

Extracranial Carotid Artery Stenting With or Without Distal Protection Device

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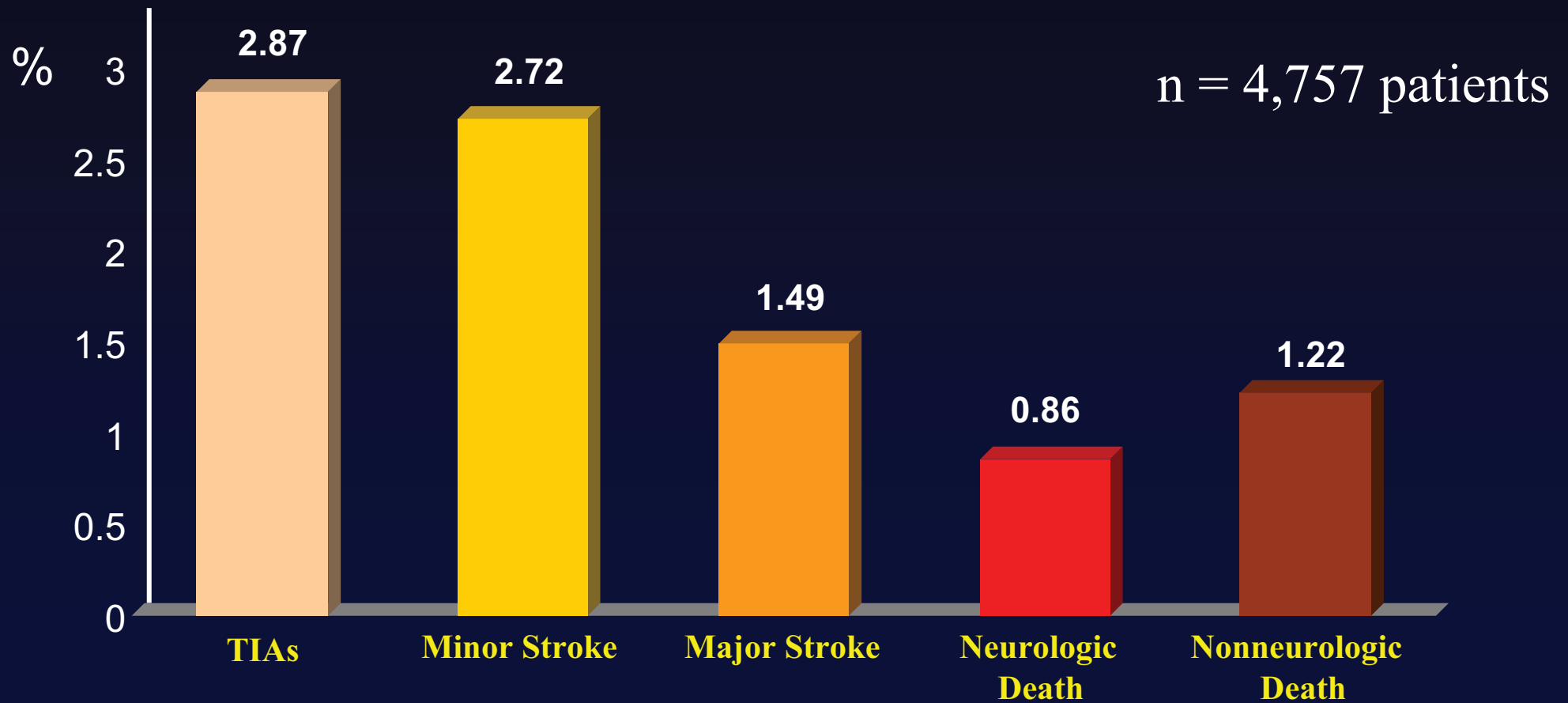
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Backgrounds

- Although **surgical endarterectomy** has been known to be the standard treatment modality of carotid artery stenosis, it had several limitations in high-risk patients, particularly with coronary artery disease.
- **Carotid angioplasty and stenting** has been suggested to be a safer and more cost-effective alternative to carotid endarterectomy in the management of symptomatic carotid artery disease.

