

Intracranial Angioplasty and Stenting

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Treatment options for intracranial atherosclerosis

- Medical therapy
- Surgery
- Endovascular therapy

Medical therapy for intracranial atherosclerosis

The Warfarin-Aspirin Symptomatic Intracranial Disease Study

- Symptomatic patients
- 50% to 99% stenosis

151 patients retrospectively reviewed

88 warfarin \Rightarrow stroke rate 3.6/100 pt-yrs

63 ASA \Rightarrow stroke rate 10.4/100 pt-yrs

Neurology 1995;45:1488

Medical therapy for intracranial atherosclerosis

Neurology 2000;55:490

29 of 52 patients receiving antithrombotic therapy
had cerebral ischemic events
recurrent symptoms occurred in 51.7%
with a median time of 36 days

Patients with symptomatic intracranial atherosclerosis who
fail antithrombotic therapy have extremely high rates
of recurrent TIA/stroke or death

Medical therapy for intracranial atherosclerosis

Needs to be further medical therapy trials involving the oral antiplatelet agents

aspirin

ticlopidine (Ticlid®)

clopidogrel (Plavix®)

None to date

Surgery for intracranial atherosclerosis

Endarterectomy

Surgical bypass

Surgery for intracranial atherosclerosis

NEJM 1985;313:1191

External Carotid to
Internal Carotid
Bypass Study

STA to MCA bypass



Surgery for intracranial atherosclerosis

NEJM 1985;313:1191

“Failure of extracranial to intracranial bypass to reduce the risk of ischemic stroke”

1377 patients randomized

714 best medical care

663 same regimen

plus bypass surgery STA to MCA

Intracranial Angioplasty and Stenting

Arteries

- Intracranial internal carotid artery
- Middle cerebral artery
- Intracranial vertebral artery
- Basilar artery

Intracranial Angioplasty and Stenting Patient Evaluation

Keep in mind this is a risky business!

