

Evaluation of Ischemic Stroke and TIA

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Oregon Stroke Stats

- Death from stroke increased 19% from 1990 to 2000 (OPHS 2000)
- Death rate 146/100K/yr (5th worst) (CDC 2003)
- \$140mil/yr for hospital cost alone
- 1/4 hypertension, 1/6 diabetes

The Stroke Hat?



How do I recognize a stroke?

- Sudden change in neurologic function, usually one-sided:
 - Weakness
 - Sensory loss/numbness
 - Clumsiness
 - Vision loss or double vision
 - Language/confusion
 - (Worst headache ever)

Why Care about Stroke? U.S. Stroke Stats

- >730,000 stroke diagnoses/yr
- >160,000 deaths (#3 cause)
- ~ 4 million have stroke deficit (#1 cause disability)
- >\$58 billion (care and lost productivity)

American Heart Association National Center Statistics, 2008.

Think BE-FAST

- **B**alance: a little unsteady?
- **E**yes: not working right?
- **F**ace: a little uneven?
- **A**rm: hang down?
- **S**peech: seem a little funny?

- **TIME** to Call 911.

Evaluation of Stroke and TIA

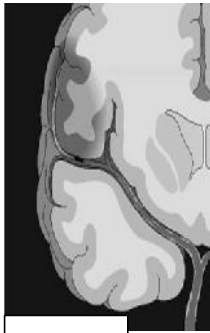
Definitions
Risk-Stratifying TIA
Evaluation
Minimizing (Recurrent) Stroke Risk

TRADITIONAL DEFINITION: TIA

Sudden onset of a focal neurologic symptom that lasts less than 24 hours and is presumably brought on by a transient decrease in blood supply, which renders the brain ischemic in the area producing the symptom. The restoration of blood flow is timely enough to make the ischemia transient and avoid infarction.

--Up to Date

What is a stroke?



A stroke occurs when the blood supply to part of the brain is cut off resulting in permanent loss of that brain tissue and its function.

-local thrombus/atherosclerosis, or
-embolus from heart, aorta, or proximal artery, or
-poor perfusion through locally narrowed artery

U.S. TIA Stats

- >240,000 ED visits/yr
- >500,000 est. events/yr
- ~ 5 million (2.3%) population prevalence

American Heart Association National Center Statistics, 2008.

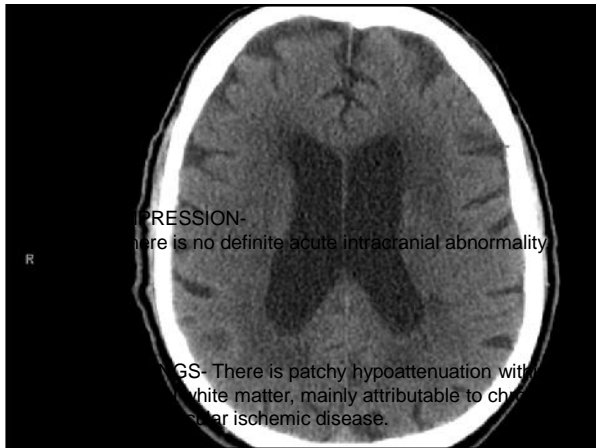
STROKE is a BRAIN ATTACK

TIME = BRAIN

EVERY MINUTE COUNTS

Dial 911

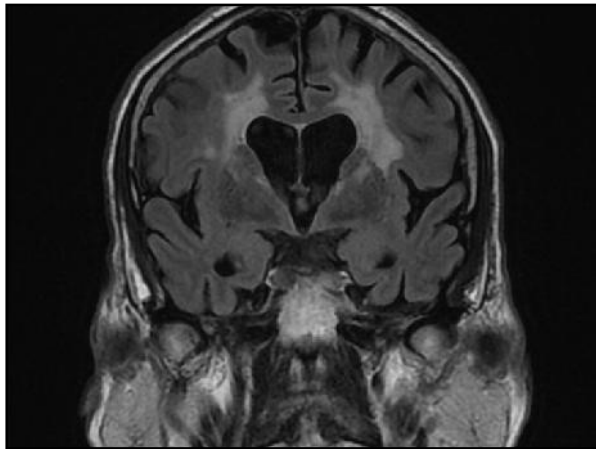




Time after TIA	Stroke rate
2 days	5%
1 week	9%
5 years	*24 – 29%

(*compare to 40% @ 5 years after stroke)

