EARLY CEA (WITHIN 48 HOURS) AFTER TIA OR STROKE: A BALANCED VIEW: WHAT ARE THE RISKS AND BENEFITS: EARLY BRAIN IMAGING AND CAROTID DUPLEX CAN HELP SELECT PATIENTS FOR SAFE, EARLY INTERVENTION

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No financial relationship to disclose

URGENT CAROTID INTERVENTION

Benefits
1. Removing a source of ongoing embolism
2. Preventing early progression towards thrombosis
3. Improving overall cerebral perfusion
4. Reducing cumulative neuronal loss by restoring blood flow to the ischemic penumbra

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This important study published in 2004 has the merit of pointing out that...

Population based study of early risk of stroke after transient ischaemic attack or minor stroke: implications for public education and organisation of services
A J Gold, J E Lovett, P M Rodbard, on behalf of the Oxford Vascular Study
BMJ. 2004 Feb 7;328(7435):326

"The early risks of stroke after either a TIA or minor stroke are much higher than usually quoted: 8-12% at seven days and 11-15% at one month."

Secondary prevention

Cure

(only to make sure there is no stroke event)
RISK OF EARLY NEUROLOGICAL RECURRENT

CAROTID REVASCULARIZATION IN ACUTE NEUROLOGICAL EVENTS

Risks
1. Increased risk of intraoperative embolism
2. Reperfusion of brain zones with loss of autoregulation
3. Hyperperfusion
4. Hemorrhagic conversion of acute infarct

RISKS OF CAROTID REVASCULARIZATION

Increased risk of embolism?

INTRAOPERATIVE BRAIN EMBOLISM/COMPLICATIONS

Accurate surgical technique
Early heparinization
Early clamping of internal carotid artery

De Rango et al. Stroke 2015
Systematic literature review past 8 years
periprocedural stroke/death after CEA and CAS related to the time between qualifying neurological symptoms and intervention
47 studies included (35 on CEA, 7 on CAS, 5 both)
periprocedural risk for patients treated within
0 to 48 hours
0 to 7 days
0 to 15 days

RISK OF INTERVENTION

De Rango et al. Stroke 2015
Summary of Evidence on Early Carotid Intervention for Recently Symptomatic Stenosis Based on Meta-Analysis of Current Risks

<table>
<thead>
<tr>
<th></th>
<th>Perioperative stroke %</th>
<th>Perioperative stroke&amp;death %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CEA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-15 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All pts</td>
<td>3.36</td>
<td>3.80</td>
</tr>
<tr>
<td>TIA pts</td>
<td>1.84</td>
<td>1.86</td>
</tr>
<tr>
<td>Stroke pts</td>
<td>4.99</td>
<td>4.94</td>
</tr>
<tr>
<td>0-7 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All pts</td>
<td>3.25</td>
<td>3.61</td>
</tr>
<tr>
<td>TIA pts</td>
<td>1.51</td>
<td>1.87</td>
</tr>
<tr>
<td>Stroke pts</td>
<td>5.31</td>
<td>5.55</td>
</tr>
<tr>
<td>0-2 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All pts</td>
<td>5.26</td>
<td>5.75</td>
</tr>
<tr>
<td>TIA pts</td>
<td>2.74</td>
<td>2.78</td>
</tr>
<tr>
<td>Stroke pts</td>
<td>7.95</td>
<td>8.44</td>
</tr>
</tbody>
</table>
LIMITATIONS OF THE STUDIES INCLUDED

• grouped different urgent indications together (stroke severity, stable/unstable pts)
• small number of patients with different treatment strategies and variable application of medical therapy
• no uniform reporting of the indications for using CAA or CEA
• transient events were defined according to authors, without details on cerebral findings
• we haven’t data to investigate the mechanism of postprocedural stroke (eg, the type and laterality of cerebral infarction or hemorrhage with respect to side of operation, etc)

De Rango et al. Stroke 2015

What is the adjunctive risk in very early CEA?

1. Reperfusion of brain zones with loss of autoregulation
2. Hyperperfusion
3. Hemorrhagic conversion of acute infarct
4. Increased perilesional oedema

