Multi-modality management of intracranial aneurysms

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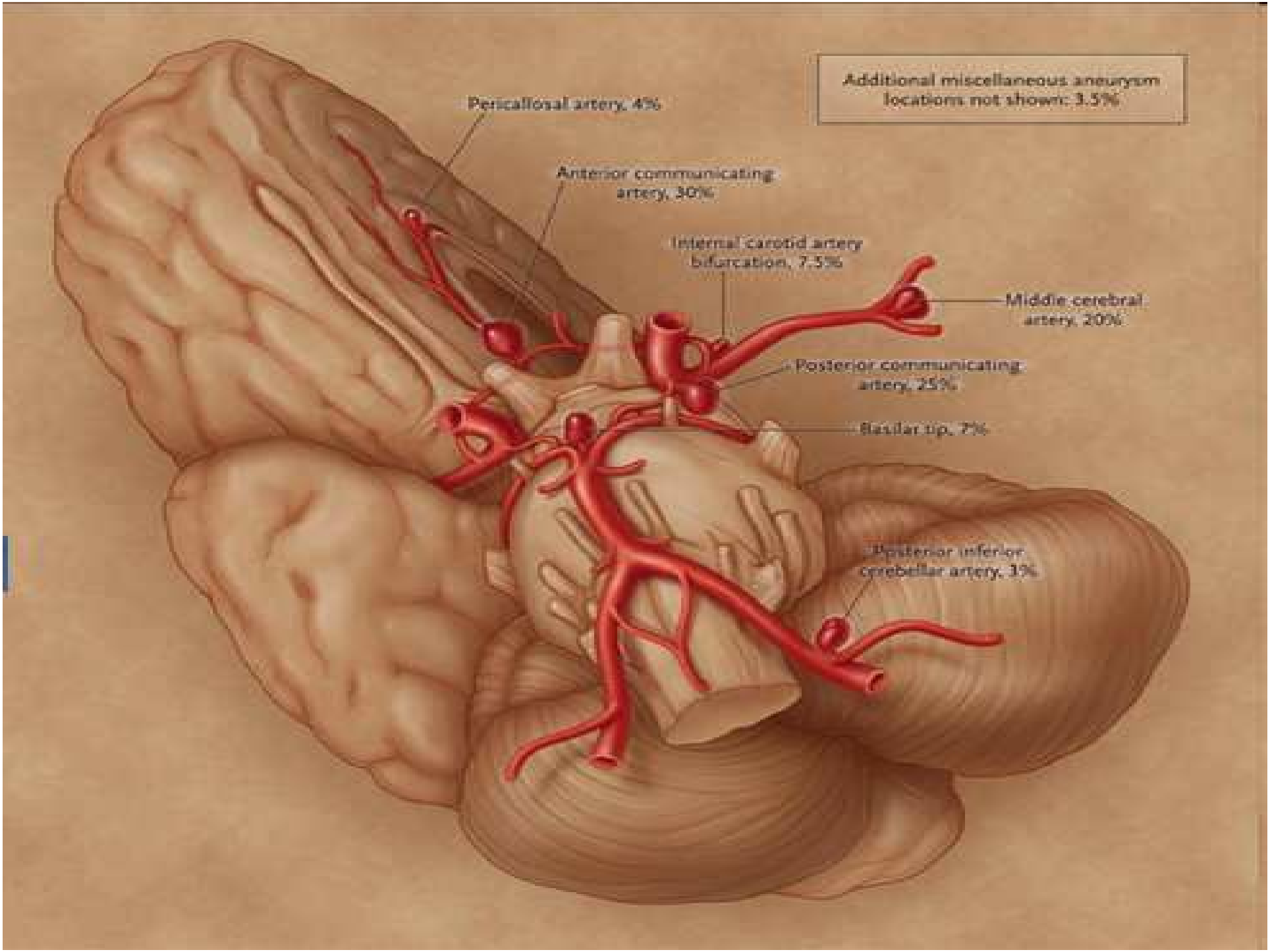
Overview

- Location and imaging
- Who should be treated?
- The clip vs coil debate
- The tools of the trade: Evolution of endovascular technologies


Additional miscellaneous aneurysm locations not shown: 3.5%
Pericallosal artery, 4%
Anterior communicating artery, 30%
Internal carotid artery bifurcation, 7-5%
Middle cerebral artery, 20%
Posterior communicating artery, 25%
Basilar tip, 7%
Posterior inferior cerebellar artery, 3%

The many faces of a brain aneurysm


BRAIN ANEURYSM
AWARENESS
SAVES LIVES!
The Brain Aneursym Foundation
The San Antonio Chapter

Risk Factors for Aneurysm Growth

- ***Smoking!!!***
  - #1 risk for development and rupture
- Family History
  - 17X increase rupture risk in small aneurysms (Stroke June 2009)
  - Don’t blame it on your loved one-not AD
  - Get an MRA/CTA if a first degree relative
- Bad Luck
  - 80% of aneurysm patients have neither of the above
  - Born with artery weakness

Warning signs of a brain aneurysm

- Headache
  - Sign of rupture
  - MOST headaches not due to aneurysms
  - Worst headache of life
    - “Hit by a baseball bat”
    - “Car ran over my head”
    - “ Head was in a vice clamp”

Additional warning signs

- Stroke signs
  - Numbness
  - Weakness
- Visual Changes
  - Double vision
  - Drooping eyelid

What to do next??

- If ruptured get treated immediately
- If not ask the magic 8 ball

- As I see it, yes
- It is certain
- It is decidedly so
- Most likely
- Outlook good
- Signs point to yes
- Without a doubt
- Yes
- Yes - definitely
- You may rely on it
- Reply hazy, try again
- Ask again later
- Better not tell you now
- Cannot predict now
- Concentrate and ask again
- Don't count on it
- My reply is no
- My sources say no
- Outlook not so good
- Very doubtful

ISUIA data
12/10/1998 NEJM

- H/o SAH from another aneurysm
  - 11X increase risk between group 1 and 2 for <10mm
- Size (no h/o SAH)
  - <10mm 0.05%/year risk of rupture
  - >10mm 1%/yr
  - >25mm 6%/year
- Location (no h/o SAH)
  - Basilar apex/VBJ 13.6 RR
  - Pcom 8.0 RR
- Surgical outcomes very poor
  - 17% risk of death or disability at 30 days periop

ISUIA data not seen in real practice

CLINICAL STUDIES

A Review of Size and Location of Ruptured Intracranial Aneurysms

Thomas R. Forget, Jr., M.D., Ronald Benitez, M.D., Erol Veznedaroglu, M.D., Ashwini Sharan, M.D., William Mitchell, M.D., Marco Silva, M.D., Robert H. Rosenwasser, M.D.