Symptomatic vs asymptomatic

Exhausted medical therapy

Intracranial Angioplasty and Stenting

Patient Evaluation

Pre-procedure imaging

CT

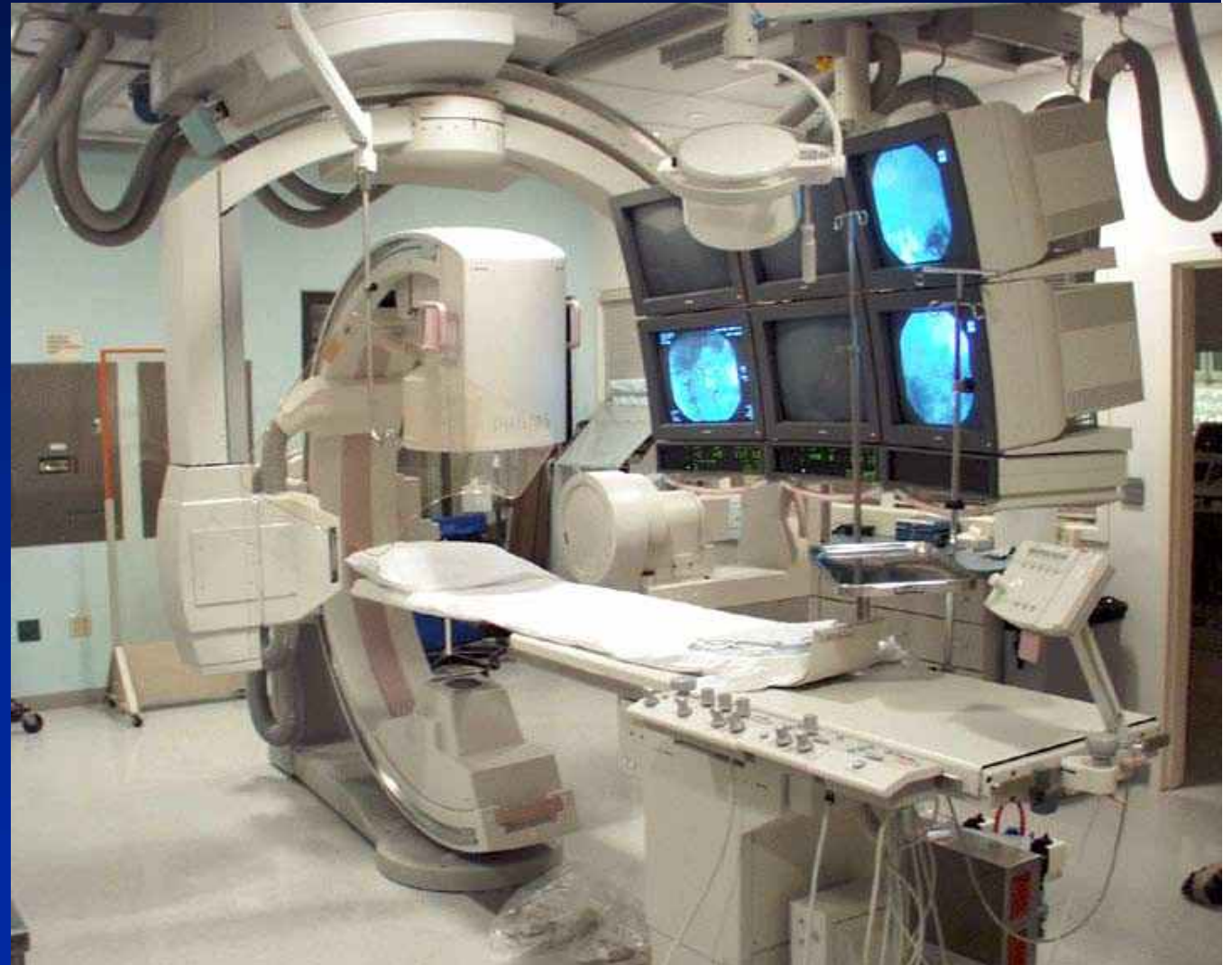
MR

Prefer to perform diagnostic angiography
in a separate sitting

Angioplasty/stenting \Rightarrow general anesthesia

Intracranial Angioplasty and Stenting Procedure

Biplane
angiography
suite



Intracranial Angioplasty and Stenting Procedure

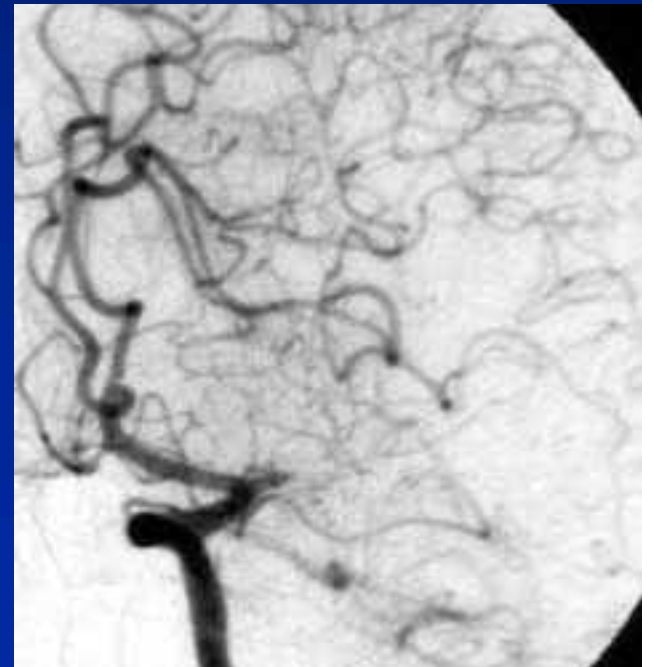
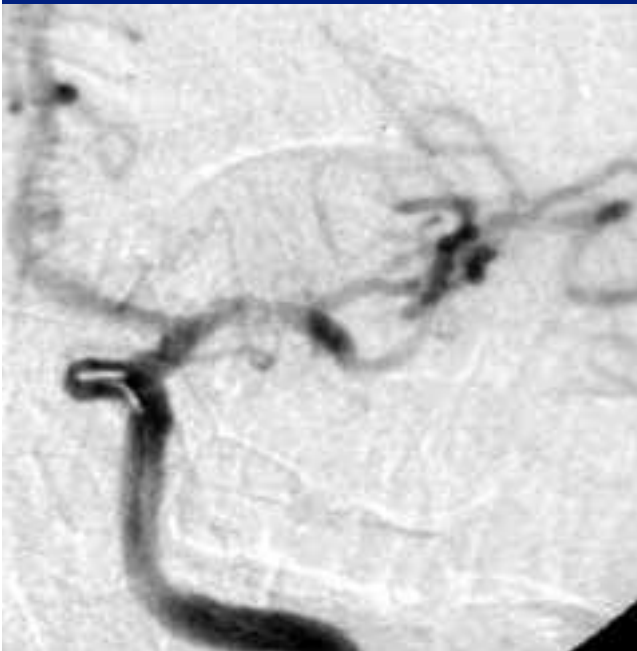