30-Day Procedure Complications

- Global Experience in Cervical Carotid Artery Stent Placement



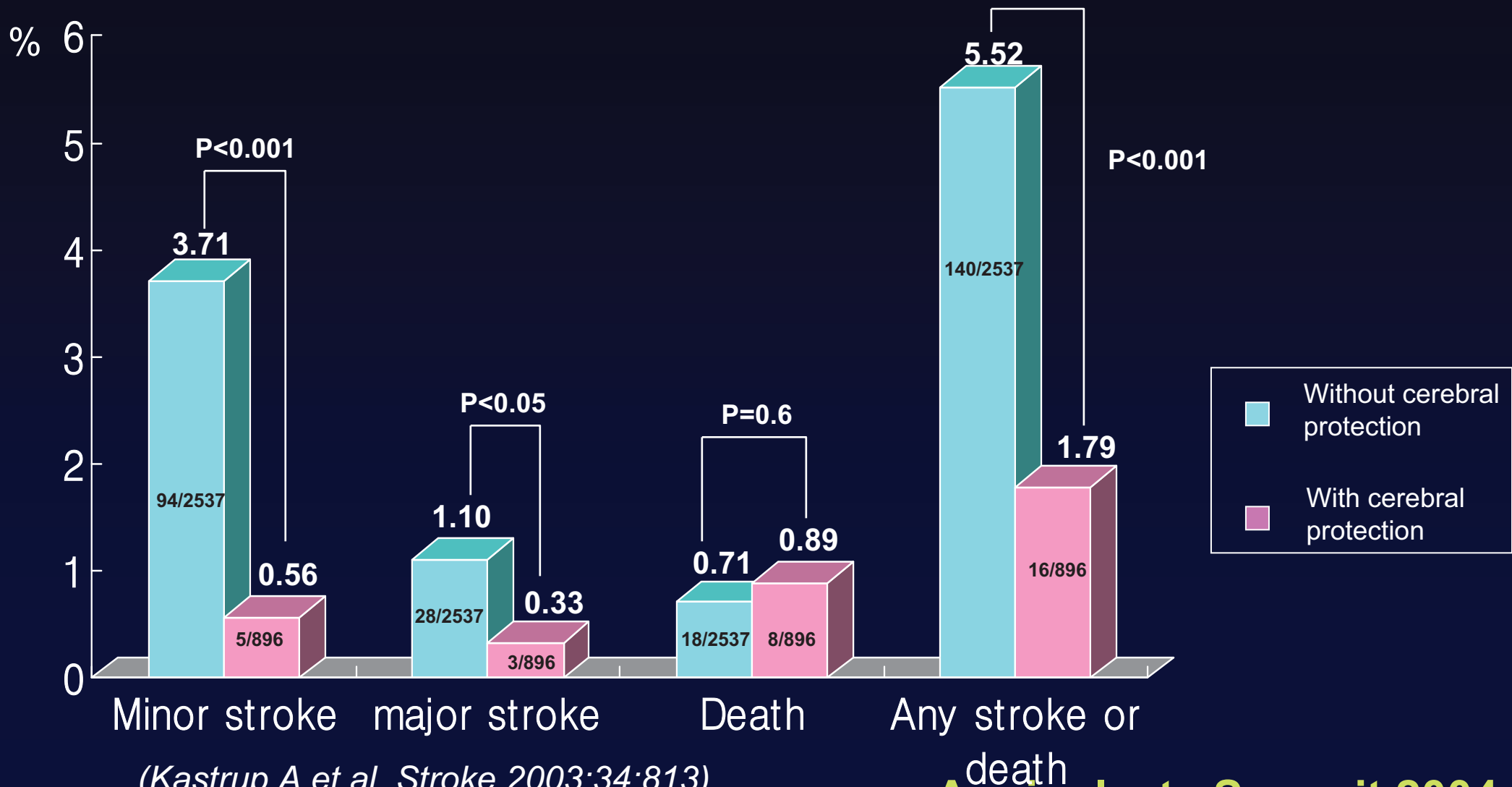
Cathet. Cardiovasc. Intervent. 50: 160-167, 2000.