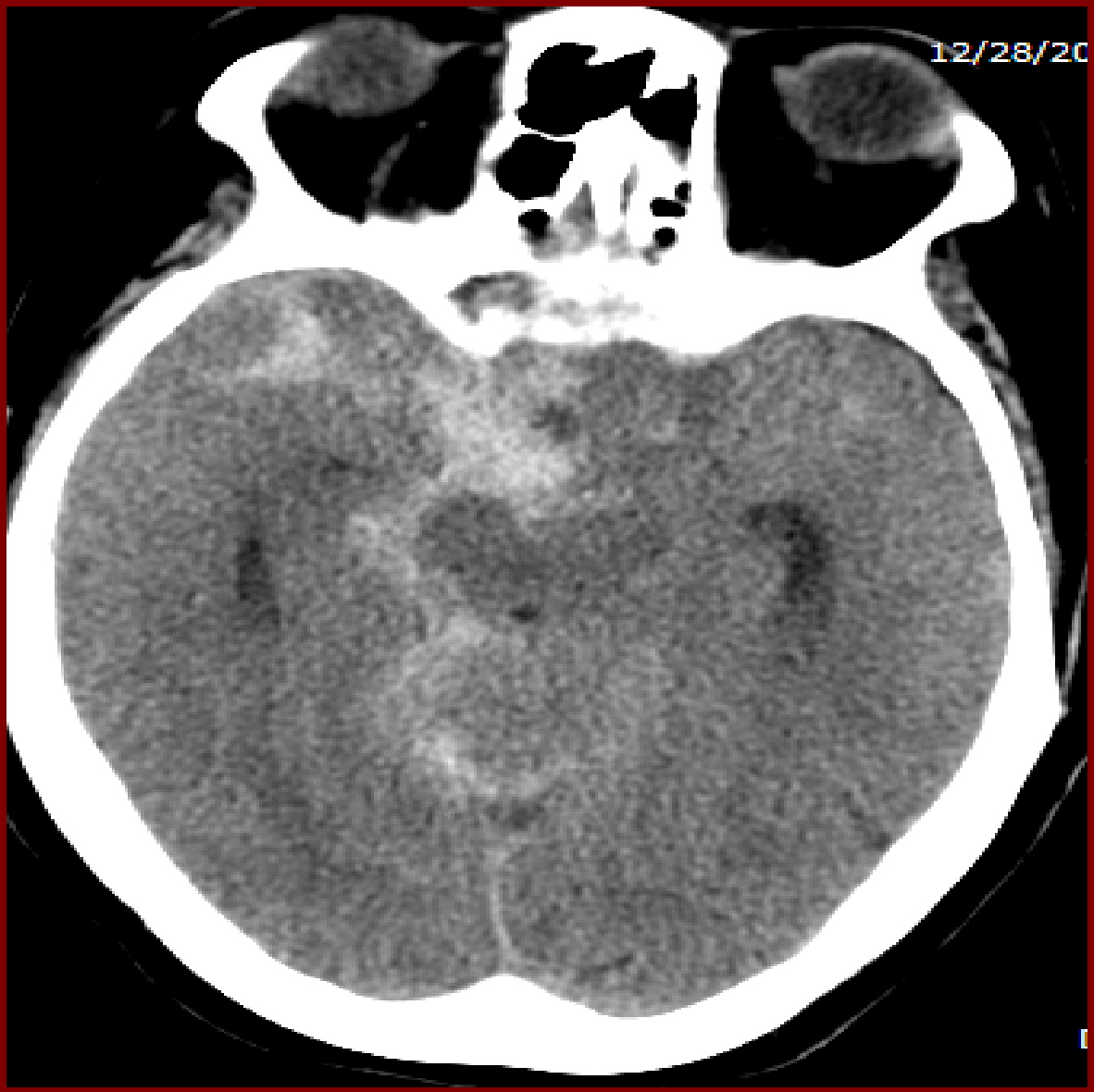
St. Louis University Health Sciences Center (TRF), St. Louis, Missouri, and Thomas Jefferson University/Wills Eye Hospital (TRF, RB, EV, AS, WM, MS, RHR), Philadelphia, Pennsylvania

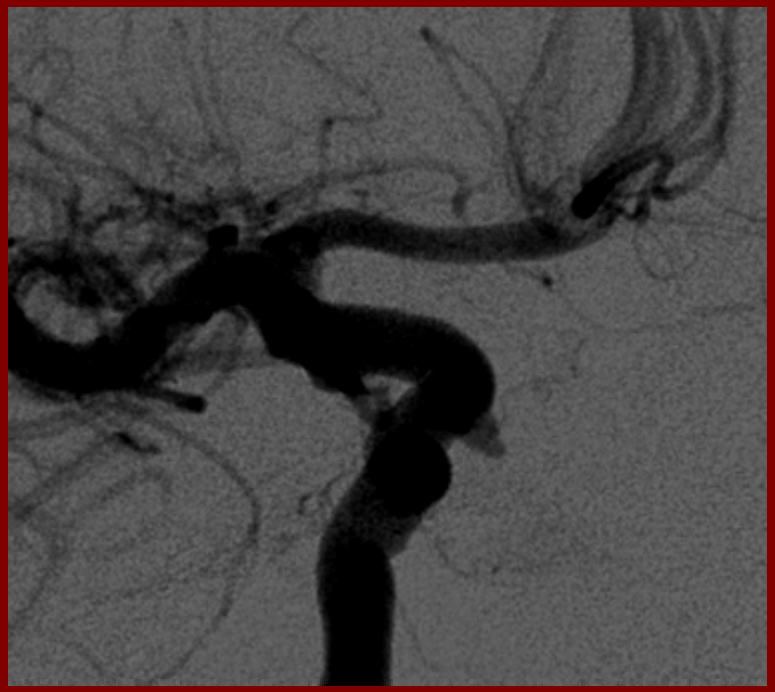
TABLE 1. Size and Location of Ruptured Aneurysms[a]

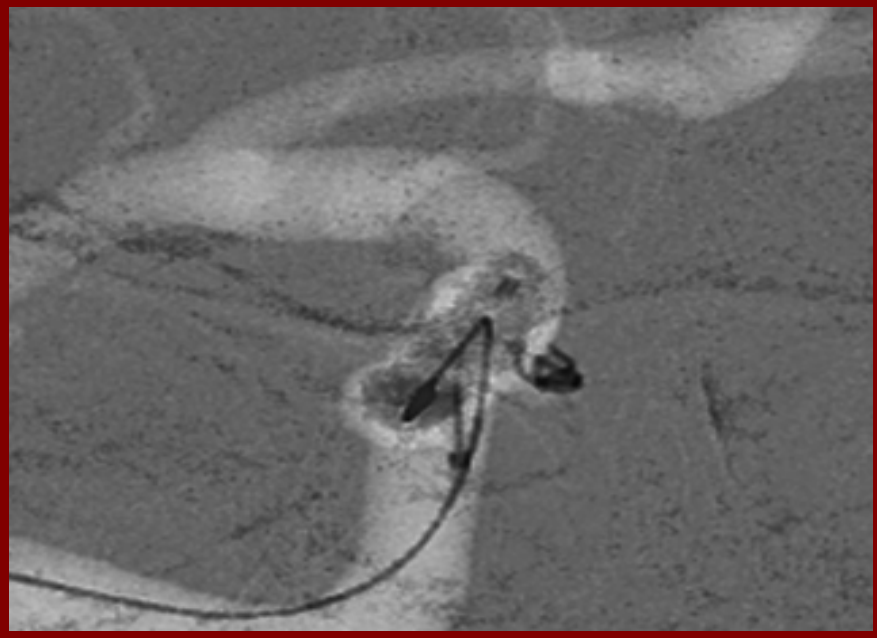
Size	<5 mm	6–10 mm	11–15 mm	16–20 mm	21–25 mm	>25 mm	Total
AComA	31	36	3	1	0	0	71
PComA	19	23	6	0	0	0	48
MCA	8	12	3	1	1	4	29
Basilar	8	23	2	2	0	1	36
PCA	3	6	2	0	0	0	11
SCA	4	0	0	0	0	0	4
Car	3	7	1	1	1	1	14
PICA	8	7	0	0	0	1	16
Opht	1	8	0	1	1	2	13
Peri	1	2	0	0	0	0	3
Total	86 (35%)	124 (50.6%)	17 (6.9%)	6 (2.4%)	3 (1.2%)	9 (3.7%)	245

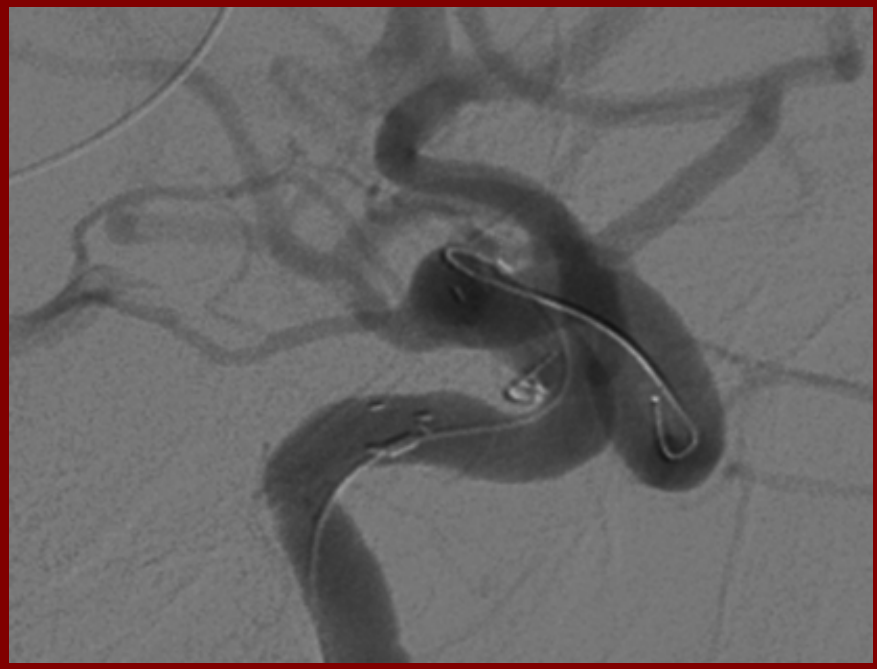
Dec 2001

65 yo woman HH 4 SAH









ISUIA revised (Lancet Jul 2003)

- 5 yr cumulative risk of rupture
  - <7mm: 0 vs 2.5%
  - 7-12 mm: 2.6 vs 14.5%
  - 13-25 mm: 14.5 vs 18.4%
  - >25mm: 40 vs 50%
- Surgery vs. Endovascular
  - 30 day risk:14/11% surg vs 9/7% endovasc
  - Older patients did much worse with surgery
  - Risk of re-hemorrhage higher with endovasc
  - MUST BE BETTER THAN NATURAL HISTORY!

