Asymptomatic Carotid Disease

Observation
If it were possible to identify and operate on all asymptomatic 60 - 99% stenosis…
...with a procedural risk of 2.3%
...fewer than 5% of all strokes would be prevented
Is this the true risk?

Asymptomatic Carotid Disease

Annual rates of “ipsilateral” and “any” stroke by date

Demonstrates: Improved medical care reduces risk of stroke

Carotid Interventions in the Post-CREST Era:
Contemporary Outcomes in the State of Michigan

38th Annual Meeting
Midwestern Vascular 2014

Charles J. Shanley, MD, Michael J. Boros, MD, Yeo J. Park, PhD, Hitinder S. Gurm, MD, Paul M. Grossman, MD, Jeffrey R. Rubin, MD and Peter K. Henke, MD

30 Day Outcomes Study

- Consecutive carotid interventions
- Prospective, statewide quality improvement registry
- 3,136 carotid interventions
  - 2,482 CEAs
  - 654 CAS
- Outcomes: in-hospital
  - Any TIA/stroke
  - Ipsilateral stroke
  - MI
  - Composite: stroke/death
  - Composite: MI/stroke/death
Carotid Interventions in the Post-CREST Era: Contemporary Outcomes in the State of Michigan

**Outcomes**

<table>
<thead>
<tr>
<th>All Patients</th>
<th>CEA</th>
<th>CAS</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIA/Stroke</td>
<td>1.9%</td>
<td>5.5%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Stroke/Death</td>
<td>2.3%</td>
<td>6.3%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>MI/Stroke/Death</td>
<td>2.7%</td>
<td>6.7%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Propensity matched samples gave same results

**Asymptomatic Carotid Disease**

Is there evidence that improvement in medical therapy is reducing the annual stroke risk?

**Randomized Trials**

Best Medical Care

ACAS - No data re: Changing trends in therapy, compliance or medical outcome

ACST - Considerable data on changes in medical Rx during the 10 year trial

ie: Statins... 17% - 1996
58% - 2000
70% - 2003
90% - 2008

**Temporal changes in the 5-year risk of “any” stroke and “ipsilateral” stroke**

<table>
<thead>
<tr>
<th>Trial</th>
<th>Years</th>
<th>Pub Year</th>
<th>‘Any’</th>
<th>‘Ipsilateral’</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACAS</td>
<td>1-5</td>
<td>1995</td>
<td>17.5%</td>
<td>11.0% (2.2)</td>
</tr>
<tr>
<td>ACST</td>
<td>1-5</td>
<td>2004</td>
<td>11.8%</td>
<td>5.3% (1.1)</td>
</tr>
<tr>
<td>ACST</td>
<td>6-10</td>
<td>2009</td>
<td>7.2%</td>
<td>3.6% (0.7)</td>
</tr>
</tbody>
</table>
Asymptomatic Carotid Artery Disease

Some patients with asymptomatic carotid disease will have a stroke... ...can they be identified?

Patient Evaluation

- Identify “High Risk Plaque” –
  - Plaque characteristics
    - Plaque type (heterogeneous/homogeneous)
    - Gray-Scale Median
    - Juxta-Luminal Black Area
  - Embolization
  - Cerebral infarction

...identify carotid lesion that is likely to become symptomatic

From the Society for Vascular Surgery

Asymptomatic internal carotid artery stenosis and cerebrovascular risk stratification

Nicolaides AN et al J Vasc Surg 2010; 57:1486

ACSRS Study

- Prospective, multicenter, cohort study
- Asymptomatic ICA stenosis 50-99% (ECST)
- Medical Rx only (not standardized)
- Features correlated with ipsilateral cerebrovascular or retinal ischemia (CORI)
- Statistical analysis
  - Univariate
  - Proportional hazards model

ACSRS Features Studied

Clinical
- Hx contralateral stroke/TIA
- % Stenosis

Plaque Characteristics
- Plaque area (mm²)
- Plaque type
- Juxta-Luminal Black Area (mm²)
- Gray-Scale Median

Can contrast arteriography improve upon this?
Asymptomatic Carotid Artery Disease

