Secondary Stroke Prevention

Evidence based approach to care standards and Controversies

Ted Lowenkopf MD
Medical Director
Providence Stroke Center
The most FAQs to stroke neurologists

- What is the appropriate antiplatelet management when my patient has a stroke or TIA on aspirin?

- My patient had a TIA/stroke, what is the work up?

- Atrial Fibrillation:
  - What is the appropriate timing of anticoagulation after an ischemic stroke?
  - What is adequate duration of monitoring to exclude PAF?
  - When is it appropriate to offer one of the NoACs?
  - Is it ever appropriate to anticoagulate after ICH (intracerebral hemorrhage)?

- What is appropriate stroke prophylaxis when TTE or TEE shows a PFO?

- What is the optimal management of carotid disease?
Stroke Facts

- 795,000 Strokes in the US/year, one every 40 seconds
- 5th leading cause of death in the United States, 130,000 stroke deaths/year
- #1 Cause of long term adult disability, 6.5 million stroke survivors

CDC Stroke Statistics, 2015
Secondary Stroke Prevention

What is the cause of the initial cerebrovascular event?

- Large- or small-vessel atherosclerosis
- Unknown
- Cardioembolic

±CEA

Antiplatelet therapy

Warfarin, dabigatran, rivoroxaban, apixaban

The most frequent sites of arterial and cardiac abnormalities causing ischemic stroke.

Ischemic stroke etiologies

The most frequent sites of arterial and cardiac abnormalities causing ischemic stroke.
“small vessel disease,”
Atherosclerotic/lipohyalinotic
Ischemic stroke 85%
Cryptogenic 30%
Cardiogenic embolism 20%
Small vessel disease “lacunes” 25%
Atherosclerotic cerebrovascular disease 20%
Other 5%
Hemorrhagic stroke 15%

Albers et al. Chest 2004; 126 (3 Suppl): 438S–512S.
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- What is the optimal management of carotid disease?
Stroke Work up
What is the appropriate work-up for patient with TIA or Stroke?

- Brain and vascular imaging
- Evaluate for a cardiac source
- Lab testing
Imaging Stroke patients

- Symptoms less than 8 hours (4.5): CT head / CTA head and neck vessels

- Severe or progressing deficits, decreased level of consciousness, or prominent headache: CT head

- Otherwise MRI brain without gadolinium, MRA head and neck vessels

- If CTA or MRA not obtained, obtain carotid ultrasound
Evaluation of a cardiac source of embolism

- EKG
- Echocardiography
- Cardiac Telemetry monitoring
- TEE
Do all stroke and TIA patients need an echocardiogram as part of their work-up?
Transthoracic Echocardiography in Patients with Cerebral Ischemia and No Heart Disease

Pooled data on 230 patients without evidence of heart disease by history, physical examination, CXR or EKG:

- 13 aortic valve thickening
- 2 mitral annulus calcification
- 1 enlarged left atrium
- 1 questionable intracardiac thrombus

PFO ASA and stroke

Mas, J-L et al  NEJM 345: 1740-46  2001
PFO

- Closure
- Respect
Closure I study: Kaplan–Meier Curve of Time to Primary End Point through 2 Years of Follow-up in the Closure and Medical-Therapy Groups.

RESPECT: Primary End-Point Events in the Intention-to-Treat and As-Treated Cohorts.

If your experiment needs statistics, you ought to have done a better experiment.

(Ernest Rutherford)
PFO and stroke

- In patients with cryptogenic stroke and PFO, closure of PFO is not recommended routinely.
- In the presence of PFO and venous source of embolism, anticoagulation is indicated.
- If anticoagulation is not possible then IVC filter should be considered.
- In patient with PFO and recurrent venous thrombosis, PFO closure can be considered depending on the risk of recurrence.
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Capturing PAF

- 2/3 of cases of afib are paroxysmal\(^1\), same risk of stroke
- The longer duration of monitoring the more likely that you will detect PAF

\(^1\)Circulation. 2006;114:119-125.
Methods of capturing PAF

Non-Invasive
- EKG
- MCOT™
- ZIO™

Invasive
- LYNC™
- Pacemaker
- Defibrillator
Table 1. Main Characteristics of Available Methods for Prolonged Ambulatory Cardiac Rhythm Monitoring