What would you do if it was your loved one?

- Age
  - The older you are the sooner something else may take your life
- Aneurysm size
  - Bigger is not always better
  - Size ratio may be better predictor (Stroke 5/10)
- Location
  - Posterior circulation is worse
- Aneurysm shape

- Presence of risk factors
  - SMOKING
    - RR 3.0 in Finnish data JNS 2000
  - Family history of rupture

Treatment options

- Observation
  - Sometimes it is safer to do nothing
- Coils vs. Clips debate

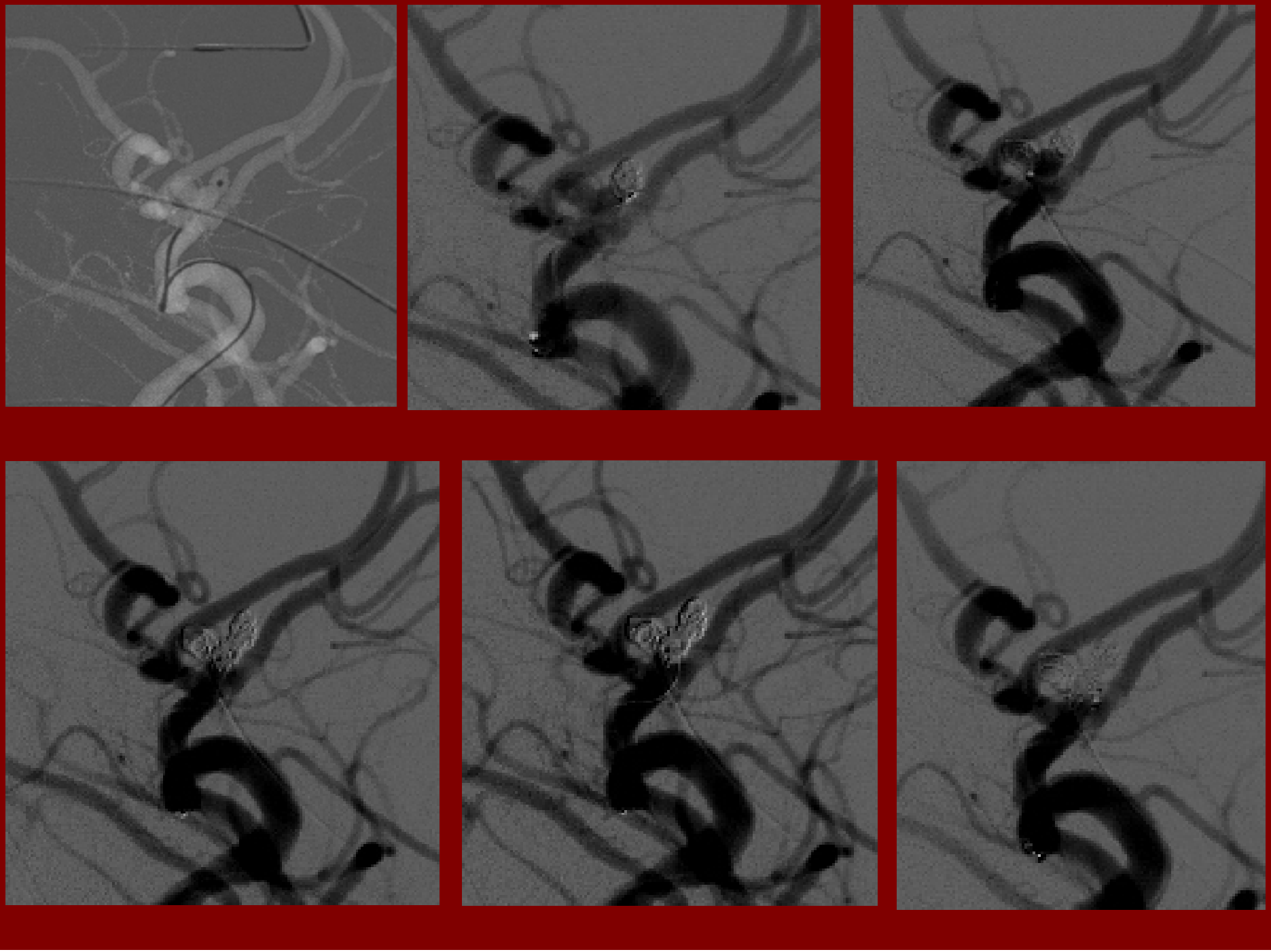
ISAT trial Lancet 2002

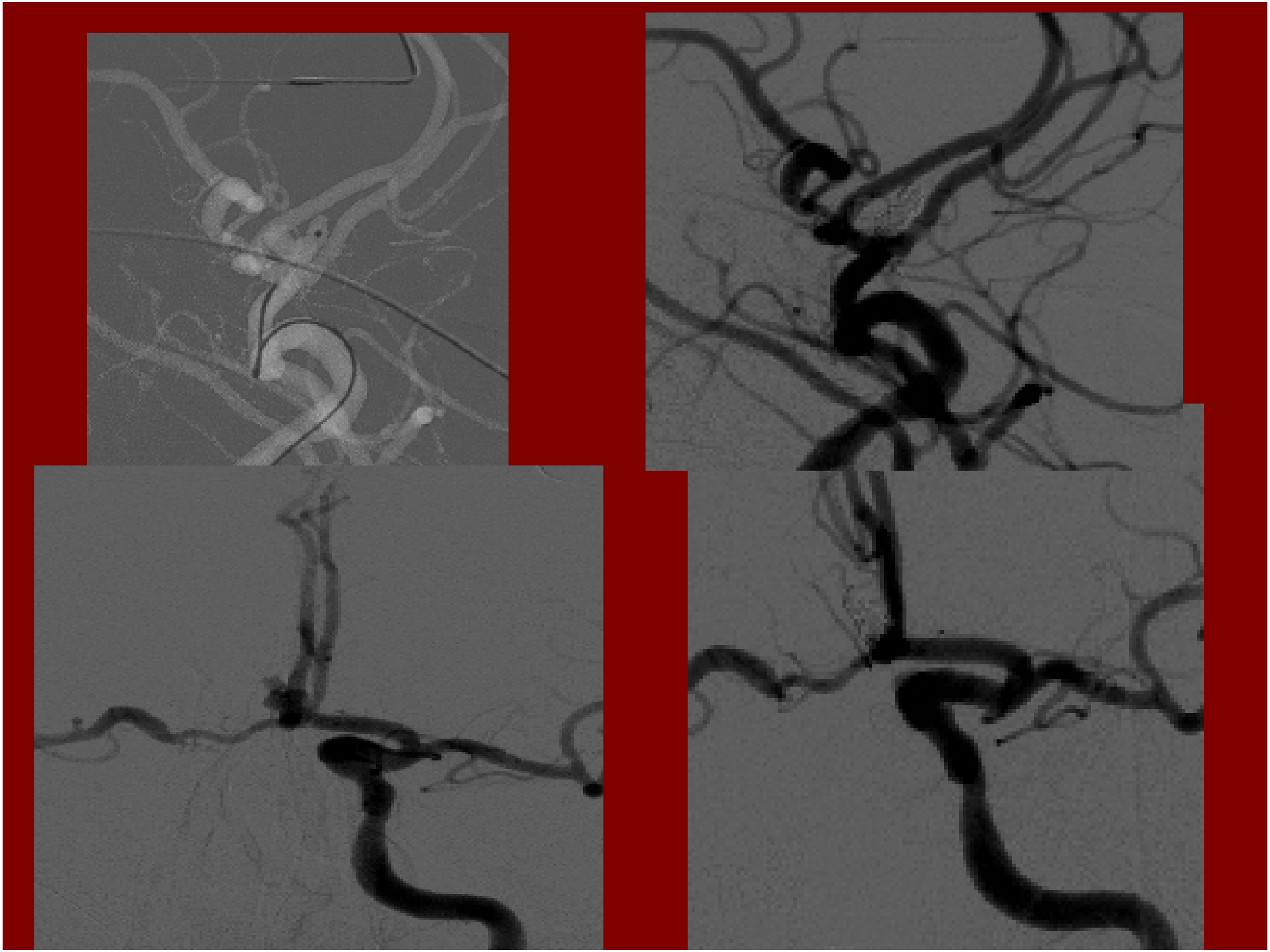
- 1st Level 1 evidence in favor of endovascular treatment in SAH patients
  - Biased in that 6000 pts excluded due to lack of equipose
    - MCA were clipped;Basilar coiled
    - A trial of pcom and acom treatments
  - Primary outcome mRs3-6: 22% with endovasc vs 31% with surgery
  - Rebleeding risk higher with endovascular (2 per 1276 pt years vs 0 per 1081)

