


NYU Langone Health NYULH—Long Island

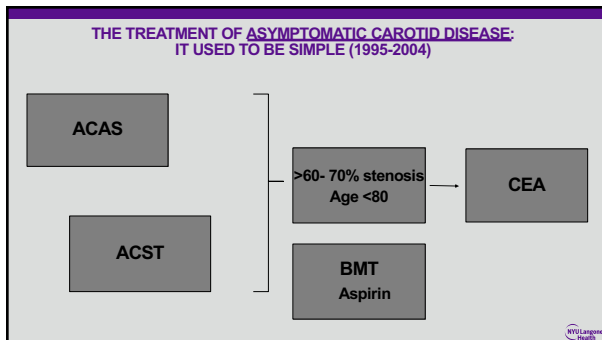
SELECTING PATIENTS FOR CAROTID INTERVENTION IS GETTING HARDER: CANDIDATES ARE OLDER (AND SICKER), ANATOMIC IMAGING IS NOT STANDARDIZED, MEDICAL THERAPY IS IMPROVING, MORE OPTIONS FOR INTERVENTION EXIST AND CRIES FOR NON-OPERATIVE MANAGEMENT ARE GETTING LOUDER: IS CONSENSUS EVEN POSSIBLE?

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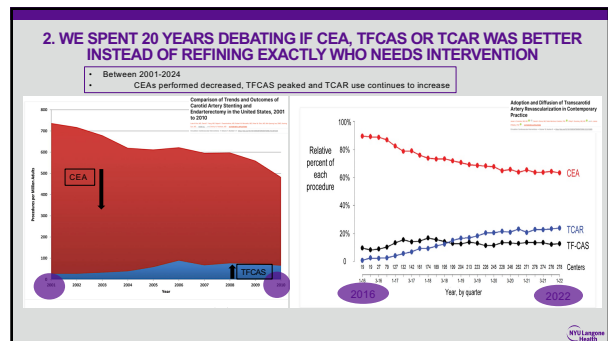
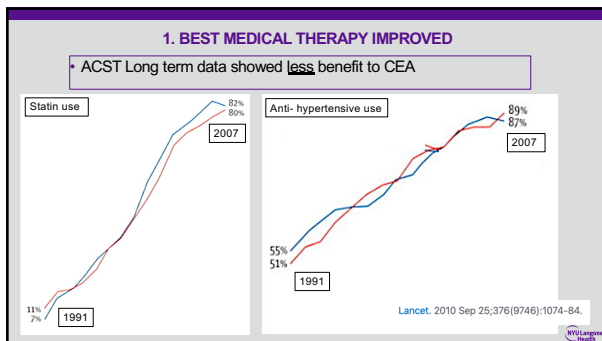


VEITH 2024: Friday, November 22

FINANCIAL DISCLOSURES: NONE



THEN WHAT HAPPENED?: (2007-2024)



3. CRIS FOR NON-OPERATIVE MANAGEMENT GOT LOUDER

- Current AHA recommendations for BMT are comprehensive

Modality	Details
Diet	Mediterranean diet
Exercise	Moderate intensity (such as brisk walking, jogging, swimming, or cycling) 4-6.7 times per week, for a total of at least 100 min per week
Smoking	Smoking cessation with varenicline or bupropion and nicotine replacement therapy
Anticoagulant therapy	Options: ASA 75-905 mg/d ASA-ticlopidine 2.5 mg bid Clopidogrel 75 mg QD or ticagrelor 90 mg BID if ASA treatment or aspirin is used
Lipid-lowering therapy	Dual LDL <1.8 mmol/L (70 mg/dL); <1.4 mmol/L (54 mg/dL) for very high risk High-dose statin Add ezetimibe or Add PCSK9 inhibitor
Antiplatelet treatment	Consider treatment other than high-dose P2Y ₁₂ for testing hypotheses 132-134 review
Antiarrhythmic therapy	Class III (sotalol) Prefer ACE antagonist due to high prevalence of renovascular hypertension May require combination therapy
Glucose-lowering therapy	Dual HbA _{1c} <7.5% Metformin, SGLT1 agonist, SGLT2 antagonist are preferred

Stroke

Abstract AL (2022) Extra-Cranial Carotid Artery Stenosis: An Objective Analysis of the Available Evidence. Front. Neurol. 12:720998.