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Backgrounds

- Obstructive carotid artery lesions are known to contain **friable thrombotic and atherosclerotic components** that have the potential to embolize during intervention and may be responsible for the majority of the neurologic events during carotid artery stenting.
- A number of “**distal protection**” strategies, designed to capture embolic debris released during carotid intervention, are currently being evaluated for their efficacy in minimizing the risk of embolic neurologic events.

Backgrounds- 30 day clinical event rates



Objective

- The purpose of this study is to evaluate the feasibility, safety and **short(30-day) , mid-term(6-month) clinical follow up results** of elective carotid artery stenting with or without distal protection device in patients with carotid artery stenosis

Method

Jun 1997 ~ Sep 2003, 58 pts (62 lesions) were included

- Inclusion criteria

- Symptomatic and asymptomatic pts with carotid artery stenosis (>60%)
- Informed consent

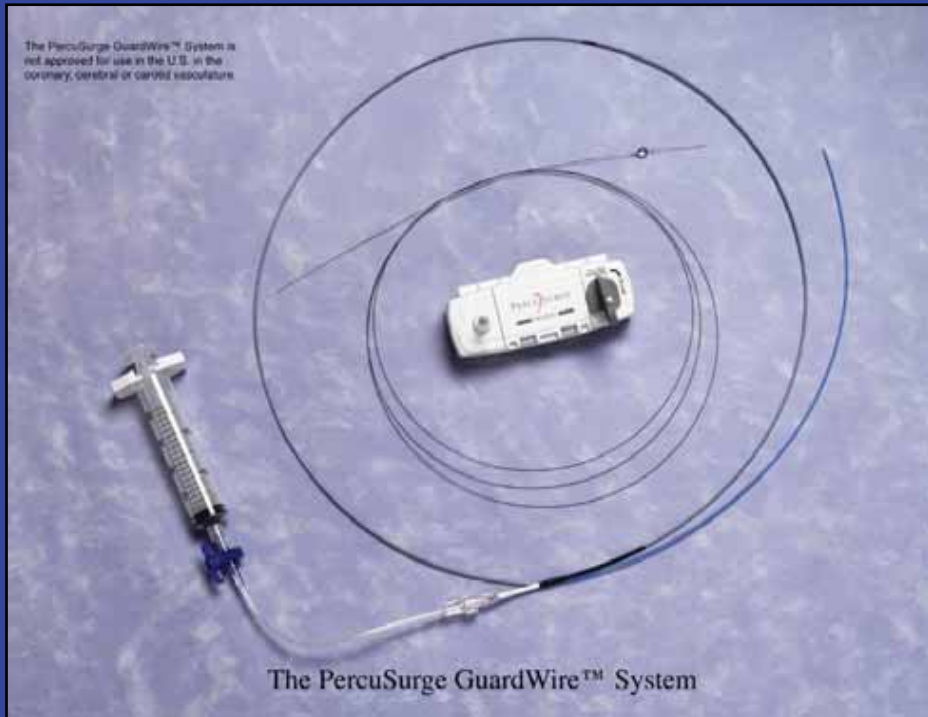
- Exclusion criteria

- Intracranial tumor or arteriovenous malformations
- Severely disabled as a result of stroke or dementia
- Intracranial stenosis that exceeded the severity of the extracranial stenosis
- Peripheral vascular disease to prevent vascular access
- Acute ischemic neurologic stroke or past 48hrs
- Total occlusion of the target carotid artery