ISAT update: 5 yr results (Lancet Neurology 2009)

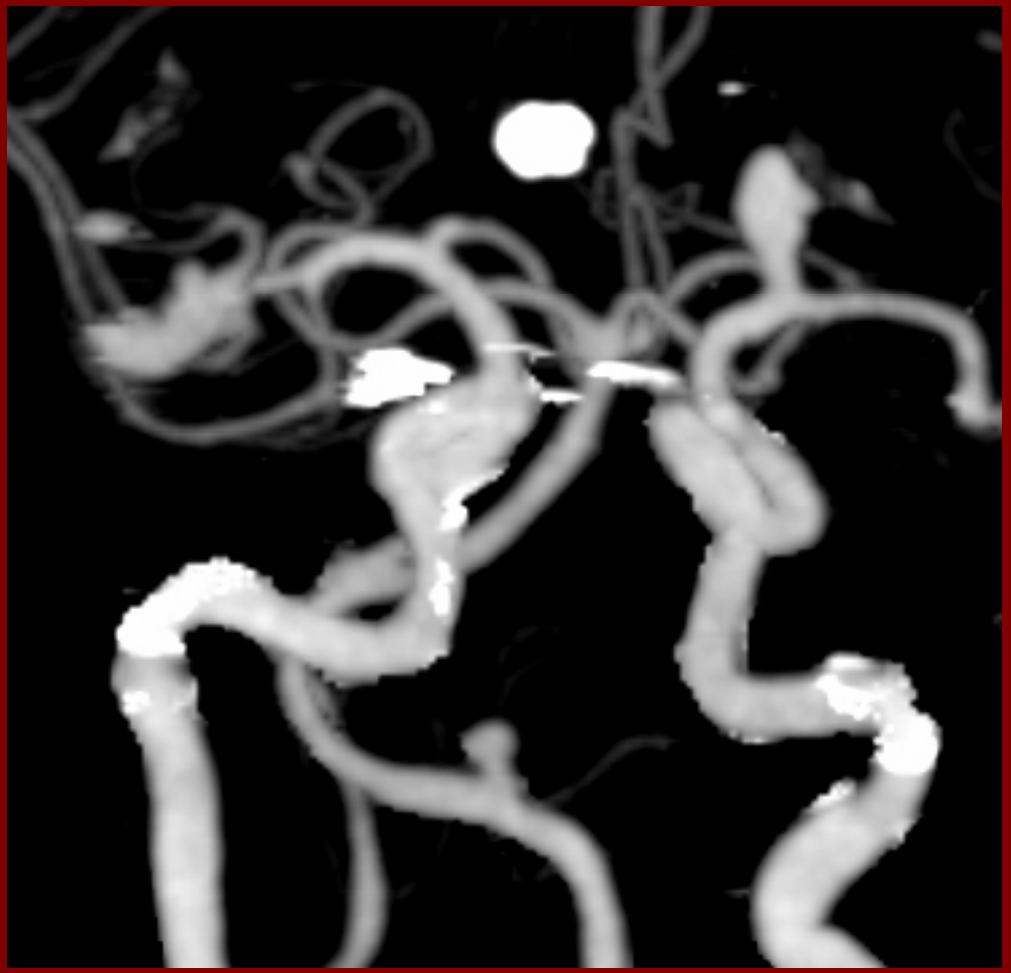
- Risk of rebleed (n=13)
  - 10 endovascular vs 3 surgical (p=0.06)
- Primary outcome mRS 0-2 no longer significant
  - Endovascular 83% vs neurosurgical 82%
- Risk of death significantly different
  - 11% endovascular and 14% neurosurgical (p=0. 03)

SAH decision making: 67 yo HH3 with right ICA occlusion= “3-headed” monster





57 yo woman HH grade 3
Dec 2008: Clips and/or coils



Feb 2009

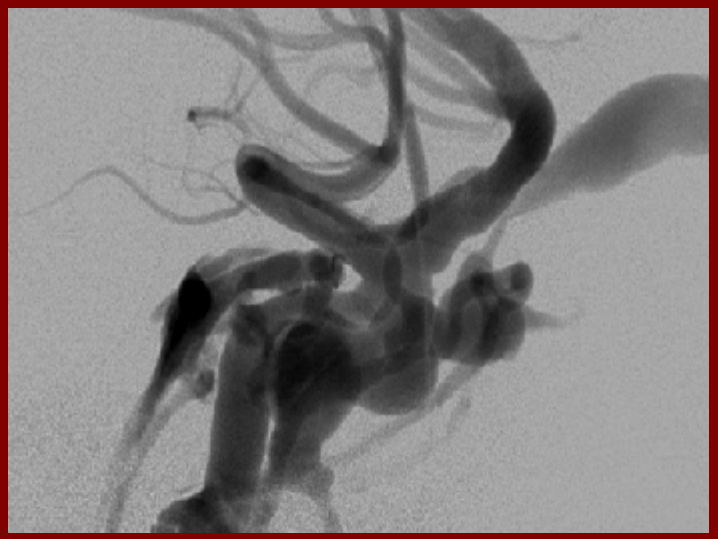
Endovascular options

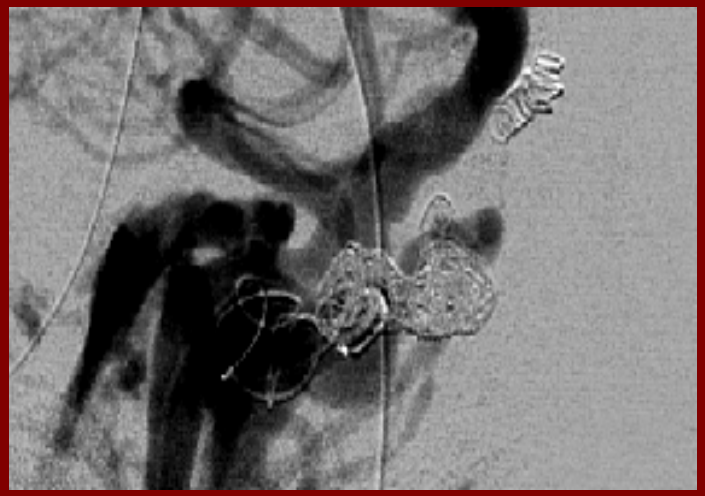
- Coils are the key
- Many newer tools
  - Stents
  - “Glue”

Role of complex shaped coils

- Increased packing density
  - Prospective trial to begin here
- Frame wide neck aneurysm

