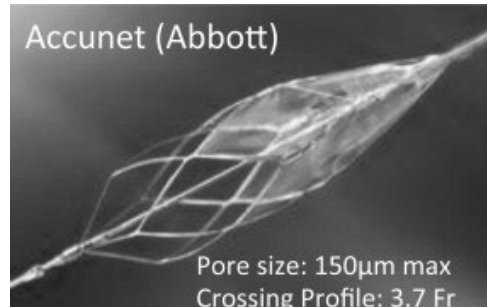


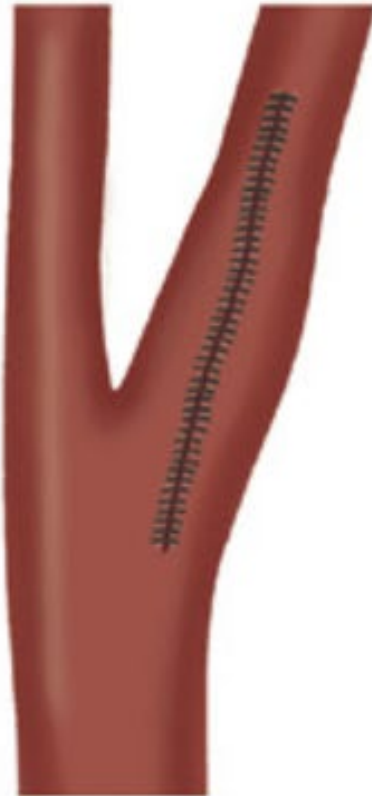
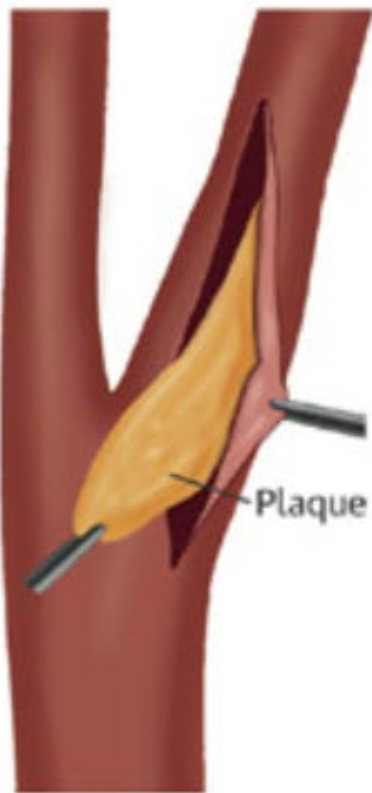
Fig. 1. Schematic drawings illustrating reconstitution of the 8 Fr Simmons-2 catheter in the left carotid artery.  $\Delta$ :  $\Delta$  stiff

# Pitfalls of Carotid Artery Stenting

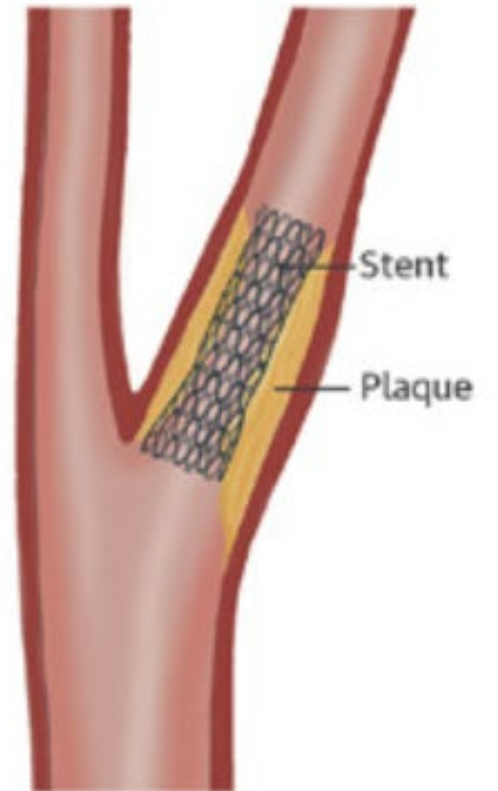
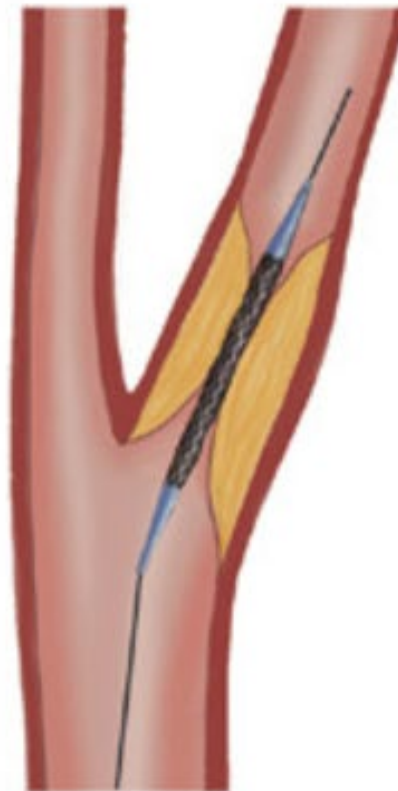