We began looking at the trial data more critically and as Anne Abbott a leading advocate of BMT over intervention says:

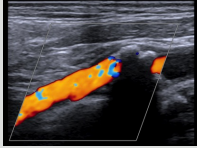
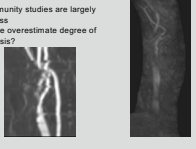
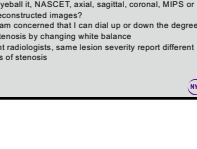
Patients with Stroke Prevalence by CEA (n=75)

Patients with Stroke Prevalence by BMT (n=75)

It can now be estimated that ~4% of low-to-average surgical risk patients with advanced asymptomatic carotid stenosis (AS) have received either CEA or BMT (not included in meta-analysis) (1, 12, 35, 37). Would low surgical benefit bias a carotid artery procedure if they are receiving current best practice medical intervention?

4. IMAGING STUDIES (IN MY OPINION) GOT HARDER TO INTERPRET

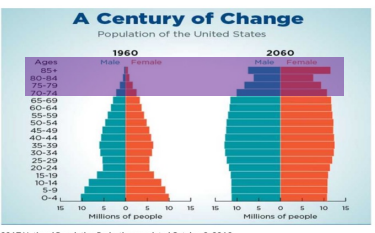
- DUS
 - Can't agree on criteria to define severe stenosis
 - Criteria keep changing
 - Frequent disagreement with other modalities
 - Acoustic shadowing limits usefulness in calcified lesions
- MRA
 - Community studies are largely useless
 - Maybe overestimate degree of stenosis?
- CTA
 - How is stenosis even measured?
 - Eyeball it, NASCET, axial, sagittal, coronal, MIPS or reconstructed images?
 - I am concerned that I can dial up or down the degree of stenosis by changing white balance
 - Different radiologists, same lesion severity report different degrees of stenosis

5. THE POPULATION IS AGING

A Century of Change

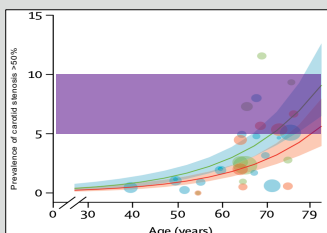
Population of the United States



2017 National Population Projections, updated October 8, 2019
CENSUS.GOV

- The number of patients in the age groups with the highest rates of carotid disease is increasing
- Look at the increase in the total number of people over the age of 70 between 1960 and 2060 (estimated)

6. THE PREVALENCE OF CAROTID STENOSIS IS INCREASING



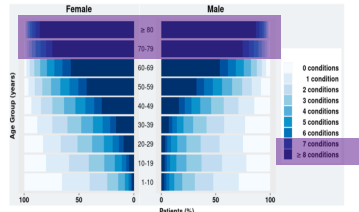
Prevalence of carotid stenosis >50%

Age (years)

- Between 5-10% of the population over the age of 65 has a >50% carotid stenosis

Lancet Glob Health 2021; 9:e701-29

7. PATIENTS ARE GETTING SICKER



Female Male

Age Group (years)

0 conditions
1 condition
2 conditions
3 conditions
4 conditions
5 conditions
6 conditions
7 conditions
≥ 8 conditions

- The older the patient the more comorbidities
- Majority of the >70 year-old group has >7 medical conditions

Identifying and visualizing multimorbidity and comorbidity patterns in patients in the English National Health Service: a population-based study

Lancet Digit Health 2022; 5:e46-57

CAN THE SVS HELP US NEGOTIATE ALL OF THESE CHANGES?

- Intervention if...
 - >70% stenosis
 - BMT is started
 - 3-5 year life expectancy
 - Stroke/Death risk <3%
 - No major change from 1995

2022 SVS guidelines J Vasc Surg 2024;79:1272-5

Patients with AsxCS

In low surgical risk patients with >70% AsxCS documented by validated Duplex ultrasound examination or CTA/angiography, CEA with BMT is recommended over BMT alone for the long-term prevention of stroke and death (**Grade 1 [Strong], Quality of Evidence: B [Moderate]**).

Patients with a $\geq 70\%$ AsxCS should be considered for CEA, TCAR, or transfemoral CAS for reduction of long-term risk of stroke, provided the patient has a 3- to 5-year life expectancy and perioperative stroke/death rates can be $\leq 3\%$. The selection of intervention is based on risk stratification.

WHAT ABOUT THE ESVS?