Role of complex shaped coils: CCF with wide neck with ICH



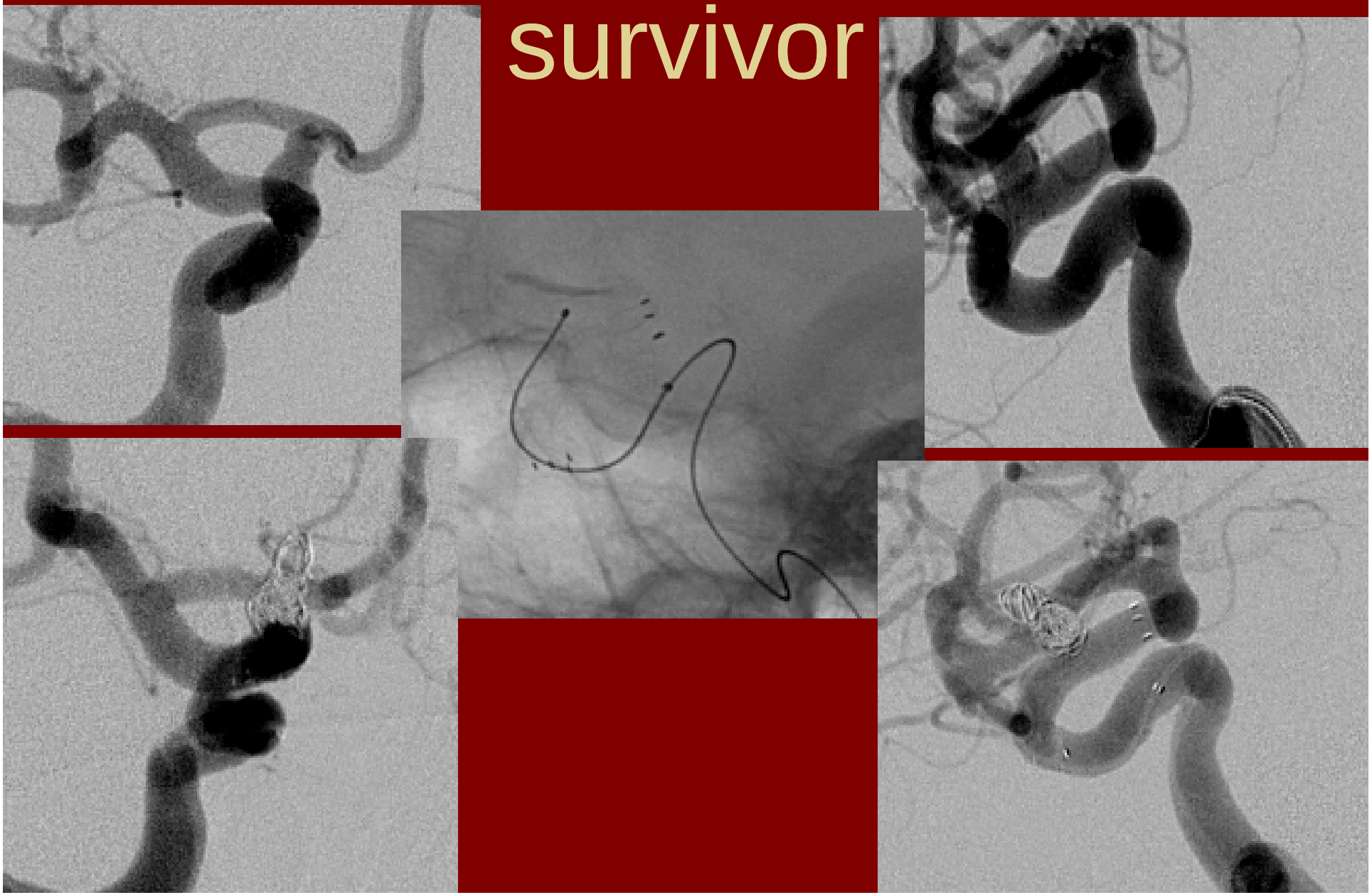


Traumatic CCF with tri-lobed appearance and CVD

Stent-assisted embolization for wide neck aneurysms

- Barrow experience (n=61,Nsurg Jun 2005)
  - Initial results
    - Complete/near complete (>95%) occlusion in 28 patients (45.9%)
    - Partial occlusion (<95%) in 33 patients (54%)
  - Risk of treatment
    - Perioperative morbidity 7% mortality 2%
    - Delayed instent stenosis 1-5%
  - 6 mo results
    - 52% progressive thrombosis
    - 25% no change
    - 23% recanalization