<table>
<thead>
<tr>
<th>Device</th>
<th>Location</th>
<th>Duration</th>
<th>Minimal Threshold</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holter</td>
<td>Skin surface</td>
<td>Usually 1–2 d</td>
<td>Few seconds</td>
<td>Short duration</td>
</tr>
<tr>
<td>External loop recorder</td>
<td>Skin surface</td>
<td>≤30 d</td>
<td>Few seconds</td>
<td>Requires patient action</td>
</tr>
<tr>
<td>Ambulatory telemetry</td>
<td>Skin surface</td>
<td>≤30 d</td>
<td>Few seconds</td>
<td>Patient compliance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Skin irritation</td>
</tr>
<tr>
<td>Implantable loop recorder</td>
<td>Subcutaneous</td>
<td>≤3 y</td>
<td>2 min</td>
<td>Invasiveness (minimal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Does not detect PAF&lt;2 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td>Dual-chamber pacemaker and defibrillator</td>
<td>Intracardiac</td>
<td>Many years</td>
<td>Seconds</td>
<td>Only indicated for life-threatening arrhythmias</td>
</tr>
</tbody>
</table>

PAF indicates paroxysmal atrial fibrillation.
Cardiac tele monitoring for afib

- PAF detection over average hosp LOS: ~3%
- 48 holter 2-3%
- 30 day monitor 11-16%
- 6 month monitor 22%
- 12 month 25%
- 36 months 30%

Presented ISC, San Diego 2/2014
Questions that remain....

- What duration of monitoring is enough?

- What duration or frequency of afib on monitor is enough to increase stroke risk and merit anticoagulation?

- Another approach: NAVIGATE-ESUS, RE-SPECT ESUS,
Comparison of Novel Anticoagulants to warfarin for stroke prophylaxis and safety

<table>
<thead>
<tr>
<th></th>
<th>STROKE</th>
<th>BLEEDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dabigatran</td>
<td>Better</td>
<td>Equal</td>
</tr>
<tr>
<td>Rivaroxaban</td>
<td>Equal</td>
<td>Equal</td>
</tr>
<tr>
<td>Apixaban</td>
<td>Better</td>
<td>Better</td>
</tr>
</tbody>
</table>
Patients to consider for NoAcs

- Intolerant of warfarin
- Unstable INR
- Unable to get INR
- Offer to new patients
- Stable patients?
Timing of anticoagulation after stroke with atrial fibrillation

76 year-old man with atrial fibrillation presents with 8 hours of left sided weakness and slurred speech.
Timing of anticoagulation after stroke with atrial fibrillation

- What is the risk of recurrent stroke off anticoagulation?
- What is the risk of hemorrhagic transformation on anticoagulation?
Timing of anticoagulation after stroke with atrial fibrillation

- 4.9% 14 day recurrence¹

- Risk of hemorrhagic complication is linked to ²:
  - Size of stroke
  - Timing of stroke
  - Degree of anticoagulation
  - Patient age
  - History of diabetes
  - History of hypertension
  - Presence of ‘microvascular’ changes on CT/MRI

¹ Stroke. 2001; 32: 2333-2337
Timing of anticoagulation after stroke with atrial fibrillation

Adequate data are not available to address the issue of when to begin oral anticoagulation following a cardioembolic stroke. In general, we recommend initiation of oral anticoagulation therapy within 2 weeks of a cardioembolic stroke; however, for patients with large infarcts or other risk factors for hemorrhage, additional delays may be appropriate.

Chest 2008;133;630-669
Anticoagulation after ICH

- Individualized to each patient
- High risk of recurrent ICH (lobar ICH or probable amyloid angiopathy) antiplatelets may be considered
- Risk of ICH - 9.3% in patients with microbleeds compared with 1.3% without microbleeds
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- What is appropriate stroke prophylaxis when TTE or TEE shows a PFO?

- What is the optimal management of carotid disease?
Stroke neurologist’s lullaby
## Antithrombotic Therapy for Secondary Prevention of Stroke