Johnson. JAMA. 2000;284:2901-06.
Sacco. Neurology. 1997;49(suppl 4):S39.
Feinberg et al. Stroke. 1994;25:1320.



ABCD2 Score

- Age ≥ 60 pt 1
- Blood pressure; SBP ≥ 140 OR DBP ≥ 90 pt 1
- Clinical: weakness, one side, OR language disturbance pt 2
- D(1)uration of symptoms ≥ 60 min OR duration of symptoms 10 – 59_min 2 pt
- D(2)iabetes +1 pt 1 pt

Total ABCD2 score

Johnson et al. Stroke. 2007;38:283-292. n=4799

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ABCD2 Score

n=4799

ABCD2	2 day risk	7 day risk	90 day risk
0-3	1.0%	2.2%	3.1%
4-5	4.1%	5.9%	9.8%
6-7	8.1%	11.7%	17.8%

Lancet 2005; 366:29-36

Yes, there really is a benefit to **early** evaluation of TIA

EXPRESS
Lancet 2007; 370:1432-42

Before: referral by PCP to TIA clinic, awaited recs to start by PCP
After: same-day TIA clinic, recs started immediately from clinic

	N	Days to clinic	Days to RX	90 day Strokes
Before	310	3	20	10.3%
After	281	1	1	2.1%%

Stroke = CAD Risk Factors

- **Non-modifiable**
 - Age
 - Sex
 - Personal History
 - Family History
- **Modifiable**
 - Hypertension
 - Diabetes
 - High cholesterol
 - Smoking
 - Atrial fibrillation
 - Carotid disease
 - Obesity/inactivity
 - Sleep apnea
 - Clotting disorders
 - PFO?

Goals of admission

- Expedite work-up
- Optimize preventive measures
- Provide stroke education

TIA

- Monitor during period of highest stroke risk
 - allows early intervention
 - RRT Stroke protocol

Stroke

- Acute revascularization
 - tPA
 - Endovascular
- Supportive care
- Rehab therapies