Naylor R, EJVES 2008

URGENT CAROTID INTERVENTION

Intracerebral hemorrhage

<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Symptom</th>
<th>Median days from event to CEA</th>
<th>Stroke-score</th>
<th>3-day death/stroke</th>
<th>ICP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Racine 2006</td>
<td>71</td>
<td>CEA</td>
<td>0-2 days of stroke onset</td>
<td>2.2</td>
<td>0/21</td>
<td>0/21</td>
</tr>
<tr>
<td>Aff et al 2004</td>
<td>71</td>
<td>CEA</td>
<td>&lt;2</td>
<td>2.3</td>
<td>0/7</td>
<td>0/7</td>
</tr>
<tr>
<td>Fife 2004</td>
<td>1</td>
<td>CEA</td>
<td>&lt;4</td>
<td>3.5</td>
<td>0/4</td>
<td>0/4</td>
</tr>
<tr>
<td>Dieterle 2007</td>
<td>71</td>
<td>CEA/BA</td>
<td>20</td>
<td>2.3</td>
<td>0/4</td>
<td>0/4</td>
</tr>
<tr>
<td>Karl et al 2006</td>
<td>30</td>
<td>CEA/BA</td>
<td>0-2 days</td>
<td>2.1</td>
<td>0/4</td>
<td>0/4</td>
</tr>
<tr>
<td>Barradas 2006</td>
<td>8</td>
<td>CEA</td>
<td>15-180 days</td>
<td>2.1</td>
<td>0/2</td>
<td>0/2</td>
</tr>
<tr>
<td>Bantar et al 2005</td>
<td>28</td>
<td>CEA</td>
<td>1-15 days</td>
<td>2.0</td>
<td>0/2</td>
<td>0/2</td>
</tr>
<tr>
<td>Schober et al 2005</td>
<td>47</td>
<td>CEA</td>
<td>0-2 days of stroke onset</td>
<td>2.0</td>
<td>0/21</td>
<td>0/21</td>
</tr>
</tbody>
</table>

Nickol R, EJVES 2008

SwedVasc Prospective Registry
22 centers
Increased risk in pts operated in days 0-2 compared to “delayed” surgery

Sofia Stromberg et al. Stroke 2012

CEA WITHIN 48 HOURS

0-2 days
1 posterior impaired perfusion
8-14 days
1 ICH (prev rtPA)
15-180 days
2 ICH
**CEA WITHIN 48 HOURS**

Higher % of complications in pts operated in 0-2 days

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Minor stroke, n (%)</th>
<th>Major stroke, n (%)</th>
<th>Mortality, n (%)</th>
<th>Mortality and any stroke, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2 days</td>
<td>10 (1.6)</td>
<td>1 (0.2)</td>
<td>1 (0.2)</td>
<td>18 (2.2)</td>
</tr>
<tr>
<td>3-7 days</td>
<td>10 (1.6)</td>
<td>1 (0.2)</td>
<td>1 (0.2)</td>
<td>18 (2.2)</td>
</tr>
<tr>
<td>8-14 days</td>
<td>2 (0.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (0.3)</td>
</tr>
<tr>
<td>15-90 days</td>
<td>2 (0.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (0.3)</td>
</tr>
</tbody>
</table>

*Major stroke includes major stroke-related death.

(Stromberg S, Stroke 2012)

**ICH IN URGENT CEA**

1 ICH out of 148 pts (0.6%)

3/804 (0.3%)

5/677 (0.7%)

2/967 (0.2%)

(Stromberg S, Stroke 2012)

**HOW CAN WE KEEP THIS ADJUNCTIVE RISK TO A MINIMUM?**

**By using appropriate selection criteria**

**INCLUSION CRITERIA**

**Inclusion criteria**

- Clear time of onset of symptoms
- NIHSS score < 22
- Recent ischemic hemispheric brain infarct < 1/3 of the middle cerebral artery area regardless of BBB disruption at CT or MRI scans
- ICA stenosis ≥ 50% at US evaluation
- Patent middle cerebral artery in the detectable portion M1 and M2

**Exclusion criteria**

- Not clear time of onset of symptoms
- Severe neurological deficit (NHISS score > 22)
- Cerebral ischemia onset with seizures
- Previous ischemic or hemorrhagic stroke with residual severe deficit (Modified Rankin Scale≥2)
- History of cerebral haematomas
- Other cerebral disease with residual permanent deficit

- According to CT or MRI scans on admission
- Recent ischemic hemispheric brain infarct > 1/3 of the middle cerebral artery area
- Presence of cerebral haemorrhage
- Brain tumor
- Cerebral arterio-venous malformation
- Cerebral aneurysm

(Stromberg S, Stroke 2012)

**Urgent carotid endarterectomy to prevent recurrence and improve neurologic outcome in mild-to-moderate acute neurologic events**

**Table 1B**: Inclusion and exclusion criteria for carotid endarterectomy (CEA) study population

<table>
<thead>
<tr>
<th>Exclusion criteria</th>
<th>Inclusion criteria</th>
</tr>
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<tr>
<td>Recent ischemic hemispheric brain infarct &gt; 1/3 of the middle cerebral artery area</td>
<td>Clear time of onset of symptoms</td>
</tr>
<tr>
<td>Presence of cerebral haemorrhage</td>
<td>NIHSS score &lt; 22</td>
</tr>
<tr>
<td>Brain tumor</td>
<td>Recent ischemic hemispheric brain infarct &lt; 1/3 of the middle cerebral artery area</td>
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<td>Cerebral arterio-venous malformation</td>
<td>ICA stenosis ≥ 50% at US evaluation</td>
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<tr>
<td>Cerebral aneurysm</td>
<td>Patent middle cerebral artery in the detectable portion M1 and M2</td>
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(Stromberg S, Stroke 2012)

**URGENT CAROTID INTERVENTION CONCLUSIONS**

**Aims**

- Embolism recurrence
- Outcomes by reducing complications

CEA within 48 hours plausible

Appropriate selection criteria

(Stromberg S, Stroke 2012)

**From 2005 to 2009**

62 neurologically stable patients

1.5 days from onset of symptoms to CEA