<table>
<thead>
<tr>
<th>Agents</th>
<th>Clinical Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>WARSS</td>
</tr>
<tr>
<td>Clopidogrel</td>
<td>SPIRIT</td>
</tr>
<tr>
<td>ASA/Dipyridamole</td>
<td>WASID</td>
</tr>
<tr>
<td>Warfarin</td>
<td>ESPRIT</td>
</tr>
<tr>
<td>Dabigatran</td>
<td>ESPS 2</td>
</tr>
<tr>
<td>Rivaroxaban</td>
<td>CAPRIE</td>
</tr>
<tr>
<td>Apixaban</td>
<td>MATCH</td>
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<tr>
<td></td>
<td>CHARISMA</td>
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<tr>
<td></td>
<td>PROFESS</td>
</tr>
<tr>
<td></td>
<td>Re-LY</td>
</tr>
<tr>
<td></td>
<td>Rocket-AF</td>
</tr>
<tr>
<td></td>
<td>ARISTOTLE</td>
</tr>
</tbody>
</table>
Secondary Stroke Prevention: Antiplatelet agents

- Aspirin
- Clopidogrel
- ASA/dypridamole
Aspirin

- Reduces stroke risk by about 15%
- Shows equal efficacy in men and women
- FDA recommends low doses as safe and effective: 50-325 mg/day
Does the *dose* of aspirin matter?

*Aspirin*

Aspirin prevents stroke among patients with a recent stroke or TIA.\(^{526-529}\) In a meta-regression analysis of placebo-controlled trials of aspirin therapy for secondary stroke prevention, the RR reduction for any type of stroke (ie, hemorrhagic or ischemic) was estimated at 15% (95% CI, 6%–23%).\(^{530}\) The magnitude of the benefit is similar for doses ranging from 50 to 1500 mg,\(^{440,526-528,530,531}\) although the data for doses <75 mg are limited.\(^{440}\) In contrast, toxicity does vary by dose; the principal toxicity of aspirin is gastrointestinal hemorrhage, and higher doses of aspirin are associated with greater risk.\(^{526,527}\)
Guidelines for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Abstract—The aim of this updated guideline is to provide comprehensive and timely evidence-based recommendations on the prevention of future stroke among survivors of ischemic stroke or transient ischemic attack. The guideline is addressed to all clinicians who manage secondary prevention for these patients. Evidence-based recommendations are provided for control of risk factors, intervention for vascular obstruction, antithrombotic therapy for cardioembolism, and antiplatelet therapy for noncardioembolic stroke. Recommendations are also provided for the prevention of recurrent stroke in a variety of specific circumstances, including aortic arch atherosclerosis, arterial dissection, patent foramen ovale, hyperhomocysteinemia, hypercoagulable states, antiphospholipid antibody syndrome, sickle cell disease, cerebral venous sinus thrombosis, and pregnancy. Special sections address use of antithrombotic and anticoagulation therapy after an intracranial hemorrhage and implementation of guidelines. (Stroke. 2014;45:2160-2236.)
CAPRIE
Primary Outcome Result

Patients Enrolled (n=19,185)

Stroke (n=6,431)

MI (n=6,302)

PAD (n=6,452)

8.7% Relative Risk Reduction (RRR)
Clopidogrel vs. aspirin alone (P=0.043)

Primary Outcome

The Composite of Stroke, MI or Vascular Death

Lancet 1996; 348:1329-39
The CAPRIE trial compared aspirin and clopidogrel for the prevention of cardiovascular events. The primary combined endpoint was CV death, MI, and stroke. The secondary endpoint was ICH or fatal bleeding. The results showed a net decrease in events of 10.1% with clopidogrel compared to aspirin, with a decrease in bleeding events of 9.7% and a decrease in outcome events of 10.1%. The CAPRIE Steering Committee. *Lancet*. 1996;348:1329–39.
CAPRIE Results by Subgroup Analysis
Aspirin vs. Clopidogrel

Relative Risk Reduction (%)

- Stroke 7.3
- MI -3.7
- PAD 23.8
- All 8.7

P = 0.26

n = 19,185
MI = myocardial infarction
PAD = peripheral arterial disease

Aspirin better Clopidogrel better

Lancet 1996;339:1329-1339
WHAT IF I TOLD YOU

CLOPIDOGREL AND ASA ARE BETTER THAN ASA ALONE?
MATCH: Clopidogrel Plus Aspirin vs Clopidogrel Fails in Stroke

- n=7,599
- Stroke or TIA plus risk factor
- Clopidogrel + ASA vs clopidogrel

Results

- No difference in stroke/MI/death or stroke outcomes
- Major bleeds and life-threatening bleeds significantly higher with combination treatment

MATCH: Net Benefit
Combined Endpoint vs. Serious Bleeding

- **Stroke + MI + CV death** (primary combined endpoint)
  - Clopidogrel + Placebo: 13.3%
  - Clopidogrel + ASA: 13.8%
  - Net increase in events: 1.3%