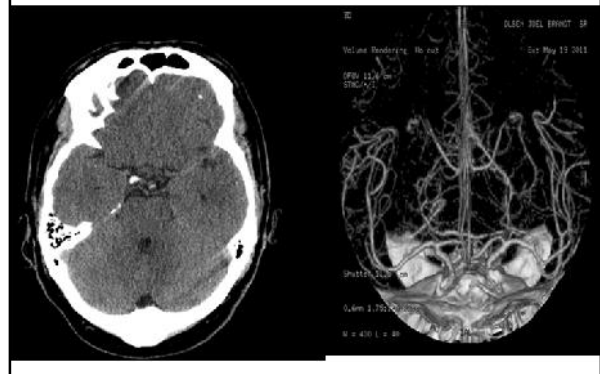
ASA recs: Stroke/TIA evaluation

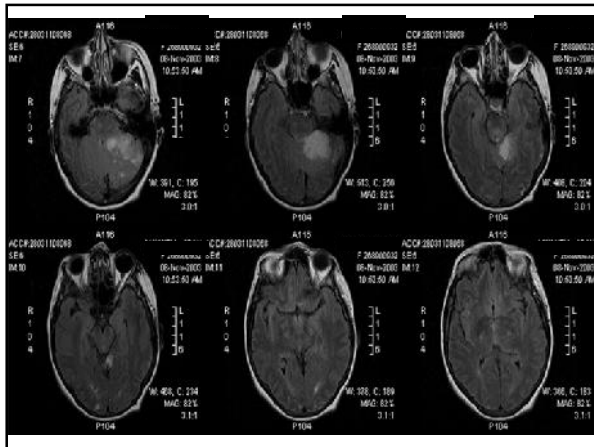
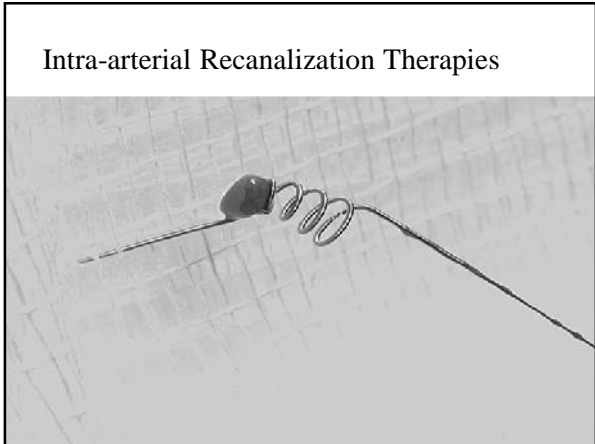
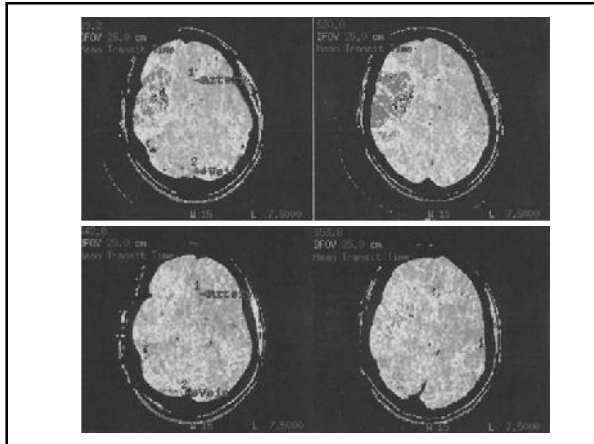
- Evaluate <24hr/ASAP after an event
- *Brain imaging: MRI>CT
- Cervical vascular imaging
- Intracranial vascular imaging IF findings would alter management
- EKG ASAP; Tele/Holter if unclear origin
- TTE if no cause identified; TEE IF findings would alter management
- Bloodwork (CBC, Chem, coags, lipids)

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Acute Radiographic Assessment: CT/CTA





Stroke Risk Factors and Prevalence

Risk Factor	RR	Prevalence (%)
Hypertension	3.0 – 5.0	25 – 56
Cardiac disease	2.0 – 4.0	10 – 20
Atrial fibrillation	5.0 – 18.0	1 – 2
Diabetes mellitus	1.5 – 3.0	4 – 8
Cigarette smoking	1.5 – 3.0	20 – 40
Heavy alcohol use	1.0 – 4.0	5 – 30

Adapted from Sacco. In: Gorelick and Alter (eds). Handbook of Neuroepidemiology. New York: Marcel Dekker, Inc; 1994:87, with data from Feinberg. Curr Opin Neurol. 1996;9:46; Gorelick. Stroke. 1994;25:222.

Obligatory Acute Stroke Treatment Slide

- Re-open the vessel, the sooner the better
 - Iv tPA up to 4.5 hours from onset in most patients
 - Endovascular clot retrieval up to 8 hours from onset
- Optimize cerebral blood flow
 - Allow permissive hypertension, to 220/110 in most
- Minimize brain metabolism
 - Normalize temperature, glucose, electrolytes
- Prevent complications from immobility

Study	Time	Patient Charge
Non-contrast CT	2 min	\$411
CTA neck	5 min (head and neck)	\$1395
CTA head		\$1358
MRI stroke protocol	25 min	\$1150
MRA neck	15 min	\$1999
MRA head	15 min	\$1272
Carotid Duplex	20 min	\$392
Cerebral angiogram	Hours	\$10,445