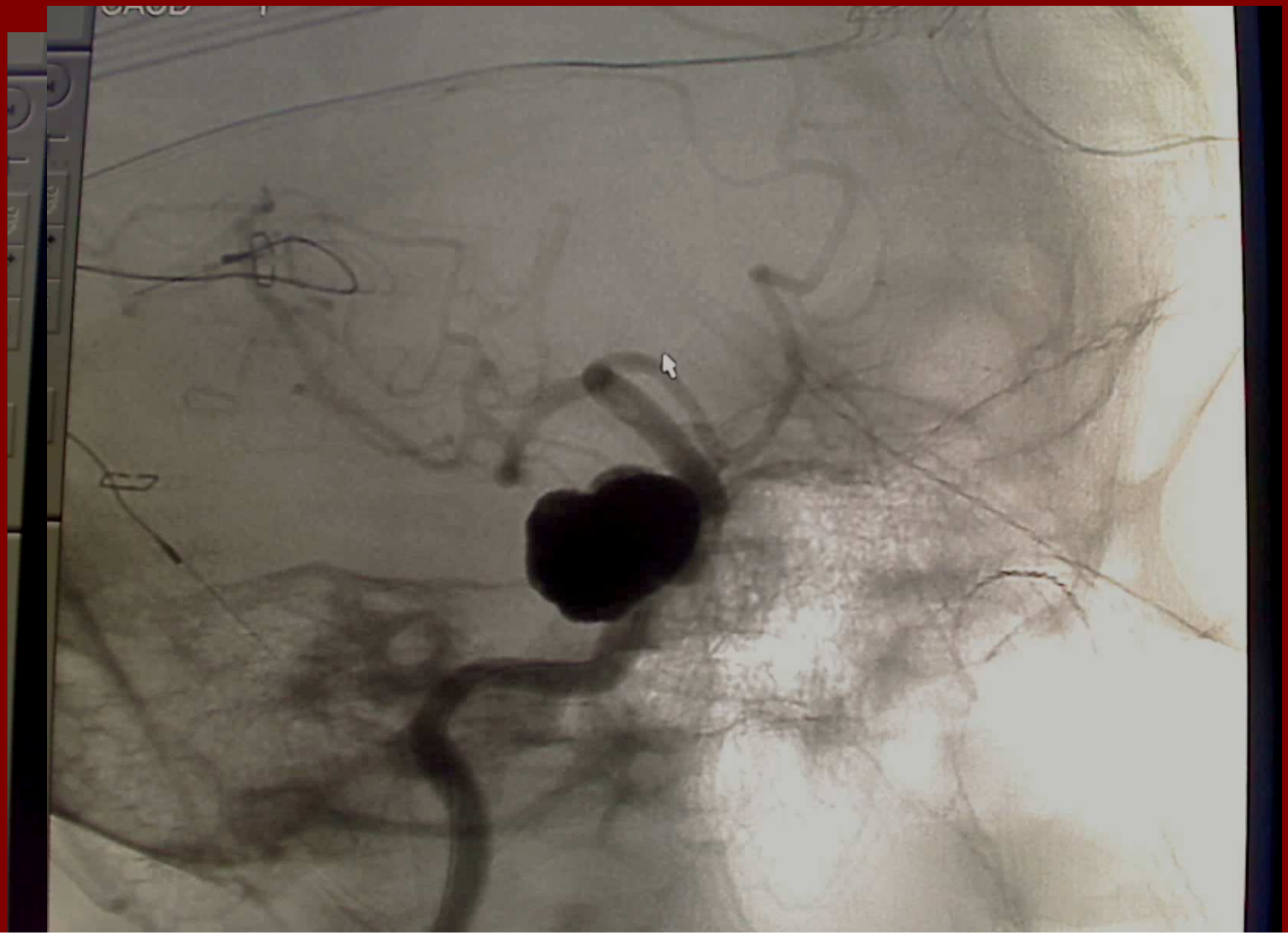
60 yo woman breast ca survivor



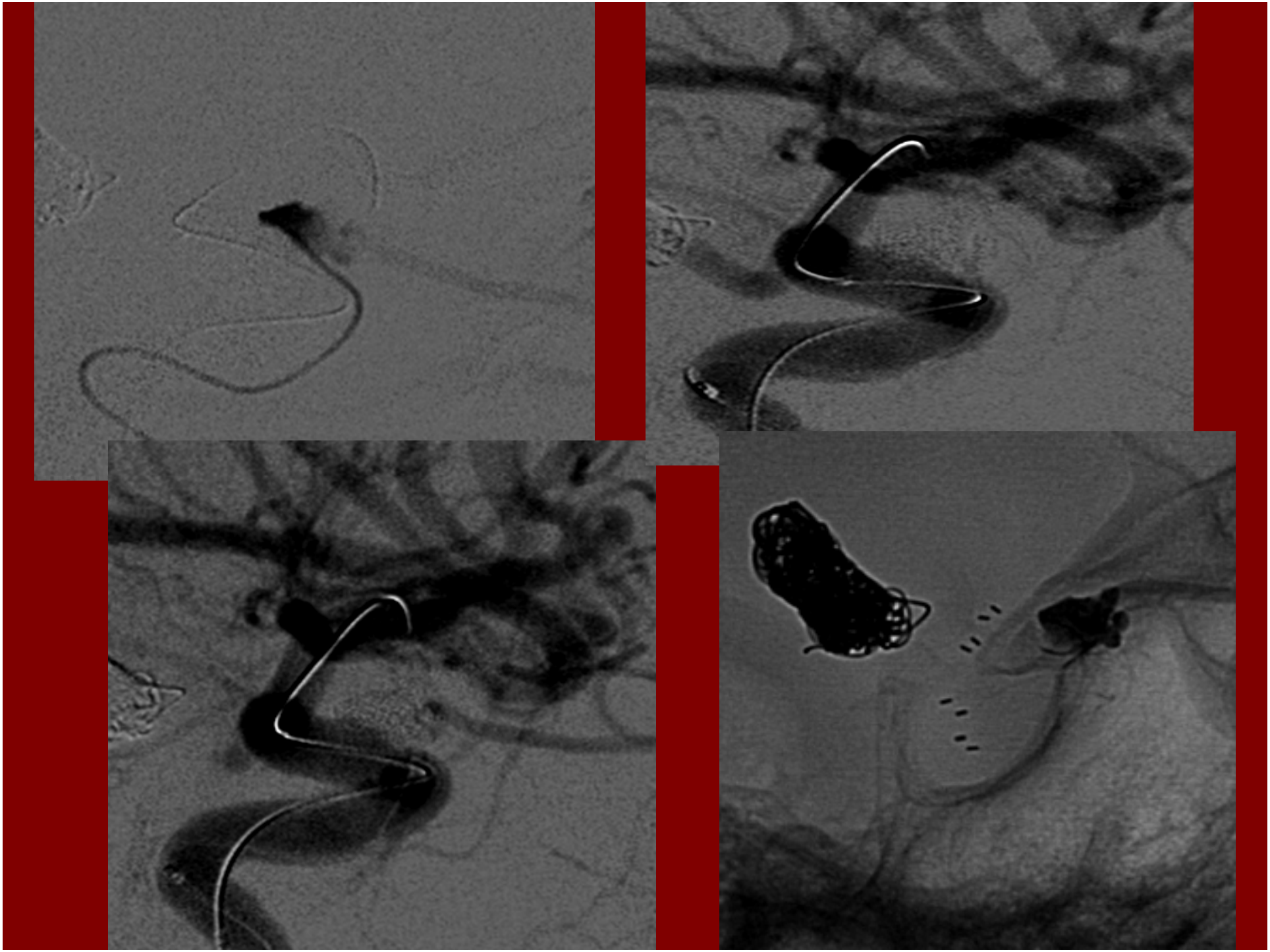
Onyx HD500=Aneurysm liquid embolic

- Initial results: Molyneux AJNR 2004
  - 12 mo f/u: Complete occlusion in 56 (79%); subtotal 9 (13%); incomplete 6 (8%)
  - Morbidity 8/97 pts; Mortality 2/97 pts
  - Parent vessel occlusion in 9/97 pts
- Learning curve results (JNS 2009 Sao Paulo, n=69 pts 84 aneurysms)
  - Complete occlusion 74%/95%/95.2% for small aneurysms and 53%/70%/80% for large aneurysms
  - Recanalization was observed in 3 patients (4.6%)
    - Procedural mortality 3% morbidity 7%
    - Retreatment in 2 patients (3.3%)

Onyx HD 500:75 yo woman giant cavernous aneurysm with 4th nerve palsy



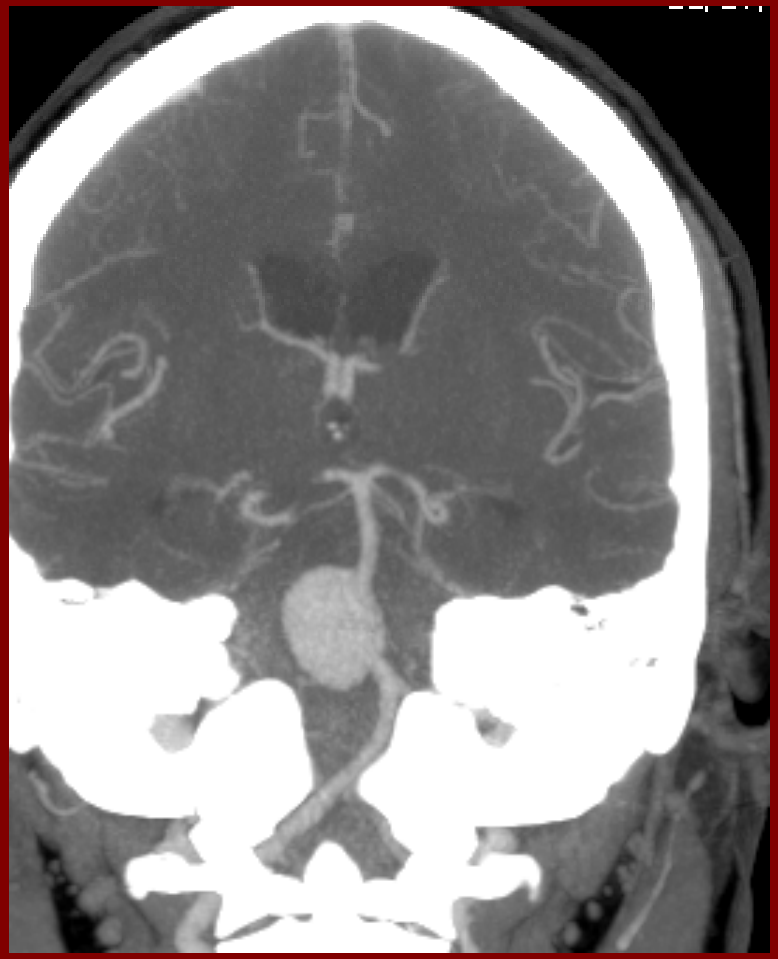
Onyx: Aneurysm “glue”
60 yo woman 2 sisters SAH w/3 aneurysms