- **Life-threatening bleeding** (secondary - safety)
  - Clopidogrel + Placebo: 12.0%
  - Clopidogrel + ASA: 11.2%

**CHARISMA**

Clopidogrel and Aspirin versus Aspirin Alone for the Prevention of Atherothrombotic Events

<table>
<thead>
<tr>
<th>Study design</th>
<th>768 clinical centers in 32 countries; randomized, blinded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study population</td>
<td>15,603 patients &gt; 45 years (median age 64 years) with cardiovascular disease or multiple risk factors</td>
</tr>
<tr>
<td>Study drugs</td>
<td>Clopidogrel (75 mg/day)+ low dose ASA (75-162 mg/day) vs low-dose aspirin</td>
</tr>
<tr>
<td>Primary endpoint</td>
<td>Composite outcome cluster of ischemic stroke, MI, vascular death</td>
</tr>
<tr>
<td>Treatment duration</td>
<td>Average patient follow-up 28 months</td>
</tr>
</tbody>
</table>
CHARISMA: Net Benefit/Risk

1 event avoided/1,000 treated/2.3 years

- Stroke + MI + CV death (primary combined endpoint)
- Severe/fatal bleeding

**ASA** + Placebo
n = 7,801
- 1.3% increase in bleeding
- 7.3% decrease in outcome events
- 8.6% events

**Clopidogrel** + ASA
n = 7,802
- 1.7% increase in bleeding
- 6.8% decrease in outcome events
- 8.5% events

European Stroke Prevention Study 2 (ESPS 2): Trial Design¹

<table>
<thead>
<tr>
<th>Study design</th>
<th>59 clinical centers in 13 European countries; randomized, doubleblind, placebocontrolled with a 2 x 2 factorial design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study population</td>
<td>6,602 patients &gt;18 yr (mean age 66.7 yr²) with recent cerebrovascular episode (within 90 days of study entry)</td>
</tr>
<tr>
<td>Study drugs</td>
<td>ASA/ERDP (25 mg ASA/200 mg ER-DP bid); ER-DP (200 mg bid); ASA (25 mg bid); placebo</td>
</tr>
<tr>
<td>1º endpoint</td>
<td>Stroke, death, and stroke or death together</td>
</tr>
<tr>
<td>2º endpoint</td>
<td>TIA and other vascular events</td>
</tr>
<tr>
<td>Treatment duration</td>
<td>Treatment period 2 yr; patient follow-up 2 yr</td>
</tr>
</tbody>
</table>

¹. ESPS 2 Group. J Neurol Sci. 1997;151(suppl):S1S77.
ESPS 2: Net Benefit

26 events avoided/1000 treated/2 yr

- **Aspirin**
  - n=1,649
  - Stroke: 12.5%
  - Serious bleeding: 1.2%
  - Increase in bleeding: 9.5%
  - Decrease in combined endpoint: 11.1%

- **Aspirin/ER-DP**
  - n=1,650
  - Stroke: 13.7%
  - Serious bleeding: 1.6%
  - Net decrease in events: 11.1%

### Study design
Randomized, open-label, international

### Study population
2,763 patients > 45 years (median age 64 years) with cardiovascular disease or multiple risk factors

### Study drugs
Dipyridamole (200 mg BID) + aspirin (30-325 mg) vs. aspirin (30-325 mg)

### Primary endpoint
Composite outcome cluster of stroke, MI, vascular death, major bleeding

### Treatment duration
Average patient follow-up 3.5 years
389 patients suffered at least one primary outcome event, 173 patients randomised to ASA+DP (13%) versus 216 patients randomised to aspirin alone (16%)

# Dipyridamole/Aspirin: ESPRIT

## Results (n=2739)

<table>
<thead>
<tr>
<th>Primary outcome</th>
<th>ARR</th>
<th>NNT</th>
<th>HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3%</td>
<td>33</td>
<td>0.80 (0.66-0.98)</td>
</tr>
</tbody>
</table>

*Lancet 2006;367:1665-73*
Prevention Regimen For Effectively avoiding Second Strokes – The PRoFESS Trial
### Profess Study Design

<table>
<thead>
<tr>
<th>Telmisartan</th>
<th>Telmisartan placebo</th>
<th>ER-DP+ASA</th>
<th>Clopidogrel*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ER-DP+ASA</td>
<td>ER-DP+ASA placebo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ clopidogrel placebo</td>
<td>+ ER-DP+ASA placebo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Telmisartan</td>
<td>+ Telmisartan</td>
</tr>
</tbody>
</table>

