Controversies in Treatment of Extra-cranial Carotid Disease

- What is the Optimal Therapy for carotid artery stenosis?
- When to perform Carotid Revascularization: Carotid endarterectomy vs carotid stenting with embolic protection are they equivalent?
- What longer-term data is available?
- What about medical therapy?

Carotid Revascularization

- Who should receive carotid revascularization? And of these who should get a stent?
- It depends on who you ask
  - Neurologist?
  - Vascular surgeon?
  - Interventionalist

Outcomes of CAS Trials Over Time

- CAS results have vastly improved over time due to: (1) more experienced operators; (2) better patient selection and; (3) a wider spectrum of technology
- CAS outcomes have evolved over time similarly to CEA

Faculty Disclosure

J. Michael Bacharach, MD, MPH, FACC, FSCAI

"I have no relevant financial relationships to disclose with regard to this continuing medical education activity".
Death or Major Stroke Rates Decrease for CAS over the Period of CREST Enrollment

<table>
<thead>
<tr>
<th>Year</th>
<th>CAS (%)</th>
<th>CEA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2004</td>
<td>2.5%</td>
<td>2.5%</td>
</tr>
<tr>
<td>2005-2006</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

\[ 2000-2004: \text{CAS} = 0.4\% \quad \text{CEA} = 0.4\% \]

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2011 ASA/ACCF/AHA/AANN/AANS/ACR/ASNR/CNS/SAIP/SCAI/SIR/SNIS/SVM/SVS Guideline on the Management of Patients With Extracranial Carotid and Vertebral Artery Disease: Executive Summary

Why Didn’t CREST Settle the Debate?

- Surgeons feel that carotid revascularization is performed for stroke prevention
  - CEA reduced stroke risk more than CAS
  - Excess MI rate with CEA less of an issue
- Interventionists feel that CAS performed as safely as CEA
  - Excess stroke risk was minor stroke only
- MI risk of CEA is important
- Neurologists feel that although outcomes were low, medical therapy is more effective than any revascularization
So, Can I Make Sense of the Data?

Firstly, it still never ceases to amaze me how even after Level A Multicenter Randomized Trials that Meet the Primary Endpoint, Physicians Don’t Agree on the Interpretation

Options for Patients with Carotid Artery Disease

- **CEA**: Effective when performed by skilled surgeons with excellent track record
- **CAS**: Effective when performed by skilled interventionists
- **Medical Therapy**: Still must be tested head-to-head with revascularization, but impact likely improving—

Released February 18, 2016

Long-term Results of Stenting vs Endarterectomy for Carotid-Artery Stenosis

Thomas G. Brott, MD
On behalf of the CREST Investigators

Primary Long-term End Point

- **Durability**: Ipsilateral stroke after 36 days post-procedure, up to 10 years.

Postprocedural Long-term Stroke

<table>
<thead>
<tr>
<th>Total Stroke</th>
<th># Events</th>
<th>Rate (95% CI)</th>
<th>Hazard Ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stenting</td>
<td>42</td>
<td>6.9% (4.4 - 9.7)</td>
<td>0.99 (0.64 - 1.52)</td>
<td>0.96</td>
</tr>
<tr>
<td>Surgery</td>
<td>41</td>
<td>5.6% (3.7 - 7.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*360 days from the procedure for patients who received their treatment within 30 days from randomization (i.e., per protocol treatment), and 36 days for patients treated beyond 30 days.

Study Population

- Follow-up includes all patients.
- Long-term population:
  - 1607 patients consented;
  - 195 declined to participate;
  - 700 consent not attempted (withdrew, died, completed initial study or met primary composite outcome).

Postprocedural Long-term Stroke

<table>
<thead>
<tr>
<th># Events</th>
<th>5 year %</th>
<th>10 year %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS</td>
<td>21</td>
<td>2.5</td>
</tr>
<tr>
<td>CEA</td>
<td>20</td>
<td>2.7</td>
</tr>
<tr>
<td>Symptomatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS</td>
<td>21</td>
<td>2.5</td>
</tr>
<tr>
<td>CEA</td>
<td>21</td>
<td>2.7</td>
</tr>
</tbody>
</table>
But Vascular Surgeons Heard the Hoofbeats…..

