Why CREST 2 may tell us very little but still be bad for carotid stenting (CAS)

- VEITH Mtg 2016
- Mark Wholey M.D., FAHA, FSIR, FSCAI
- UPMC Shadyside, Adjunct Prof Bioengineering CMU

Obsolete by the time of completion?

- CAS is a technology still in evolution
- CEA has been around for 63 years!

Early CAS Studies Were Also Limited

- Absence of experienced operators
- First generation devices that are now obsolete

Peri-procedural Stroke and MI

<table>
<thead>
<tr>
<th>Condition</th>
<th>CAS vs. CEA</th>
<th>Hazard Ratio 95% CI</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>4.1 vs. 2.3%</td>
<td>HR = 1.79; 95% CI: 1.14-2.82</td>
<td>0.01</td>
</tr>
<tr>
<td>MI</td>
<td>1.1 vs. 2.3%</td>
<td>HR = 0.50; 95% CI: 0.26-0.94</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Filter Issues As A Cause For Stroke

- Nav 6 is 50% more efficient than Accunet
- Capture Efficiency 147um Size Particles

Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

- Consulting Fees/Honoraria
  - Cordis, Boston Scientific, Abbott Vascular
  - Medrad Inc., AccessClosure
  - Northern vs Boston Scientific, Neuro
  - Covidien Inc., Solingen

- Major Stock Shareholder/Equity
  - Intervention tech.
  - Equity Income

- Interventions
  - Covidien Inc., Solingen

- Total Capture Efficiency
  - Capture Efficiency
  - Particles Lost
Proximal Flow Control vs. Filters
- 62 patients pre and post MRI
- Micro EMBOLI on DWI
  - 87% with filter
  - 45% with proximal flow control
  - Future trials should include DWI

(Bijuklic, JACC, 2012)

Incidence of new Cerebral Ischemic Lesions

Multicenter Registry – 32 centers
- New DWI lesions
  - CAS 37%
  - CEA 10%
  - Close cell stent 31%
  - Open cell stent 51%
  - DWI brain lesions clinically an unsettled issue. Can't be good but how bad?
  - Is DAPT indicated if platelets, fibrin or clot source

Device options for stenting in CREST-2

Embolic Protection

- CREST I
  - Acculink
  - Accunet

- CREST II
  - Acculink/Accunet
  - Nav 6/EXACT
    - Protégé/Spyder
    - Precise/Angioguard
    - Wallstent/Filter Wire
    - Cristello/Moma
    - Gore/Terumo
This is not silent ischemia! This is microembolic infarct in asymptomatic pt.

Particle analysis in 20 filters

- Emboli composition
- Fibrin conglomerates
- Trapped erythrocytes
- Inflammatory cells
- Endothelial cells
- Foam cells
- Cholesterol clefts
- Platelets
- Calcified deposits

Asymptomatic 72 yr male with critical stenosis of left internal carotid and left vertebral. Refused surgery because relative had CEA with non healing cranial nerve injury and swallowing dysfunction. CMS refused payment. Hospital charge would be around 25,000 $.

After lengthy appeal was covered.
Diffusion Weighted MRI

Micro emboli have become a major problem

Before After CAS
Silent ischemic cognitive function, stroke, ischemic TIA's

Covered or fenestrated Stent may be the next Stent design to capture All particles

CMS would like more peer review.
We will do Crest 2

• Experience with 55,000 patients
• 41 US Registries
• 10 Randomized CAS Clinical Trials
• 20 years of Experience with CAS

‘50 years of Experience with CEA
20 years without reimbursement
Funding for carotid research if not dead is arguably badly damaged.
We have spent over 300 Mil.'
Crest 2 reminds me of Michael DeBakey’s answer when asked to join and enroll in NASCET

"Why would I enroll when I already know the answer”

The End

Here's my take home message

CAS doesn’t have a chance against BMM based on the Trial design.

Experienced CAS operators are reluctant to enroll.

Increasing MicroEmbolic ischemic events will become a major issue for CREST2.

Roadster trials has presently the lowest embolic event rate and equal to CEA.

For CAS to minimize embolic events a re design of both Filters and Stents are now in process.