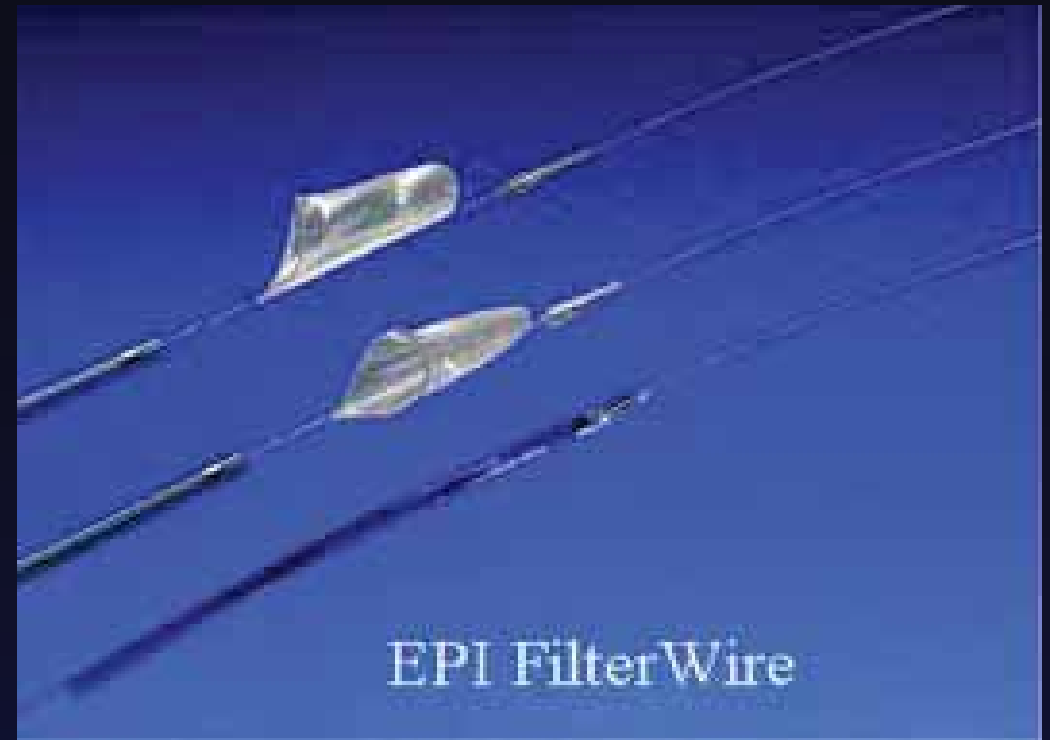
Method

Stenting Protocol

- Transvenous pacemaker(till 1999)
- Heparin 5,000U bolus IV after arterial sheath
- 9 Fr guiding catheter or 7Fr Tuohy Borst Introducer
- Cross the stenosis with extra-support wire
- Drug regimen: aspirin 300mg indefinitely,
ticlopidine 250mg or clopidogrel 75mg for 4wks
- **Protection device(from Sep 2001): 19 case(30.7%)**
 - PercuSurge –13 case
 - EPI filter-6 case