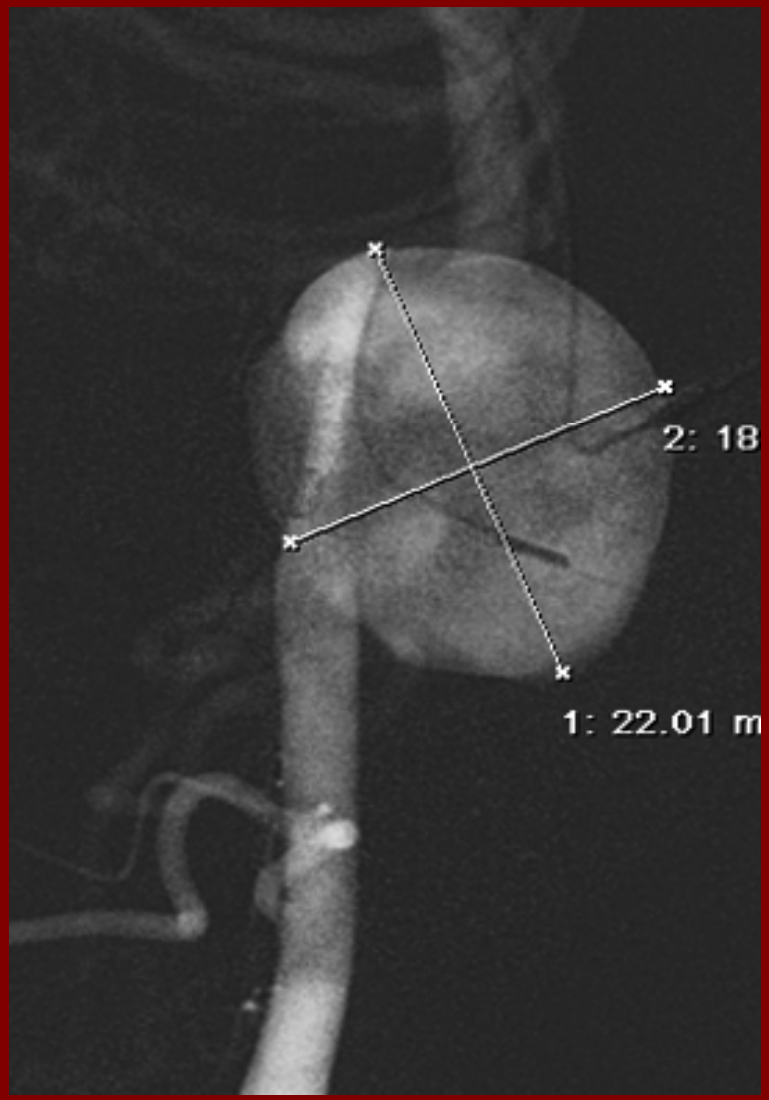


Introduction of flow “divertors”

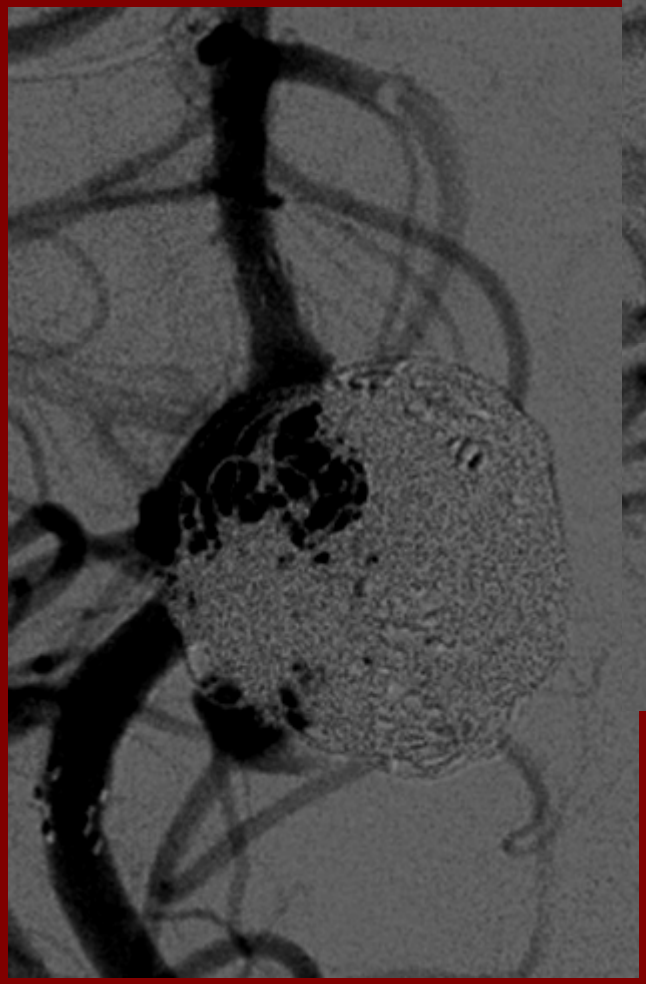
- Pipeline stent construct
  - 3-5 fold increase in surface coverage
  - 85% flow reduction within aneurysm
  - Extremely flexible for tortuous anatomy
- Buenos Aires experience (Nsurg 2009)
  - Small 33 Large 22 Giant 8
  - Complete occlusion in 17/18 f/u 12 mos.
  - No recanalization
  - No significant morbidity/mortality
    - 3 pts w/giant an had transient mass effect symptoms