**Echolucent Plaque**
- High Risk Plaque –
  (GSM < 25)

**Echogenic, Type 4 Plaque**
- Low Risk Plaque –
  (GSM > 150)

Asymptomatic internal carotid artery stenosis and cerebrovascular risk stratification

**Annual Risk of Ipsilateral Stroke**
- Univariate Analysis –

<table>
<thead>
<tr>
<th>Plaque Type</th>
<th>Annual Stroke Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.4%</td>
</tr>
<tr>
<td>3</td>
<td>0.8%</td>
</tr>
<tr>
<td>1 &amp; 2</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

Asymptomatic Carotid Artery Disease

**Juxtaluminal Black Area**
- High Risk Plaque –

**Annual Risk of Ipsilateral Stroke**

<table>
<thead>
<tr>
<th>JBA (mm²)</th>
<th>Annual Stroke Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4</td>
<td>0.4%</td>
</tr>
<tr>
<td>4-8</td>
<td>1.4%</td>
</tr>
<tr>
<td>8-10</td>
<td>3.2%</td>
</tr>
<tr>
<td>&gt;10</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plaque Area (mm²)</th>
<th>Annual Stroke Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15</td>
<td>0.6%</td>
</tr>
<tr>
<td>15-30</td>
<td>1.6%</td>
</tr>
<tr>
<td>&gt;30</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

Asymptomatic internal carotid artery stenosis and cerebrovascular risk stratification

**Multi-Regression Analysis: Develop an Individualized Annual Risk of Stroke Using:**

- Stenosis severity
- Contralateral symptoms
- Plaque area
- Gray-scale median

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Asymptomatic internal carotid artery stenosis and cerebrovascular risk stratification

<table>
<thead>
<tr>
<th>80-99% NASCET Stenosis</th>
<th>Annual Stroke Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;80</td>
<td>1.2% 3.4% 5.9%</td>
</tr>
<tr>
<td>40-80</td>
<td>0.6% 1.5% 3.0%</td>
</tr>
<tr>
<td>&lt;40</td>
<td>0.5% 1.0% 2.1%</td>
</tr>
<tr>
<td>230-15-29 &lt;15</td>
<td></td>
</tr>
</tbody>
</table>

>40: 3.0-3.9% 2.0-2.9% 1.0-1.9% <1.0%

**History of Contralateral TIA/Stroke**

- No history of contralateral TIA/Stroke –

Asymptomatic Carotid Artery Disease

**High Risk Plaque**

- Other Questions –

- Is it embolizing?
- Has it caused cerebral infarction?

Asymptomatic embolisation for prediction of stroke in the Asymptomatic Carotid Emboli Study (ACES): a prospective observational study

**Results**

- Ipsilateral Stroke –

HR = 5.57
p = 0.006

Absolute Annual Risk

- 3.62%
- 0.7%

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From the Society for Vascular Surgery

**Silent embolic infarcts on computed tomography brain scans and risk of ipsilateral hemispheric events in patients with asymptomatic internal carotid artery stenosis**

Stavros K. Kakkos, MD, MSc, PhD, BVT;† Michael S. Sobel, MD, FRCS; George G. Chalela, MD, FCS, and Nikos N. Nicolaides, MD, FRCS, PhD (Hon)∗ (for the Asymptomatic Carotid Stenosis and Risk of Stroke (ACERS) Study Group)‡, London, United Kingdom

Silent embolic infarcts and risk of ipsilateral hemispheric stroke with asymptomatic internal carotid artery stenosis

**Annual Stroke Rate**

<table>
<thead>
<tr>
<th>Stenosis</th>
<th>No Infarct</th>
<th>Infarct*</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60%</td>
<td>1.1%</td>
<td>0.48%</td>
<td>NS</td>
</tr>
<tr>
<td>60–99%</td>
<td>1.0%</td>
<td>3.6%</td>
<td>0.002</td>
</tr>
</tbody>
</table>

*CT Scans

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**Conclusions**

1. Symptomatic carotid artery disease is a vascular emergency
2. Asymptomatic carotid disease is best treated with intensive medical care
3. High risk plaques can be identified...
   A. Ultrasound plaque characteristics
   B. Embolization detected by TCD
   C. Asymptomatic cerebral infarction on brain imaging

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*Jobst Vascular Institute*