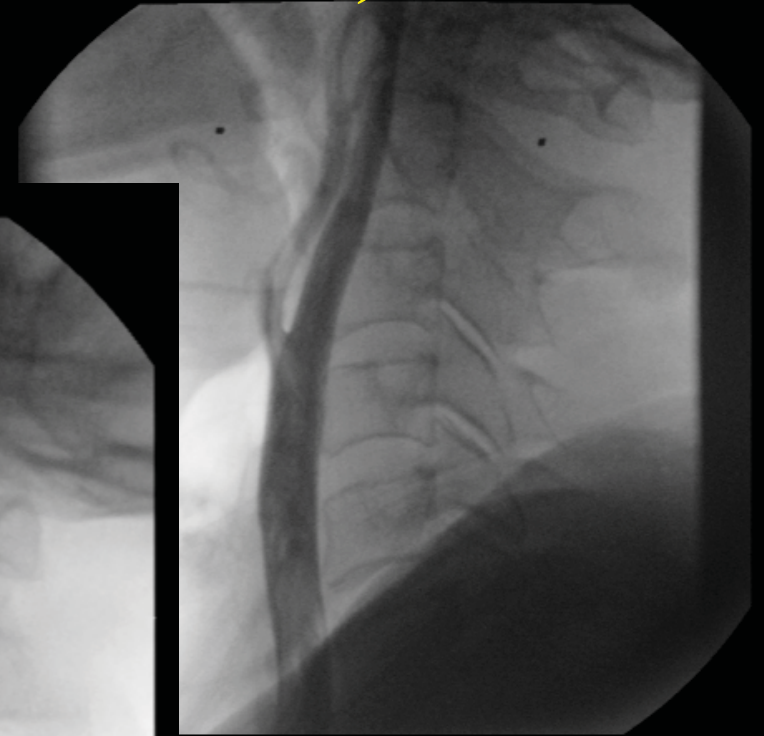
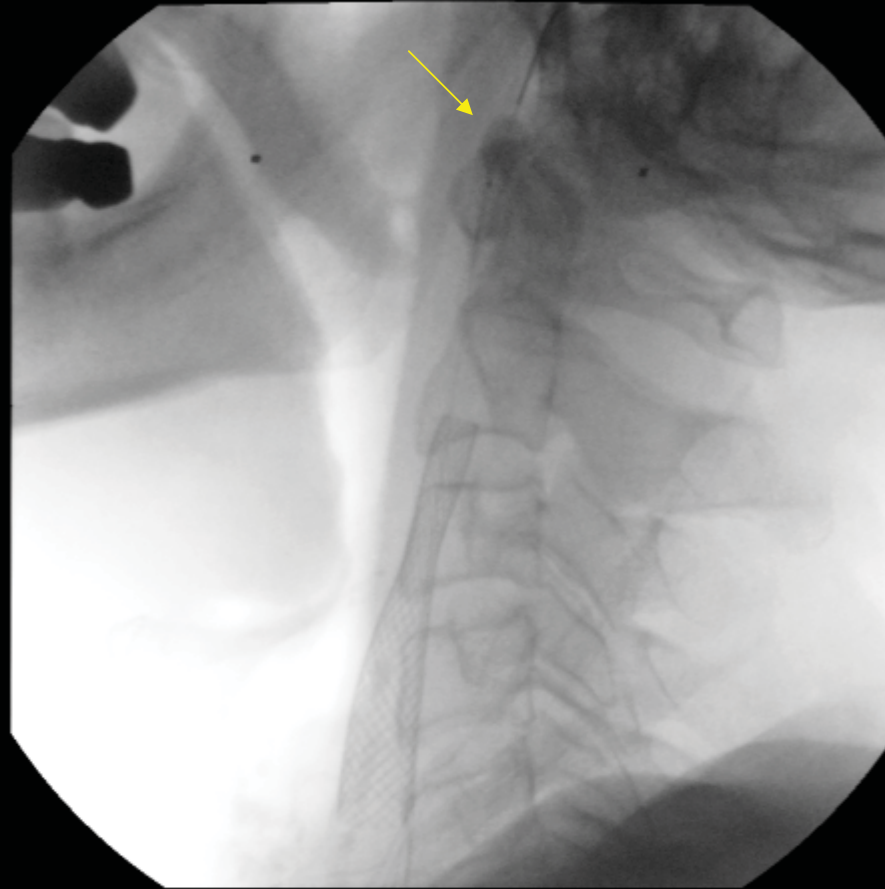
PercuSurge GuardWire system



EPI FilterWire

Protection Device (PercuSurge GuardWire)