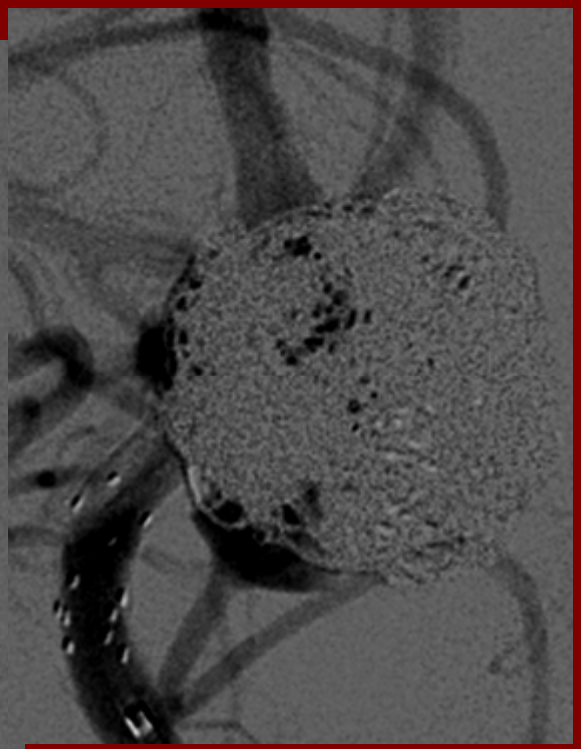
30 yo woman HH1 SAH Dec 2009



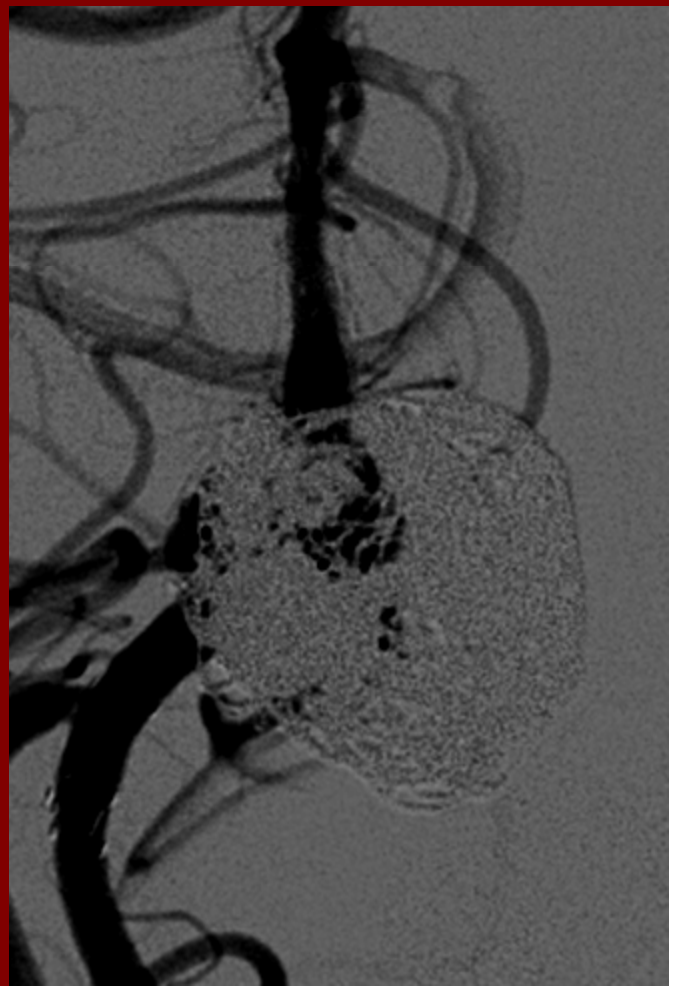


2/10 Placed 5 coils and 3 more stents





4/10 f/u



F/u 7/2010 shows complete occlusion

Aneurysm recurrence after coiling

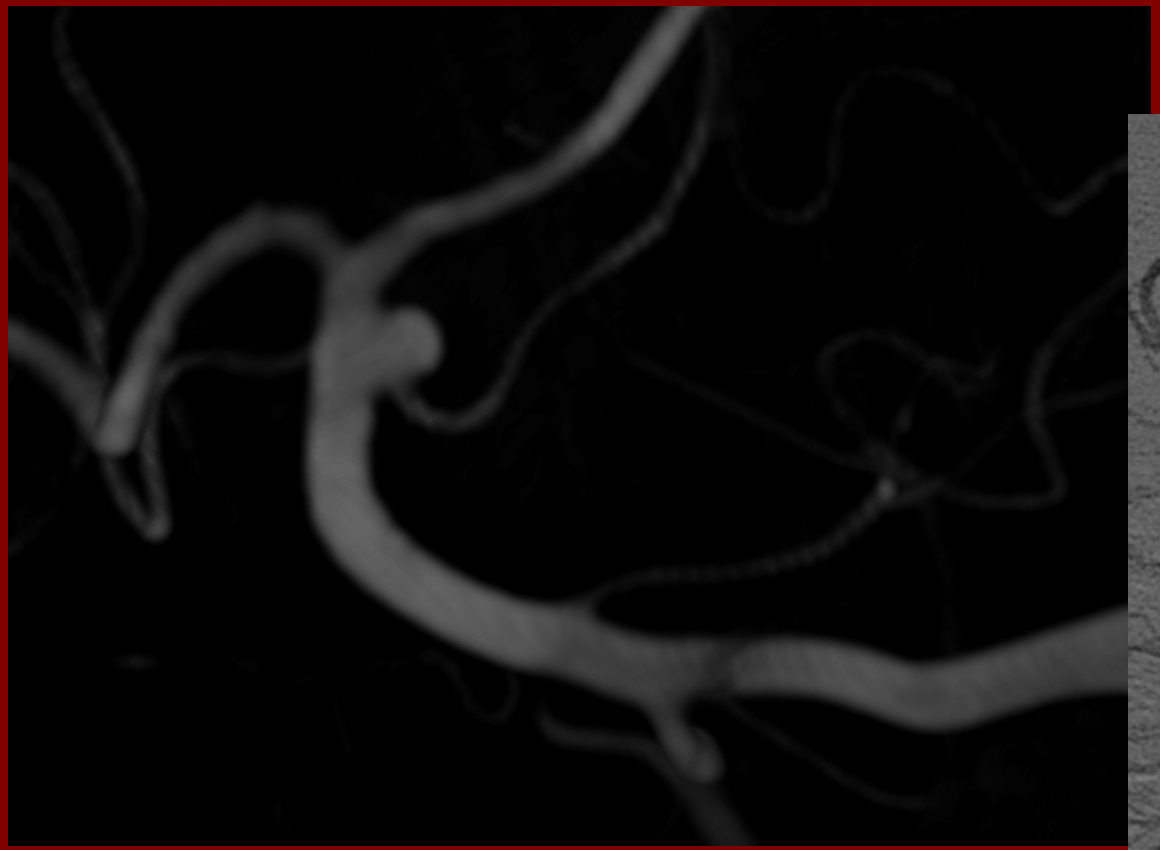
- Incidence
  - Range of 5-25% depending on source
  - Risk factors: larger aneurysm, younger pt, bifurcation an., ruptured status, packing density
- Risk of retreatment low (Nsurg 9/09)
  - Retreatment mortality 0.96% per patient
  - Permanent/temporary major disability 0.32%
  - Permanent minor disability 1.29%
  - Total risk for death or permanent major disability 1.28%

Controversial role of bioactive coils

- Turkish experience w/Cerecyte (JNS 4/10)
  - Raymond Class I obliteration on follow-up angiograms (69 [86.2%] Cerecyte group vs 51 [63.8%] control group, p = 0.002
  - Further thrombosis to Raymond Class I occlusions was higher in the Cerecyte group (17 [77.3%] of 22 vs 8 [36.4%] of 22 aneurysms)
  - Similar results in multiple retrospective studies
  - Prospective study results coming soon

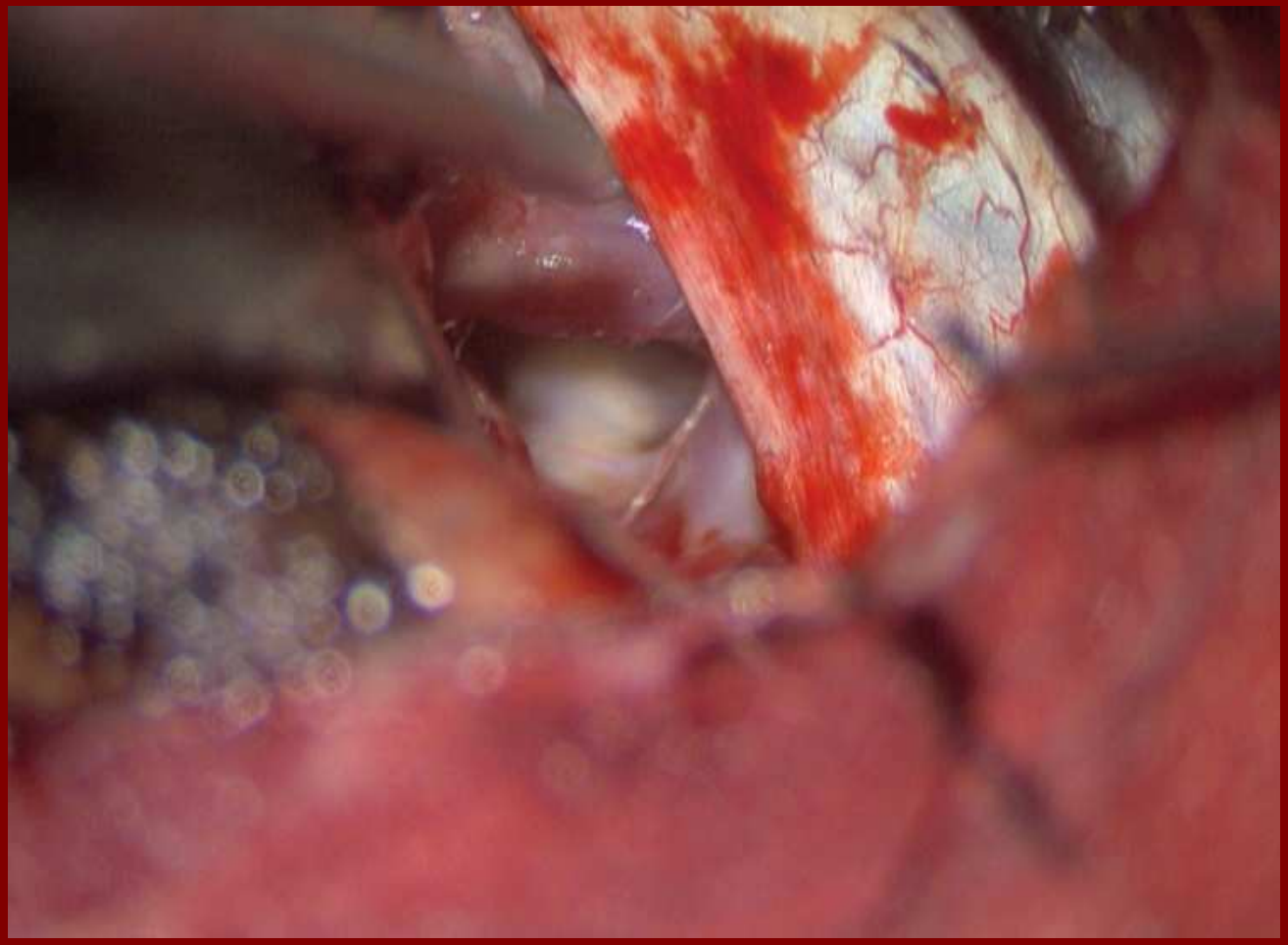
Clip Ligation

- Still need in approximately 30-40% of aneurysms treated



56 yo woman heavy smoker
HH3 SAH

56 yo woman heavy smoker HH3 SAH



Use of Intraoperative angio