20,332 pts
PRoFESS

- 20,333 patients
- Mean duration 2.4 years
- Primary outcome: first recurrence of stroke
- Secondary outcome: composite of stroke, MI, death from vascular cause
- Ultimately designed to demonstrate non-inferiority
- Inclusion: recent stroke, age >50,
Primary Outcome: Stroke Recurrence

<table>
<thead>
<tr>
<th></th>
<th>ASA+ER-DP</th>
<th>Clopidogrel</th>
<th>HR</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. at risk:</td>
<td>10181</td>
<td>916 (9.0%)</td>
<td>898 (8.8%)</td>
<td>1.01</td>
<td>0.92, 1.11</td>
</tr>
</tbody>
</table>

* Covariates in cox model are age, baseline ACE-inhibitor use, Modified Rankin, and baseline diabetes status.

10/05/2008
## Characterization of First Recurrent Stroke

<table>
<thead>
<tr>
<th>Category</th>
<th>Clopidogrel</th>
<th>ASA+ER-DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic</td>
<td>805 (7.9%)</td>
<td>780 (7.7%)</td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>45 (0.4%)</td>
<td>83 (0.8%)</td>
</tr>
<tr>
<td>Other/Unknown</td>
<td>48 (0.5%)</td>
<td>52 (0.5%)</td>
</tr>
</tbody>
</table>

- 17 strokes
- 38 Hemorrhagic strokes
- 25 Ischemic strokes
Secondary Outcome: Stroke, MI, Vascular Death

* Covariates in cox model are age, baseline ACE-inhibitor use, Modified Rankin, and baseline diabetes status.
Before PRoFESSION

A Not Including Data from the PRoFESSION Trial

Aspirin

Relative risk, 0.79
(95% CI, 0.67 to 0.92);
P=0.003

Relative risk, 0.92
(95% CI, 0.80 to 1.07);
P=0.27

Aspirin–ERDP

---

Clopidogrel

Indirect relative risk, 0.86
(95% CI, 0.69 to 1.06);
P=0.16

Kent, DM Thaler, DE* NEJM 359;12 2008
After PRoFESS

B Including Data from the PRoFESS Trial

Relative risk, 0.83
(95% CI, 0.68 to 1.02);
P=0.08

Aspirin

Relative risk, 0.87
(95% CI, 0.71 to 1.07);
P=0.19

Aspirin–ERDP

Clopidogrel

Relative risk, 0.96
(95% CI, 0.78 to 1.18);
P=0.70

From PRoFESS Trial
Direct relative risk, 1.02
(95% CI, 0.93 to 1.11);
P=0.71

Kent, DM Thaler, DE NEJM 359;12 2008
After PRoFESS

“Paper or plastic?”
Is management different for intracranial stenosis?
Intracranial Stent
Intracranial stents
Hypothesis: Non-inferiority of intracranial angioplasty and stenting to medical management in patients with a recent transient ischemic attack or stroke attributed to an intracranial stenosis of 70-99%.

**Design:** randomized to

1) Best medical management: SBP < 140, diabetics <130, LDL-C < 70
2) Best med management + stent

Both received Plavix 75 mg+ Aspirin 325 mg daily for 90 days

Primary Outcome: stroke or death within 30 days after enrollment or after a revascularization procedure for the qualifying lesion during the follow-up period or stroke in the territory of the qualifying artery beyond 30 days.
SAMMPRIS Study summary

Antiplatelet agents after ischemic stroke/TIA

- **CHANCE trial** - Combination of Aspirin and Clopidogrel for 21 days initiated within 24 hours may be more effective in secondary stroke prevention.

- **POINT trial (On going)** - Aspirin vs aspirin plus Plavix for 90 days in patients with high risk TIA or minor ischemic stroke.
Dual Antiplatelet Therapy After TIA/Stroke?
In the case of PRoFESS and the tangle of related trials, enlightenment might be expressed simply, as a haiku: “For stroke prevention, / use an antiplatelet drug. / Treat hypertension.”

Kent, DM  Thaler, DE *NEJM* 359;12 2008
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- My patient had a TIA/stroke, what is the work up?

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- What is appropriate stroke prophylaxis when TTE or TEE shows a PFO?