F/79



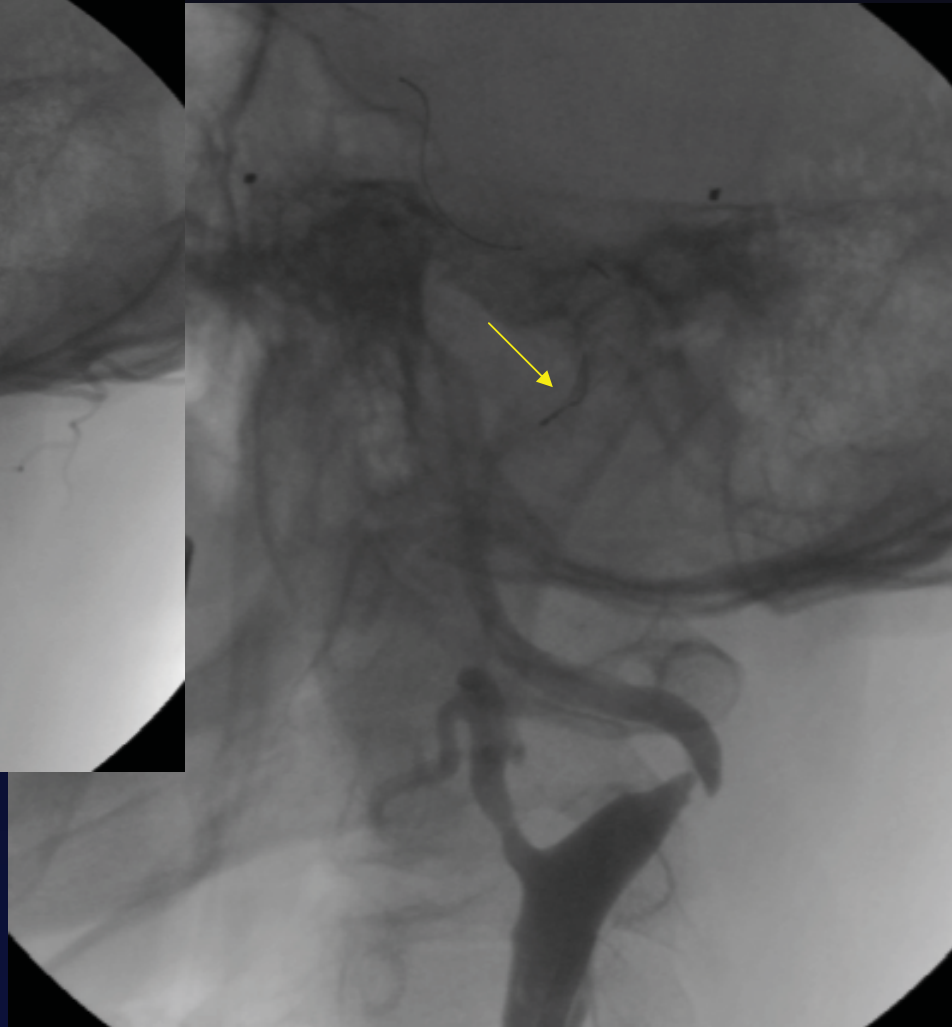
Pre-



Post-

Protection Device (EPI filter device)