- Intervention if...
 - >60% stenosis
 - BMT
 - 5-year life expectancy
 - Stroke/Death risk <3%
- Imaging/Clinical characteristics which may be associated with increased risk of stroke

Study	Design	Stenosis	Stroke	Death	Stroke/Death
ACAS	Randomized	>60%	1.9%	1.9%	3.8%
ACST	Randomized	>60%	1.9%	1.9%	3.8%
CREST	Randomized	>60%	1.9%	1.9%	3.8%
CREST-2	Randomized	>60%	1.9%	1.9%	3.8%
CREST-3	Randomized	>60%	1.9%	1.9%	3.8%
CREST-4	Randomized	>60%	1.9%	1.9%	3.8%
CREST-5	Randomized	>60%	1.9%	1.9%	3.8%
CREST-6	Randomized	>60%	1.9%	1.9%	3.8%
CREST-7	Randomized	>60%	1.9%	1.9%	3.8%
CREST-8	Randomized	>60%	1.9%	1.9%	3.8%
CREST-9	Randomized	>60%	1.9%	1.9%	3.8%
CREST-10	Randomized	>60%	1.9%	1.9%	3.8%
CREST-11	Randomized	>60%	1.9%	1.9%	3.8%
CREST-12	Randomized	>60%	1.9%	1.9%	3.8%
CREST-13	Randomized	>60%	1.9%	1.9%	3.8%
CREST-14	Randomized	>60%	1.9%	1.9%	3.8%
CREST-15	Randomized	>60%	1.9%	1.9%	3.8%
CREST-16	Randomized	>60%	1.9%	1.9%	3.8%
CREST-17	Randomized	>60%	1.9%	1.9%	3.8%
CREST-18	Randomized	>60%	1.9%	1.9%	3.8%
CREST-19	Randomized	>60%	1.9%	1.9%	3.8%
CREST-20	Randomized	>60%	1.9%	1.9%	3.8%
CREST-21	Randomized	>60%	1.9%	1.9%	3.8%
CREST-22	Randomized	>60%	1.9%	1.9%	3.8%
CREST-23	Randomized	>60%	1.9%	1.9%	3.8%
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CREST-25	Randomized	>60%	1.9%	1.9%	3.8%
CREST-26	Randomized	>60%	1.9%	1.9%	3.8%
CREST-27	Randomized	>60%	1.9%	1.9%	3.8%
CREST-28	Randomized	>60%	1.9%	1.9%	3.8%
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CREST-30	Randomized	>60%	1.9%	1.9%	3.8%
CREST-31	Randomized	>60%	1.9%	1.9%	3.8%
CREST-32	Randomized	>60%	1.9%	1.9%	3.8%
CREST-33	Randomized	>60%	1.9%	1.9%	3.8%
CREST-34	Randomized	>60%	1.9%	1.9%	3.8%
CREST-35	Randomized	>60%	1.9%	1.9%	3.8%
CREST-36	Randomized	>60%	1.9%	1.9%	3.8%
CREST-37	Randomized	>60%	1.9%	1.9%	3.8%
CREST-38	Randomized	>60%	1.9%	1.9%	3.8%
CREST-39	Randomized	>60%	1.9%	1.9%	3.8%
CREST-40	Randomized	>60%	1.9%	1.9%	3.8%
CREST-41	Randomized	>60%	1.9%	1.9%	3.8%
CREST-42	Randomized	>60%	1.9%	1.9%	3.8%
CREST-43	Randomized	>60%	1.9%	1.9%	3.8%
CREST-44	Randomized	>60%	1.9%	1.9%	3.8%
CREST-45	Randomized	>60%	1.9%	1.9%	3.8%
CREST-46	Randomized	>60%	1.9%	1.9%	3.8%
CREST-47	Randomized	>60%	1.9%	1.9%	3.8%
CREST-48	Randomized	>60%	1.9%	1.9%	3.8%
CREST-49	Randomized	>60%	1.9%	1.9%	3.8%
CREST-50	Randomized	>60%	1.9%	1.9%	3.8%


- I don't get head CTs or order TCD
- I don't have computerized US plaque analysis
- I don't perform MRIs to see intraplaque hemorrhage
- I don't know what impaired CVR is
- I don't routinely evaluate plaque lucency on DUS

Eur J Vasc Endovasc Surg (2023) 45, 7–111
© 2023 European Society for Vascular Surgery (ESVS) 2023 Clinical Practice Guidelines on the Management of Atherosclerotic Carotid and Vertebral Artery Disease