Extracranial vascular imaging

Modality	Sens	Spec	Pros/cons
CUS	80-90%	76-99%	+low cost -over-estimates stenosis -tech-dependent
CTA	89-95%	84-99% (100% NPV)	+excellent resolution stenosis -higher cost -contrast & radiation
MRA	92-94%	76-93%	-even higher cost +/-gadolinium greatly enhances s/s -over-estimates stenosis
Cerebral angiogram			+gold standard resolution -highest cost -invasive (1-2% complication rate)

ASA Recs: Carotid Stenting (with distal neuroprotective device)



- revisions, radiation injury, high cervical lesions, significant surgical risk warrant consideration
- CEA probably better in older, CAS in younger

CREST Endpoints (CEA vs. CAS)

Endpoint	CAS	CEA	Hazard Ratio (95% CI)	P Value
Primary endpoint ≤4 years	7.2	6.8	1.11 (0.81 – 1.51)	.51
Primary endpoint: periprocedural components	5.2	4.5	1.18 (0.82 – 1.68)	.38
Any periprocedural stroke	4.1	2.3	1.79 (1.14 – 2.82)	.01
Periprocedural major stroke	0.9	0.7	1.35 (0.54 – 3.36)	.52
Periprocedural MI	1.1	2.3	0.50 (0.26 – 0.94)	.03
Cranial nerve palsies	0.3	4.8	0.07 (0.02 – 0.18)	.0001
Ipsilateral stroke after periprocedural period ≤4 years	2.0	2.4	0.94 (0.50 – 1.76)	.85

CAS = carotid artery stenting; CEA = carotid endarterectomy; CI = confidence interval; MI = myocardial infarction

Incidental/asymptomatic Carotid Artery Stenosis

- Current medical management (ACE-I, statins, antiplatelets) have lowered stroke annual rate in this population to <1% **
- There may be benefit of revascularization in asymptomatic men <75 years old

*ACAS **Oxford Vascular Study, etc.

ASA Recs: Carotid Endarterectomy

- ***Symptomatic:** CEA by surgeon with <6% perioperative morbidity/mortality if:
 - ≥70% stenosis
 - 50-69% stenosis in select cases
- CEA within 2 weeks
 - 70-99% stenosis: max benefit <2 wks after symptoms
 - 50-69% stenosis: no benefit >2 wks after symptoms
 - Women: no benefit >2 wks after symptoms

*NEJM, Vol 325, no 7 Aug 15, 1991 **JAMA; May 10, 1995; vol 273, #18

Intracranial angioplasty/stenting

- intracranial stenting vs. best medical management in carefully selected patients with 70-99% stenosis of intracranial artery, with recent stroke or TIA
- Study stopped early due to:
 - 14.7% stroke or death in stented, vs. 5.4% in medical management at 30 days
 - 20.0% stroke in stented, vs. 12.2% in medical at 1 year
- Currently, we will consider compassionate use in people who have failed medical management (recurrent stroke in same area), with careful counseling

SAMMPRIS NEJM 2011; 365:993-1003.

ASA recs: Stroke/TIA cardiac evaluation

- ECG ASAP (IB)
- Tele/Holter useful if unclear origin (unknown appropriate duration)
- TTE reasonable if no cause found
- TEE useful to ID PFO, arch atheroma, valve disease if finding would change treatment

Aspirin "Failure"

Or is it risk factor management "Failure"?
Change antiplatelet?
Warfarin?

CLOSURE I

Efficacy and safety of PFO Closure vs Best Medical Management

End point	Device (%)	Medical therapy (%)	p
Composite end point	5.9	7.7	0.30
Stroke	3.1	3.4	0.77
TIA	3.3	4.6	0.39
Major vascular complications	3.2	0.0	<0.001
Atrial fibrillation	5.7	0.7	<0.001

The best antiplatelet is the one your patient will take

- Plavix: good if aspirin allergy
- Aggrenox: bid dosing and side effects limit compliance
- At what cost?