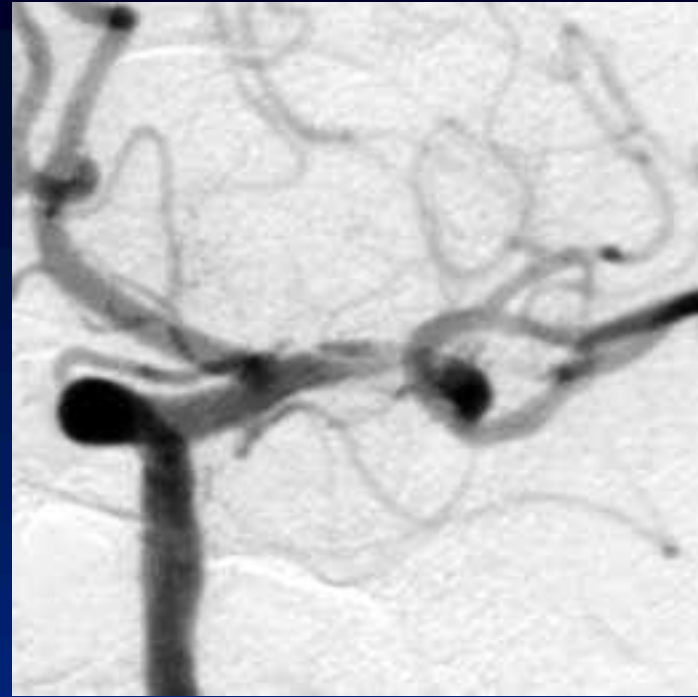
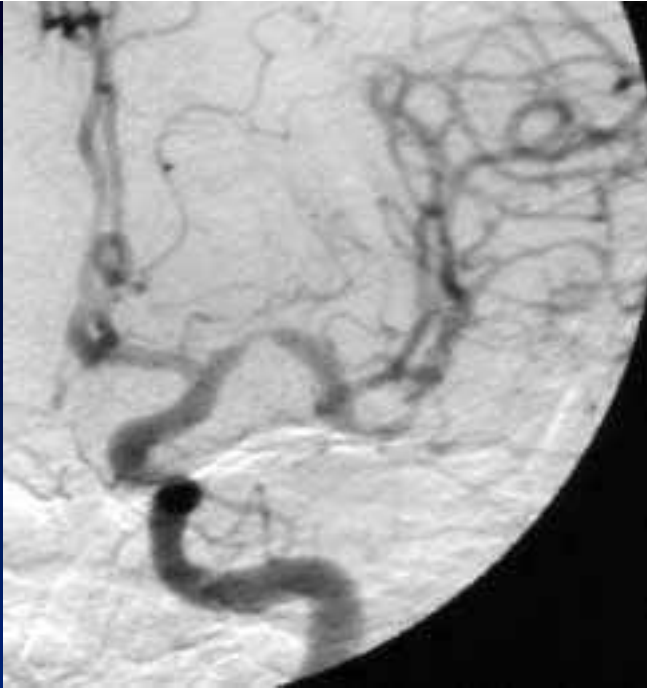
Medications

- anticoagulate the patient
ACT 2X Baseline
- oral antiplatelet agents
loaded with clopidogrel and ASA

Endovascular therapy for intracranial atherosclerosis

Angioplasty alone





Plan on stenting

Intracranial Angioplasty and Stenting

Supplies

- Guiding catheter (6F)
- Guidewire(s) (0.014")
- Balloons
- Stent(s)

Befriend your local interventional cardiologist

Balloon and stent “du jour”