- What is the optimal management of carotid disease?
Two-year risk of stroke with *symptomatic* carotid disease

<table>
<thead>
<tr>
<th></th>
<th>50-69% Stenosis</th>
<th>70-99% Stenosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NASCET</strong></td>
<td>14.6%</td>
<td>24.5%</td>
</tr>
<tr>
<td><strong>ECST</strong></td>
<td>9.7%</td>
<td>19.9%</td>
</tr>
</tbody>
</table>

Barnett HM *et al* *CMAJ* 166: 1169-79 2002
Carotid endarterectomy: Controversies

- Is carotid ultrasound an adequate measure of stenosis? 
  
  Sometimes

- Is there an optimal timing of surgery? Yes

- What is the best management of asymptomatic disease?
Timing of CEA after stroke/TIA: NASCET and ECST data

<table>
<thead>
<tr>
<th>Time since last event (weeks)</th>
<th>Surgical</th>
<th>Medical</th>
<th>ARR (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2</td>
<td>13/112</td>
<td>26/75</td>
<td>24.7</td>
<td>12.3–37.1</td>
</tr>
<tr>
<td></td>
<td>27/213</td>
<td>62/224</td>
<td>15.9</td>
<td>8.3–23.5</td>
</tr>
<tr>
<td></td>
<td>40/325</td>
<td>88/299</td>
<td>18.5</td>
<td>12.1–24.9</td>
</tr>
<tr>
<td>2–4</td>
<td>17/136</td>
<td>13/81</td>
<td>4.4</td>
<td>-5.5–14.2</td>
</tr>
<tr>
<td></td>
<td>14/132</td>
<td>31/134</td>
<td>13.1</td>
<td>4.0–22.2</td>
</tr>
<tr>
<td></td>
<td>31/268</td>
<td>44/215</td>
<td>9.8</td>
<td>3.0–16.5</td>
</tr>
<tr>
<td>4–12</td>
<td>29/271</td>
<td>31/216</td>
<td>4.1</td>
<td>-2.0–10.2</td>
</tr>
<tr>
<td></td>
<td>34/289</td>
<td>50/282</td>
<td>6.4</td>
<td>0.4–12.5</td>
</tr>
<tr>
<td></td>
<td>63/560</td>
<td>81/498</td>
<td>5.5</td>
<td>1.2–9.8</td>
</tr>
</tbody>
</table>

Asymptomatic Carotid Stenosis

ACAS: Prevention of ipsilateral stroke
Surgery vs medical therapy at 5 yrs

<table>
<thead>
<tr>
<th>Stenosis</th>
<th>Abs.RR%</th>
<th>RRR%</th>
<th>NNT</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-99%</td>
<td>5.9</td>
<td>53</td>
<td>17</td>
<td>0.004</td>
</tr>
</tbody>
</table>

JAMA 273: 1421-28  1995
ACAS: 4 years to benefit
Management of asymptomatic carotid stenosis

- 3% per year stroke risk with 80-99% (previous trials)
- 5% per year with 90-99% (previous trials)
- Recent data shows stroke risk of 0.5% to 1% per year when carotid stenosis > 50%.
- A recent meta analysis showed decrease stroke rates 2.83% before 2000 to 1.13% per year after 2000.

Asymptomatic carotid stenosis: What's Next?

The Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Study
Health and Hope for Patients at Risk for Stroke

Please refer patient with greater than 70% stenosis by ultrasound
503-216-1190 or Theodore.Lowenkopf@providence.org
Conclusions

- **Antiplatelet therapy after stroke:** There is no compelling argument to change from aspirin or change aspirin dose…

- **Anticoagulation for atrial fibrillation:**
  - Appropriate to wait 2 weeks after stroke
  - Consider extended cardiac telemetry monitoring for cryptogenic stroke

- **Echocardiography:**
  - TTE does not to be routinely ordered on all stroke and TIA patients, indications include abnormal cardiac exam, history of CAD, and abnormal EKG
Conclusions

- **Carotid Stenosis**: Surgery for symptomatic disease is appropriate, early is better; for asymptomatic disease there is equipoise for surgery vs medical management - CREST 2
Providence Stroke Center

- JC CSC
- Clinical Care: AHA GWTG/Target Stroke Awards
- Telestroke
- Outpatient referral Destination Center
- Research: Epidemiology Clinical Trials
- Regional Outreach: Oregon Region, Education, Oregon Stroke Network, Oregon State Stroke Committee