# Concerns for Stenting

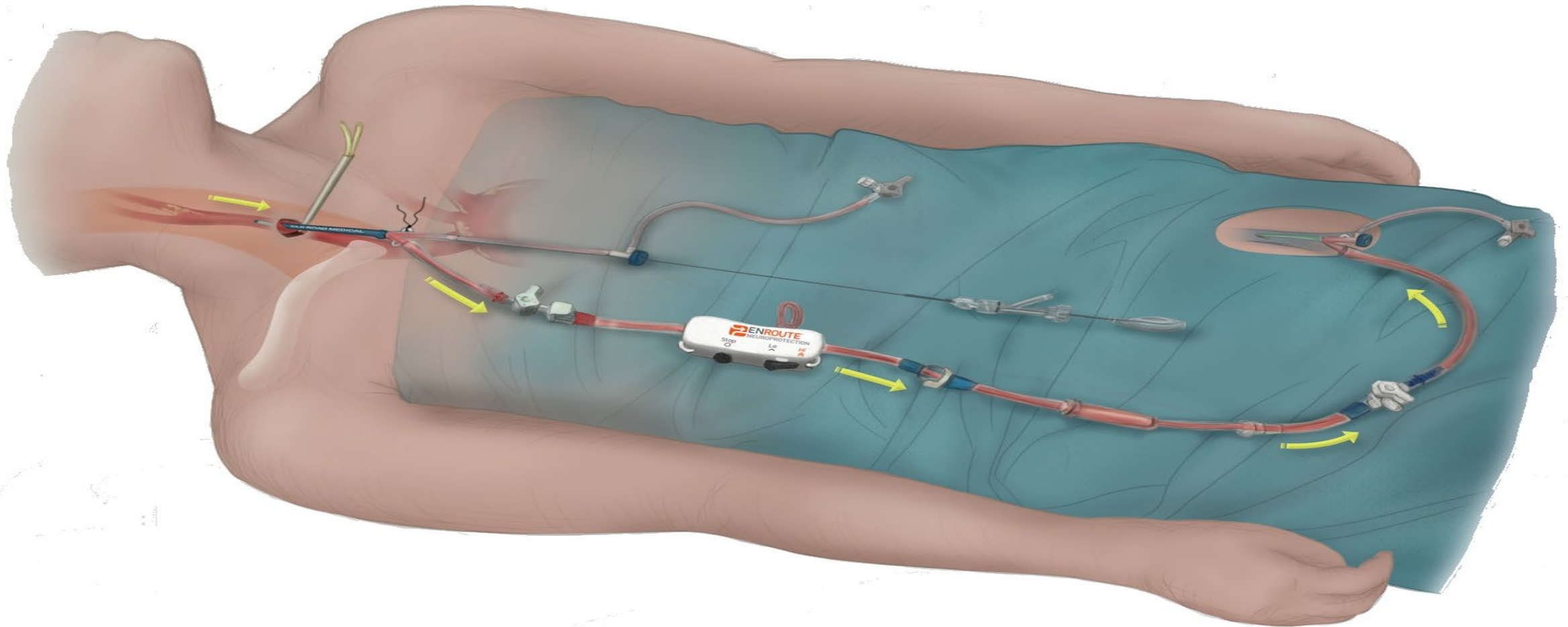
Carotid Endarterectomy



Carotid Artery Stenting

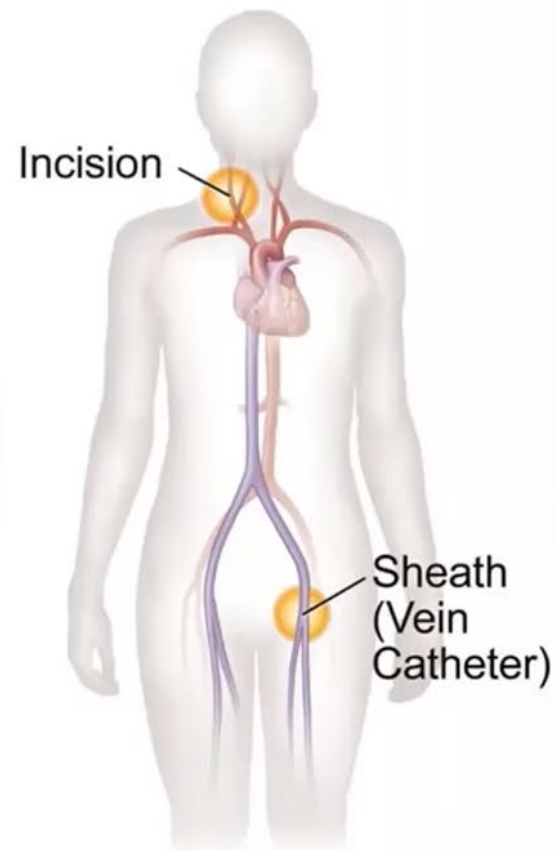
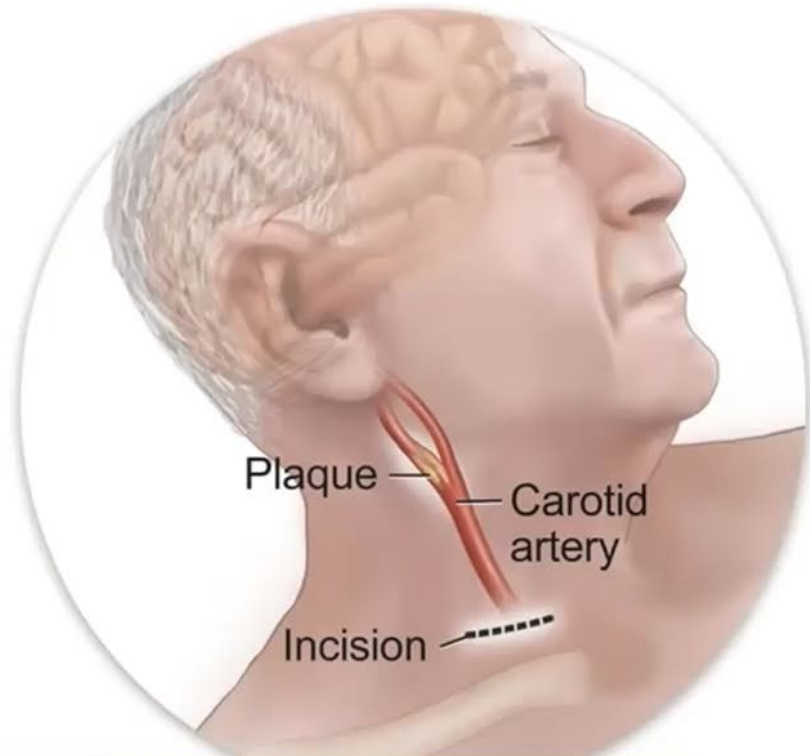


# TransCarotid Artery Revascularization (TCAR)



# ROADSTER Study

- 18 Sites
- 208 patients
- Cerebral protection provided through the ENROUTE transcrotid NPS in comparison to distal embolic protection devices as well as the transcrotid approach's circumventing diseased aortic arch manipulation and minimizing embolization. TCAR offers a safe and durable revascularization option for patients who are deemed to be at high risk for CEA