Intracranial Angioplasty and Stenting



Balloons

low profile

Recommendations

Guidant

Open Sail® or Cross Sail ®

Cordis

NC Ranger ®

BSC

Talon® or Gazelle ®, Maverick®

Intracranial Angioplasty and Stenting

Stents \Rightarrow balloon expandable
 \Rightarrow self expanding
 small (length and diameter)
 low profile
 less hoop strength



Stents

Intracranial Angioplasty and Stenting

Recommendations \Rightarrow balloon expandable

Medtronic/AVE S670/S7®

Cordis Velocity®

BSC Express®

Guidant Multi-link Pixel®

Multi-link Penta®

Abbott Biodivisio SV®

Recommendations \Rightarrow self expanding

Boston Scientific Magic Wallstent®

Radius®

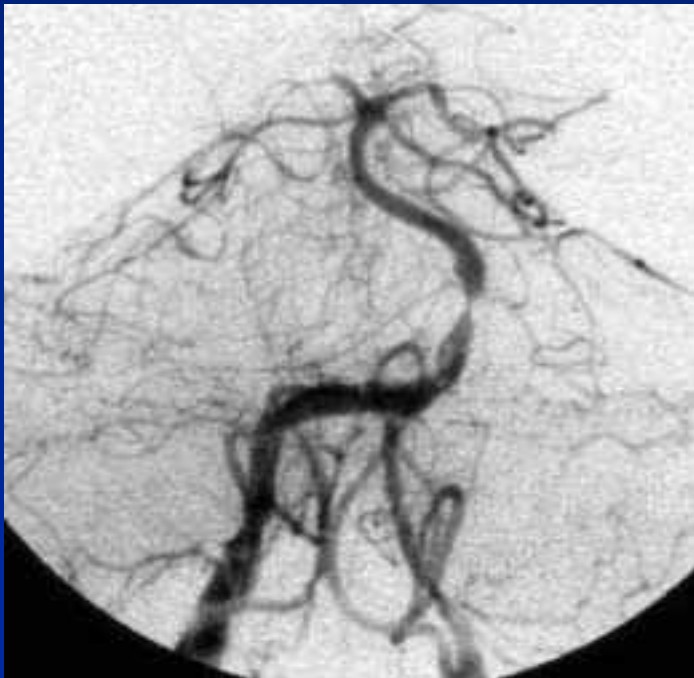
Intracranial Angioplasty and Stenting

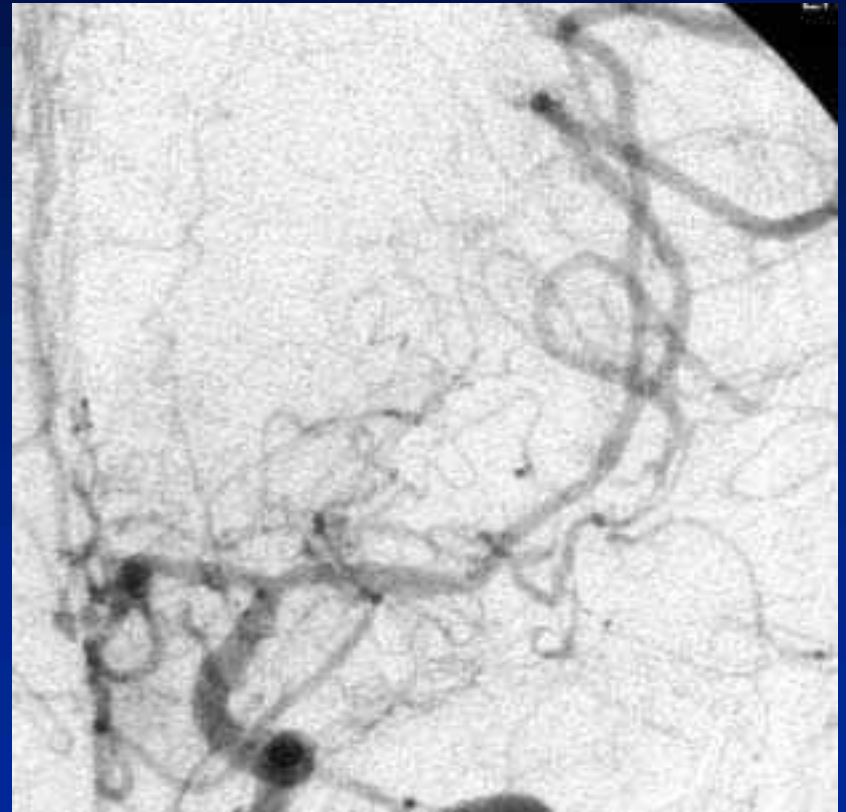
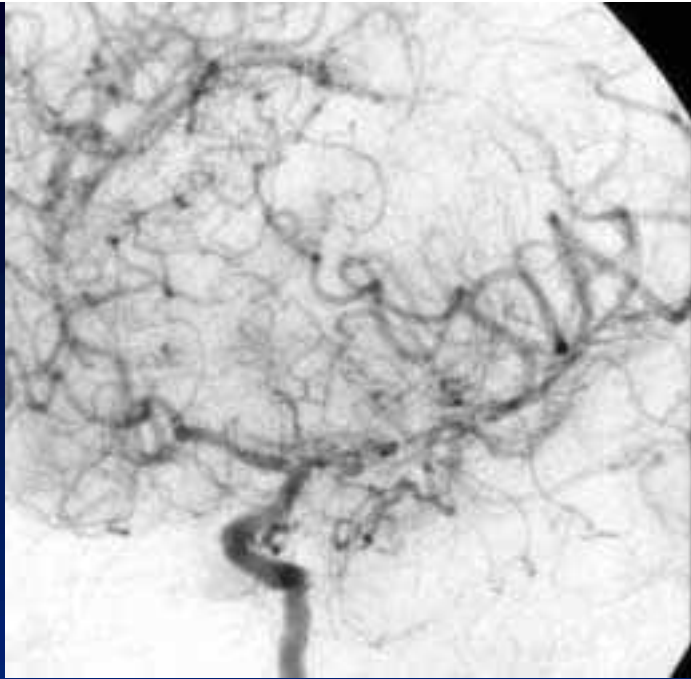
Angioplasty and Stenting

Pre-dilation \Rightarrow stenting \Rightarrow post dilation

Points:

- Usually easier to negotiate vertebral vs carotid bends
- May not be able to get stent up after pre-dilation
- Must size correctly!
- Inflate balloon slowly (Connors & Wojack, 1999)