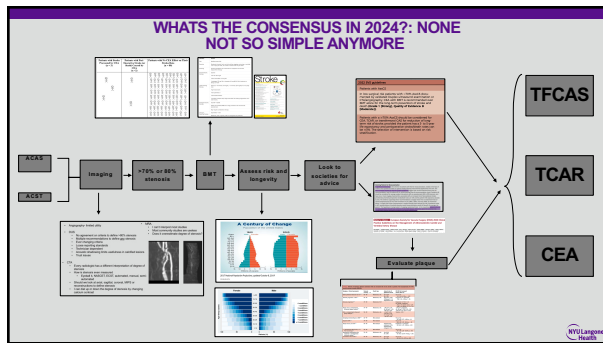
WHAT DOES THE MAINSTREAM THINK? (AHA)

Selecting Patients for Revascularization

A **significant controversy** in the selection of patients with ACS for revascularization, notably in the face of evidence that guideline-directed medical therapy have declined significantly over time. The 2017 European Society for Vascular Surgery guidelines suggest that carotid endarterectomy (class IIa recommendation, level of evidence B) or carotid stenting (class IIb recommendation, level of evidence B) should be considered for average surgical risk patients with an asymptomatic 60% to 99% stenosis, who have one or more imaging characteristics associated with an increased risk of late ipsilateral stroke, provided documented preoperative stroke/death rates are <3% and the patient's life expectancy exceeds 5 years. The evidence supporting these recommendations is largely drawn from 3 randomized trials of carotid endarterectomy for ACS with enrollment in the 1980s, 1990s, and early 2000s. As mentioned above, it is likely that further improvements in medical therapy have reduced the risk of ipsilateral stroke in ACS, possibly below a threshold whereby carotid revascularization would still benefit the average risk patient. This hypothesis is being tested in 4 ongoing randomized trials. In the meantime, patients referred for revascularization should have evidence of vulnerable plaque. Otherwise, given the uncertain risk-benefit ratio, patients should be avoided in one of the ongoing trials.



- Favor the ESVS guidelines



WHAT ARE MY RECOMMENDATIONS?

- Apply a common-sense approach
 - Institute BMT
 - Don't intervene
 - If life expectancy is <5years
 - Overwhelming comorbidities ("gut feeling")
 - If patient doesn't pass my "eyeball" test of overall fitness to undergo surgery
 - Narrowed my indications for intervention from >80% stenosis (Until we develop some new indications for intervention e.g. preservation of cognitive function as is being assessed in CREST-2)
 - Critical stenosis (according to my eyeball test)
 - Inability to follow the lesion (I have no way to assess if it's getting worse)

MY INDICATIONS FOR CAROTID INTERVENTION IN THE ASYMPTOMATIC PATIENT

1. Critical Stenosis

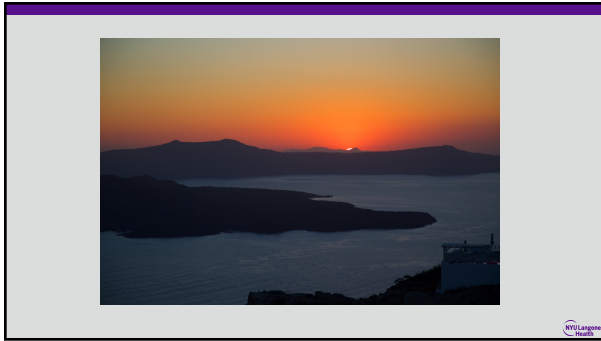
CMR CAROTID 1103 2802
 PSV 108 cm/s
 EDV -119 cm/s

T102 2 MI 03
 L Bulb
 PSV 108 cm/s
 EDV -119 cm/s

MY INDICATIONS FOR CAROTID INTERVENTION

- Inability to follow the lesion (I have no way to assess if it is getting worse)

	PSV (cm/s)	EDV (cm/s)	ICA/CCA Ratio	Stenosis
Prox CCA	73	8		
Dist CCA	77	8		
Prox ICA	108	13	1.40	< 50%
Mid ICA	82	14	1.07	
Dist ICA	81	15	1.05	
Vertebr	52	5		
ECA	101	0		



Thank you

- Dr. Ascher and the program committee for inviting me back
- Dr. Veith for so much more

In the bottom right corner of the slide, there is a small logo for NYU Langone Health.