– Aggrenox	#60	\$150
– Plavix	#30	\$145
– Aspirin	#30	\$0.31
- Cost-base analysis:
 - US analysis (2005): Slightly better efficacy of ASA/ER DP and clopidogrel are balanced by the low cost of ASA.
 - UK and French analyses (2005, 2003): Slightly better efficacy not balanced enough by lower cost of ASA.



"Cryptogenic"
probably means
"we didn't look hard
enough"

"When we looked at the causes of recurrent events, strokes or TIA, we could find an explanation [for the event] that had nothing to do with paradoxical embolism in about 80% of the patients. The important point is that many of these cryptogenic strokes [were] not due to paradoxical embolism."

--Anthony Furlan, MD, PI on CLOSURE I

When is an antiplatelet not enough?

- | | |
|--|---|
| <ul style="list-style-type: none"> • Warfarin > antiplatelet <ul style="list-style-type: none"> – Afib – LV thrombus – Anticardiolipin syndrome – Rheumatic valve* – Mechanical valve* – Cerebral sinus thrombosis – Inherited thrombophilia with recurrent thrombosis | <ul style="list-style-type: none"> • Antiplatelet ≥ warfarin: <ul style="list-style-type: none"> – Carotid disease – Intracranial disease <small>WASID</small> – Small vessel disease – Isolated PFO <small>PICCS</small> – Cryptogenic – ACLA positive <small>APASS</small> – Recurrent non-cardiogenic |
|--|---|

Risk of stroke from non-valvular afib

(ASA Guidelines for Primary Prevention of Stroke)

Age, y	Prevalence	Population Attrib Risk	Relative Risk
50-59	0.5	1.5	4.0
60-69	1.8	2.8	2.6
70-79	4.8	9.9	3.3
80-89	8.8	23.5	4.5

Risk reduction with treatment (meta-analysis):

- Aspirin vs placebo: 19% (CI, 1%--35%); 7 trials, 3990 pts
- Adj-dose warfarin vs placebo: 64% (CI, 49%--74%); 6 trials, 2900 pts
- Adj-dose warfarin vs aspirin: 39% (CI, 19%--53%); 9 trials, 4620 pts

Statin News: SPARCL

NEJM. 2006;355:549-559

- RCT, TIA/stroke (*no known CHD) pts, 4.9yr f/u
- LDL 100-190, mean 133

	Lipitor (2365)	Placebo (2366)	HR, p
Mean LDL	73	129	
Strokes	11.2	13.3	0.84, 0.03
CHD events			0.80, 0.002

"...supports the concept of atherosclerosis as a systemic disease...intensive lipid-lowering effort is recommended even in TIA/Stroke patients with no history of CHD..."

JUPITER consistent with these recommendations

ASA Guideline follows NCEP III guideline

DTI pros and cons

- Few drug/diet interactions
- No monitoring required/No monitoring available
- Renal excretion/Renal dosing guess by FDA
- Long half-life/Long half-life
- No antidote
- *High cost (\$230/month at Costco)

*Several studies have shown DTI to be cost effective. PHP/PHP Medicare covering at least partially.

Prevention Overview

- Our best medical management is getting much better outcomes:
 - Antiplatelets for most
 - Anticoagulants for afib, valves, EF < 15%
 - SBP < 140 (<130 if DM)
 - LDL < 70
 - lifestyle modifications
- Consider procedures very carefully

Antithrombotic Grey Areas: no clear answer

- Arterial dissection
- Low ejection fraction
- Aortic atheroma
- Thrombophilia without venous thrombosis
- PFO with atrial septal aneurysm

Take home

TIA is often a warning sign of imminent stroke, and both warrant emergent evaluation and aggressive treatment of risk.

We don't have all the answers, but we keep looking...

TIME IS BRAIN

EVERY MINUTE COUNTS

Call the Oregon Stroke Team:
503-494-9000
or dial 911