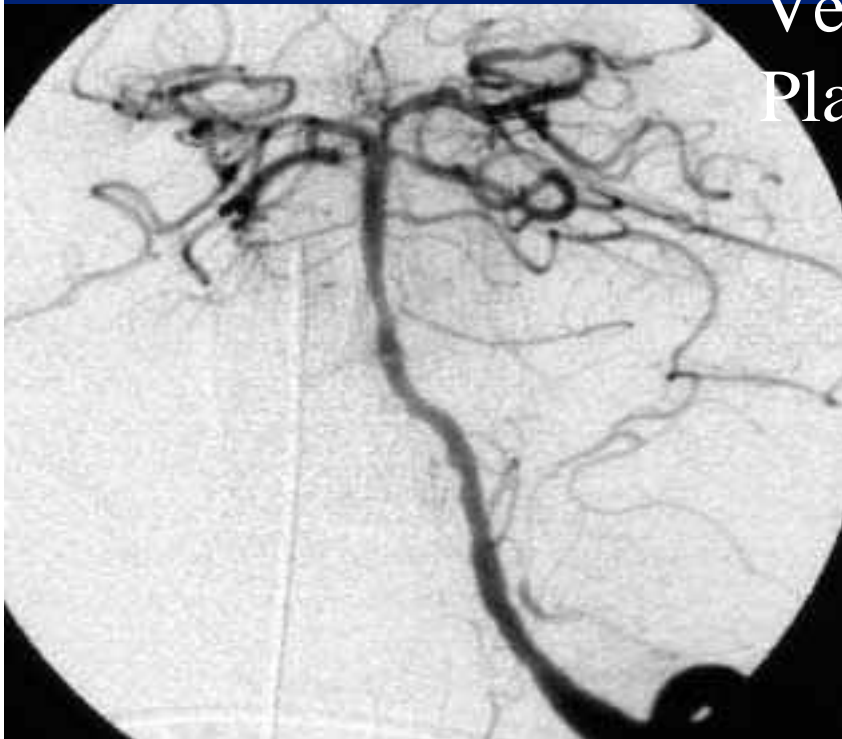


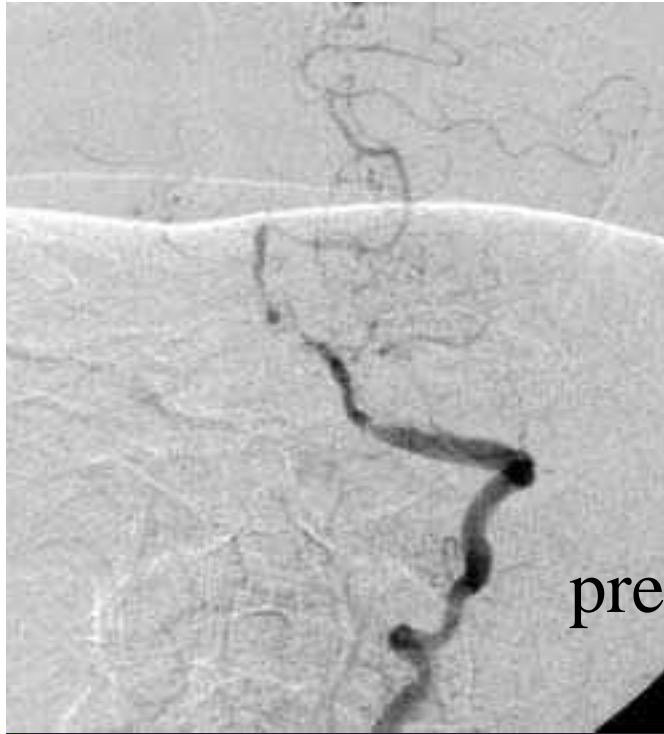


pre

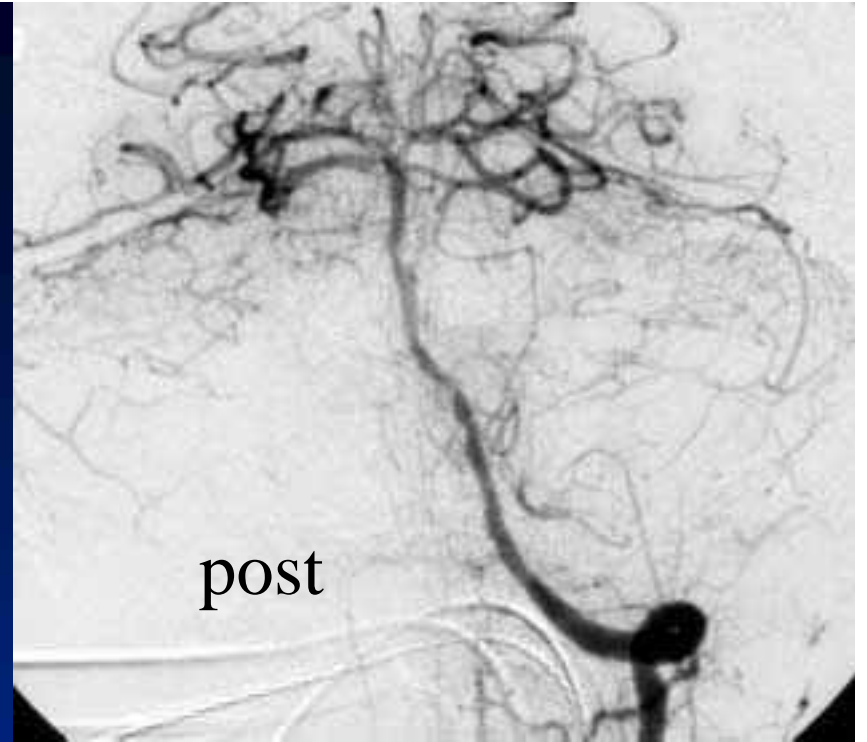
Vertebrobasilar
Plasty/Stent

post

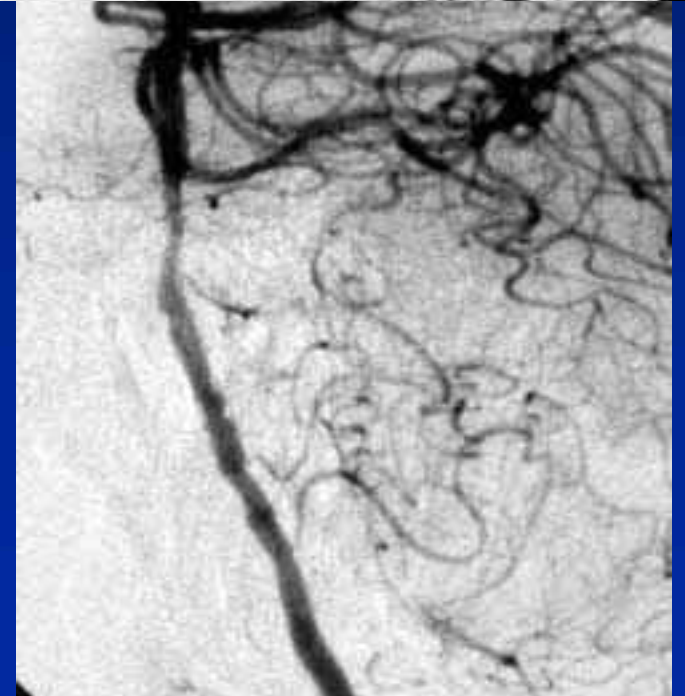




15 months



17 months



Treatment of tandem lesions

- Distinguish between hypoperfusion and thromboembolic symptoms

Hypoperfusion \Rightarrow Greater stenosis must be addressed

Thromboembolic \Rightarrow Unknown







Intracranial Angioplasty and Stenting

Potential Problems:

Vessels are very thin

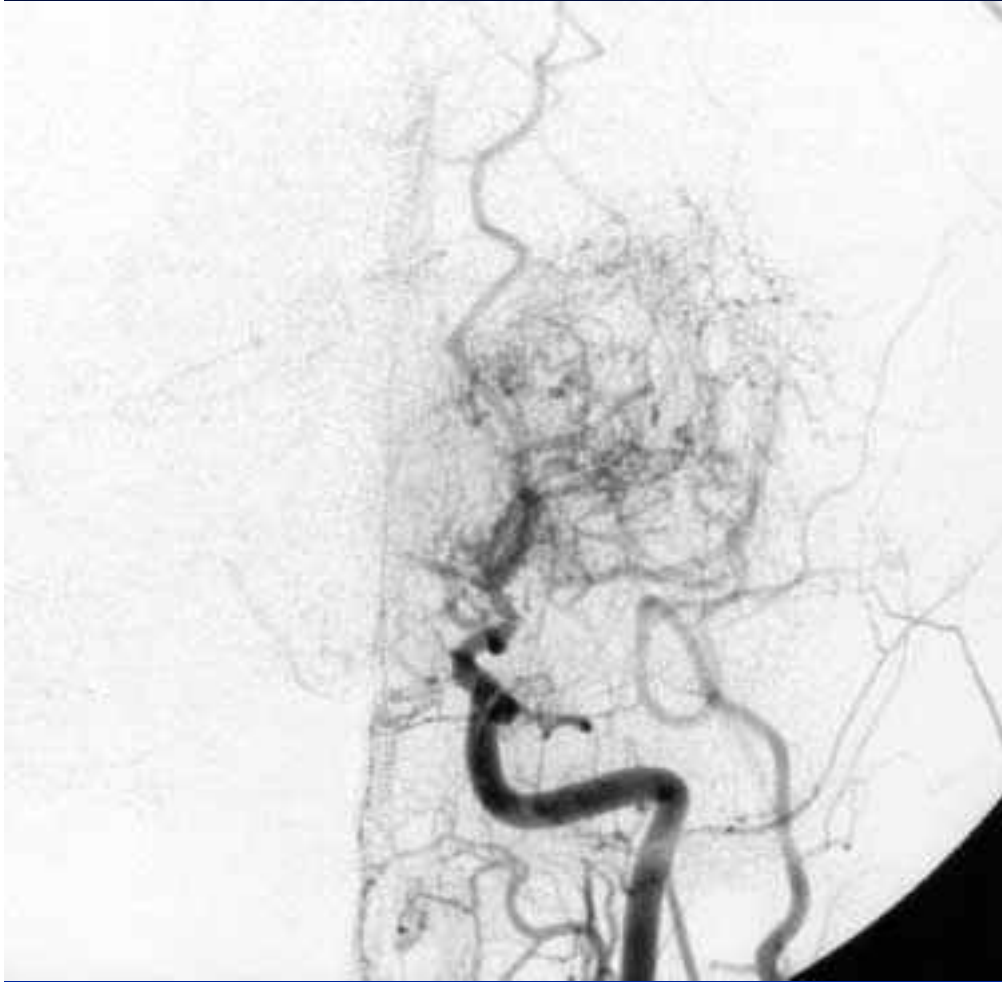
⇒ perforation is a real possibility

Stenting over small but critical side-branches

Vasospasm is likely

Thrombosis

use of IIb-IIIa inhibitors



Intracranial Angioplasty and Stenting

Results

Only small case reports and small series

Warning: cover your eyes

Author Journal, year	Balloon Angioplasty or Stent	# of patients	Location	Technical success	Follow up interval (months)	Immediate complications
Higashida RT Heart Dis Stroke, 1993	Balloon Angioplasty	18	MCA=11 DV/BA=7	75% ?	3-84	6 (33%)
Clark WM Stroke, 1995	Balloon Angioplasty	17 (22 lesions)	ICA/MCA=6 DV/BA=16	18/22 (82%)	8-54	2 (12%)
Touho H J Neurosurg, 1995	Balloon Angioplasty	19	ICA/MCA/ACA	13/19 (68%)	6-12	5 (26%)
Terada T J Neurol Neurosurg, Psychiatry, 1996	Balloon Angioplasty	12	DV/BA	10/12 (83%)	12-48	4 (33%)
Mori T AJNR, 1997	Balloon Angioplasty	42	ICA/MCA=29 DV/BA=13	32/42 (76%)	1-72	2 (5%)
Takis C AJNR, 1997	Balloon Angioplasty	10	ICA/MCA=4 DV/BA=6	8/10 (80%)	Unknown	4 (40%)
Connors JJ III J Neurosurg, 1999	Balloon Angioplasty	70	ICA/MCA=43 DV/BA=27	66/70 (94%)	Unknown	14 (20%)
Marks MP Stroke, 1999	Balloon Angioplasty	23	ICA/MCA=9 DV/BA=14	21/23 (91%)	16-74	1 (4%)