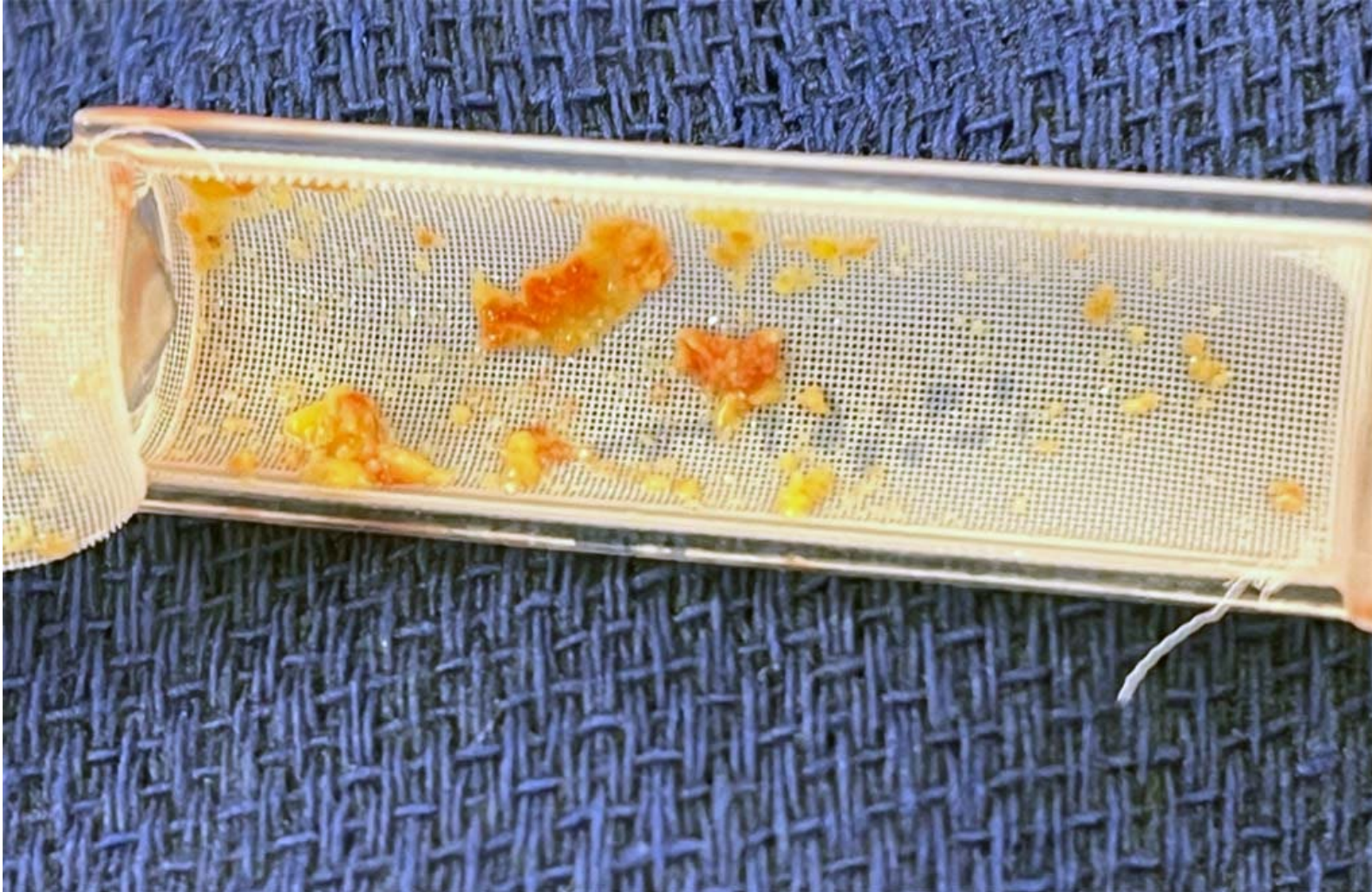


# Carotid Procedures

LESSEN THE RISK FOR STROKE



# TransCarotid Artery Revascularization (TCAR)



# Summary of Important Trials

	STROKE	DEATH	MI	STROKE+DEATH	CONCLUSION
<b>ACAS (1995)</b> N=863	1.4%	0.14%	0.5%	ND	CEA > 60% <b>asymptomatic</b>
<b>NASCET (1998)</b> MS: N=1,087 SS: N=328	MS: 5.6% SS: 5.1%	MS: 1.2% SS: 1.1%	MS: NR SS: 0.9%	MS: 6.7% SS: 5.8%	CEA > 50% <b>symptomatic</b>
<b>CREST (2010)</b> CEA: N=1,240 CAS: N=1,262	CEA: 2.3% CAS: 4.1%	CEA: 0.3% CAS: 0.7%	CEA: 2.3% CAS: 1.1%	CEA: 2.3% CAS: 4.4%	CEA: less strokes CAS: less MI



# Summary of Other Studies

STUDY	
ACT 1 (2016) N=1453	CEA = CAS <b>asymptomatic</b> severe carotid stenosis (conclusion)
ROADSTER (2015) N=141	TCAR system is safe in preventing stroke during stenting
CREST 2 (enrolling)	Comparing: <ul style="list-style-type: none"><li>• Intensive medical mgmnt alone</li><li>• CEA + intensive medical mgmnt</li><li>• CAS + intensive medical mgmnt</li></ul>
CREST H (companion study) (enrolling) Goal N=500	<ul style="list-style-type: none"><li>• Assessing cognitive outcomes with revascularization</li><li>• Redefining “symptomatic carotid stenosis”</li></ul>

# Conclusion

- Asymptomatic pts with mild to moderate stenosis should be medically managed
- Asymptomatic patients  $>70\%$  (with appropriate life-span) should be offered carotid revascularization (**SVS Guideline**)
- Symptomatic patients  $>50\%$  stenosis (with appropriate life-span) should be offered carotid revascularization (**SVS Guideline**)
- CEA should be first line modality
  - If contraindicated, TCAR should be next
  - If both contraindicated, symptomatic patients should get TF-CAS

# Thank You!



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