Results of the ROADSTER multicenter trial of transcarotid stenting with dynamic flow reversal

Christopher J. Kwok, MD,1 Michael R. Jaff, DO,1 J. Ignacio Leal, MD,1 L. Nelson Hopkins, MD,1
Ruben M. Shah, MD,2 Todd M. Hanover, MD,3 Samantha Maudrond, MD,4 and Richard P. Cambria, MD,5
Baton, Houston, Jacksonville, Buffalo, NY, San Diego, CA, and San Antonio, Calif.


Ongoing CAS/CEA Studies

<table>
<thead>
<tr>
<th>Trial</th>
<th>Trial Start</th>
<th>Enrolled/Projected</th>
<th>Duration</th>
<th>Sex</th>
<th>Protocol OMT</th>
<th>RCT of CEA vs CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCT-2</td>
<td>2008</td>
<td>1330/5000</td>
<td>10 yrs</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>SPACE-2</td>
<td>2008</td>
<td>400/3500</td>
<td>5 yrs</td>
<td>N</td>
<td>Y/N</td>
<td>N</td>
</tr>
<tr>
<td>ECST-2</td>
<td>2012</td>
<td>300/2000</td>
<td>10 yrs</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>CRESC-2</td>
<td>2015</td>
<td>0/2500</td>
<td>6 yrs</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

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Randomized Trial of Stent versus Surgery for Asymptomatic Carotid Stenosis


The Controversy is Fueled By Advocates of Modern Medical Therapy as the Primary Treatment for

Systematic Review of Guidelines for the Management of Asymptomatic and Symptomatic Carotid Stenosis

Anne L. Abbott, PhD, MBBS, FRACP; Kosmas I. Paraskevas, MD, PhD; Stavros K. Kakos, MD, PhD; Jonathan Gollledge, MB, BCHir, BA, MA, MClin; Hans-Henning Eckstein, MD, PhD; Larry J. Diaz-Sandoval, MD; Longxing Cao, MD, PhD; Qiang Fu, MD, PhD; Tissa Wijeratne, MD, FRACP; Thomas W. Leung, MD; Miguel Montero-Baker, MD; Byung-Chul Lee, MD, PhD; Sabine Pichler, BNutriDiet, MPH; Marije Bosch, PhD; Marine Donckampa, PhD, MSc; Peter Ringleb, MD, PhD. Stroke 2015;46:3288

Background and Purpose—We systematically compared and appraised contemporary guidelines on management of asymptomatic and symptomatic carotid artery stenosis.

Methods—We systematically searched for guideline recommendations on carotid endarterectomy (CEA) or carotid angioplasty/stenting (CAS) published in any language between January 1, 2006, and January 30, 2015. Only the latest guideline per scoring group was selected. Each guideline was analyzed independently by 2 to 3 authors to determine clinical scenarios covered, recommendations given, and scientific evidence used.

Results—Many inconsistencies were noted, including the key recommendation on CEA or CAS. Of 26 guidelines with asymptomatic carotid artery stenosis, 20 (77%) favored CEA, recommended it should be or may be provided, or for >50% to >99% asymptomatic carotid artery stenosis (17.2%) randomized CAS, 0 (0%) favored CAS, and 1 (4%) favored medical treatment alone. For symptomatic carotid artery stenosis, 5 (19%) recommended CEA, 0 (0%) randomized CAS, and 0 (0%) recommended medical treatment alone.

J Vasc Surg 2015;62:914

Modern medical treatment with or without carotid endarterectomy for severe asymptomatic carotid atherosclerosis

- 55 pts with 70-79% carotid stenosis randomized to
  - CEA plus Maximal Medical Therapy (31)
  - Maximal Medical Therapy (24)
Modern medical treatment with or without carotid endarterectomy for severe asymptomatic carotid atherosclerosis

CREST 2 Trial Scheme

Primary EP: Stroke + Death in 30 Days PLUS Ipsilateral Stroke to 4 Years

Management of Carotid Artery Disease

- All patients require comprehensive medical therapy
- Revascularization based on
  - Symptom Status
  - Health and (anticipated) longevity of the patient
  - Skill of the Operator
- Right now, the largest patient population you will see are ASYMPTOMATIC STANDARD RISK Patients
  - At least for US Medicare patients, your only options are medical therapy and CEA
- ACT 1 and 10-Year CREST Data may force a shift in payment

So, Who Should Get a Carotid Stent?

- Symptomatic patient with 70-99% stenosis who is at high risk for surgical events
- Asymptomatic patient with truly anatomic high risk scenario
- All others: Optimal Medical Therapy
- All others: Enroll in FDA-IDE Approved Trial
Mount Rushmore South Dakota