M/73



Pre-



Post-

Results - Clinical Characteristics

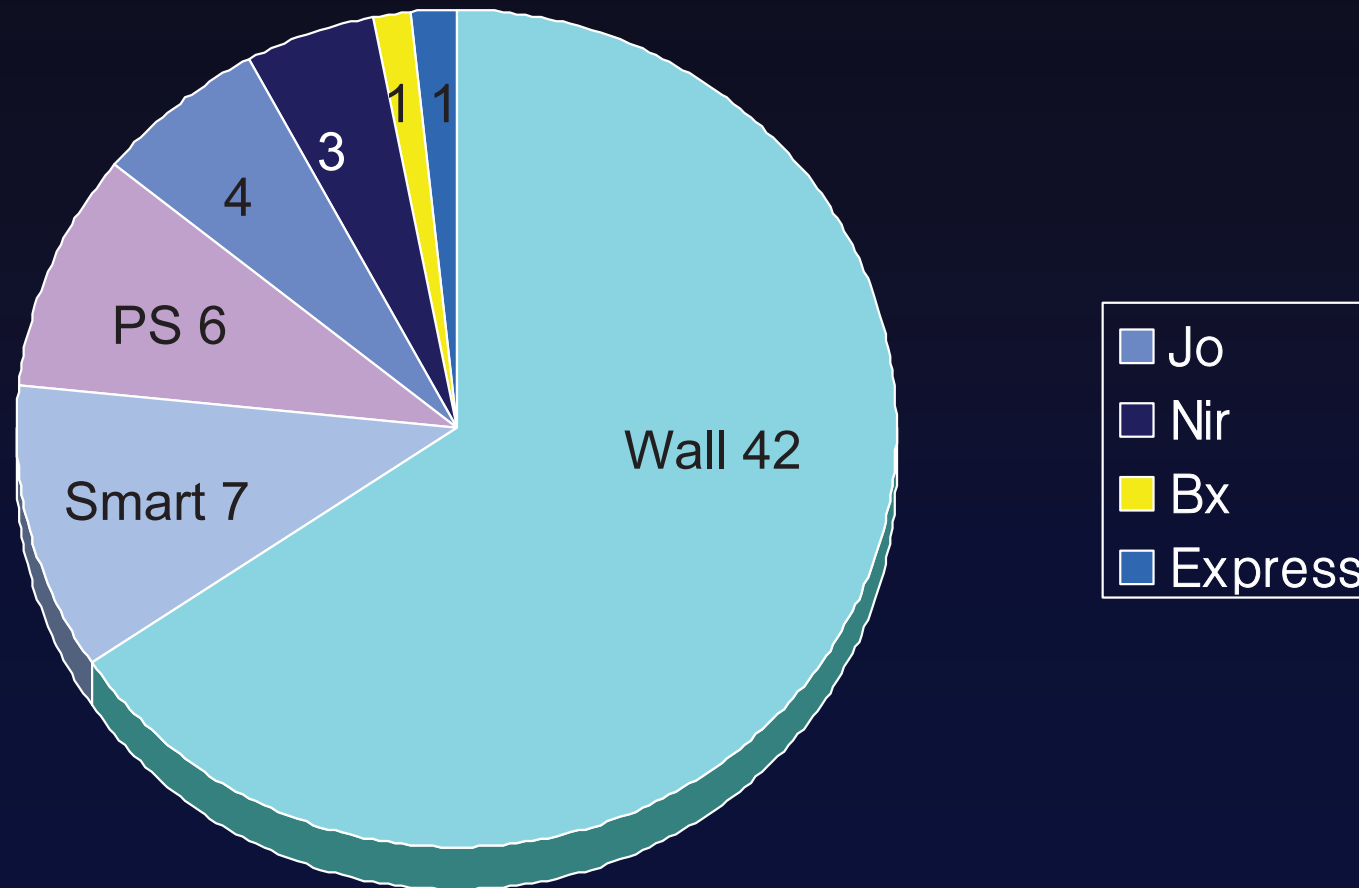
Men	45(77.6%)
Age(yr)	67.4±7.5
Cardiovascular risk factor	
Hypertension	44(75.9%)
Smoking	36(62.1%)
Diabetes	18(31%)
Hypercholesterolemia	14(24.1%)
Past History	
MI	10(17.2%)
CVA	13(22.4%)
PTCA	28(48.3%)
High Risk Patients	31(53.4%)