Alazzaz A Arch Neurology, 2000	Balloon Angioplasty	16	ICA/MCA=8 DV/BA=8	16/16 (94%)	1	3 (19%)
Nahser HC AJNR, 2000	Balloon Angioplasty	20	DV/BA	20/20 (100%)	2-18	2 (10%)
Gress, DR Neurosurgery, 2002	Balloon Angioplasty	25	DV/BA	25/25 (100%)	Unknown	7 (28%)
Ramee, SR Catheter Cardiovasc Intervent, 2001	Angioplasty (11) Stent (5)	15	ICA/MCA=10 DV/BA=5	15/15 (100%)	Mean=12	0 (0%)
Rasmussen PA J Neurosurg, 2000	Stent	8	DV/BA	8/8 (100%)	1-8	3 (38%)
Gomez CR Stroke, 2000	Stent	12	BA	12/12 (100%)	0.5-16	1 (5%)
Mori T AJNR, 2000	Stent	10 (12 lesions)	ICA/MCA=4 DV/BA=8	10/12 (83%)	3 (angio)	0 (0%)
Totals	---	317 (324 lesions)	Anterior=143 Posterior=181	274/306 (90%)	---	54/317 (17%)

Intracranial Angioplasty and Stenting

Selected Series Results

Provided in table form in syllabus

Difficult to compile and compare individual series

324 lesions in 317 patients

90% Technical Success Rate

17% Complication Rate

Summary

Intracranial stenoses present a risk of stroke

Surgical therapy is poor

Medical therapy is limited and needs further studies

Angioplasty with stenting offers a viable option

Efficacy and Safety is unproven

Patient selection and technical expertise play key roles

Intracranial Angioplasty and Stenting

Difficult Treatment
for a
Difficult Disease