Results - Lesion Characteristics

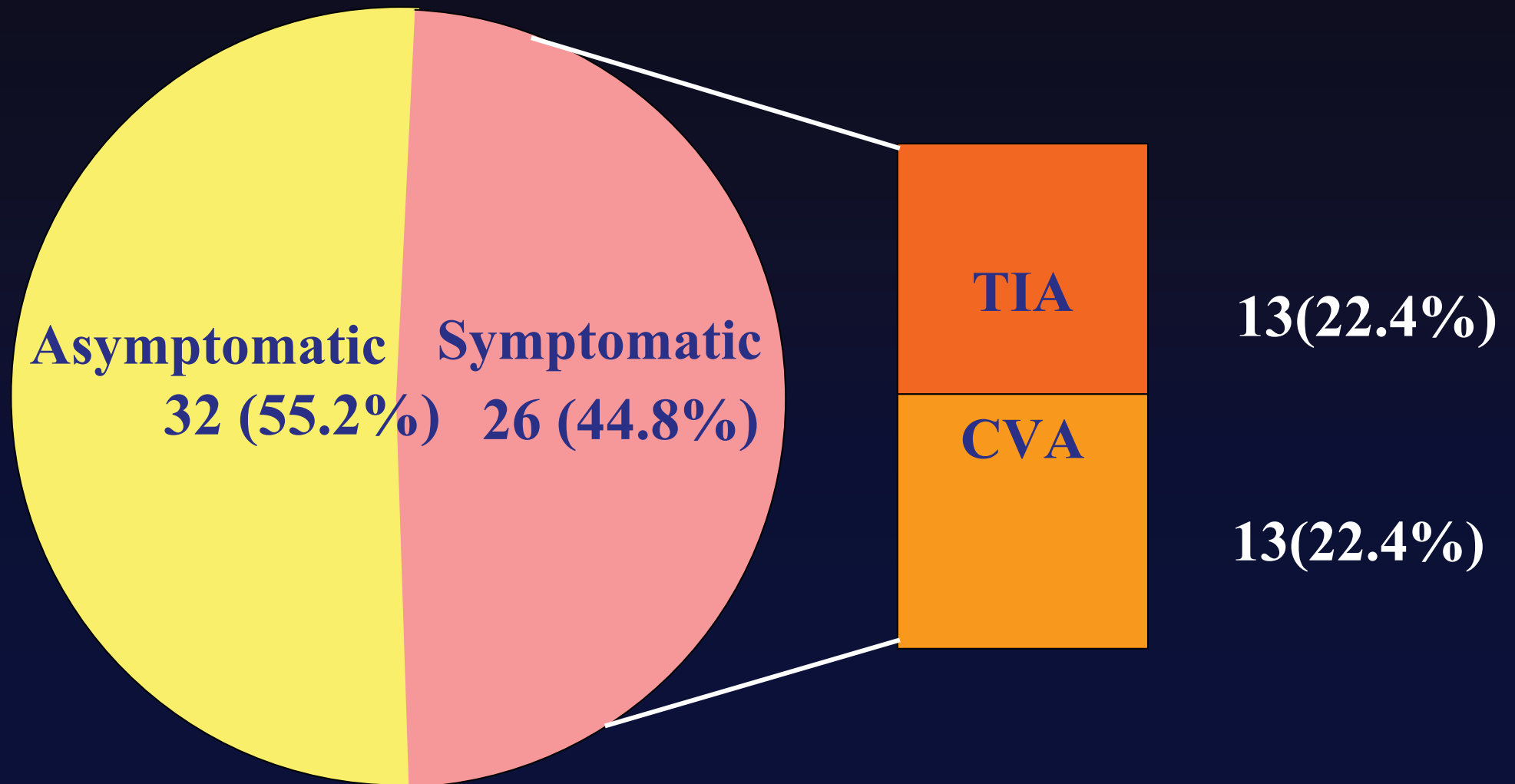
Right / Left	32(51.6%) / 30(48.4%)
Common CA	4 (6.4%)
Internal CA	58(93.6%)
Combined coronary stenosis	41(70.7%)
Bilateral CA	4 (6.9%)

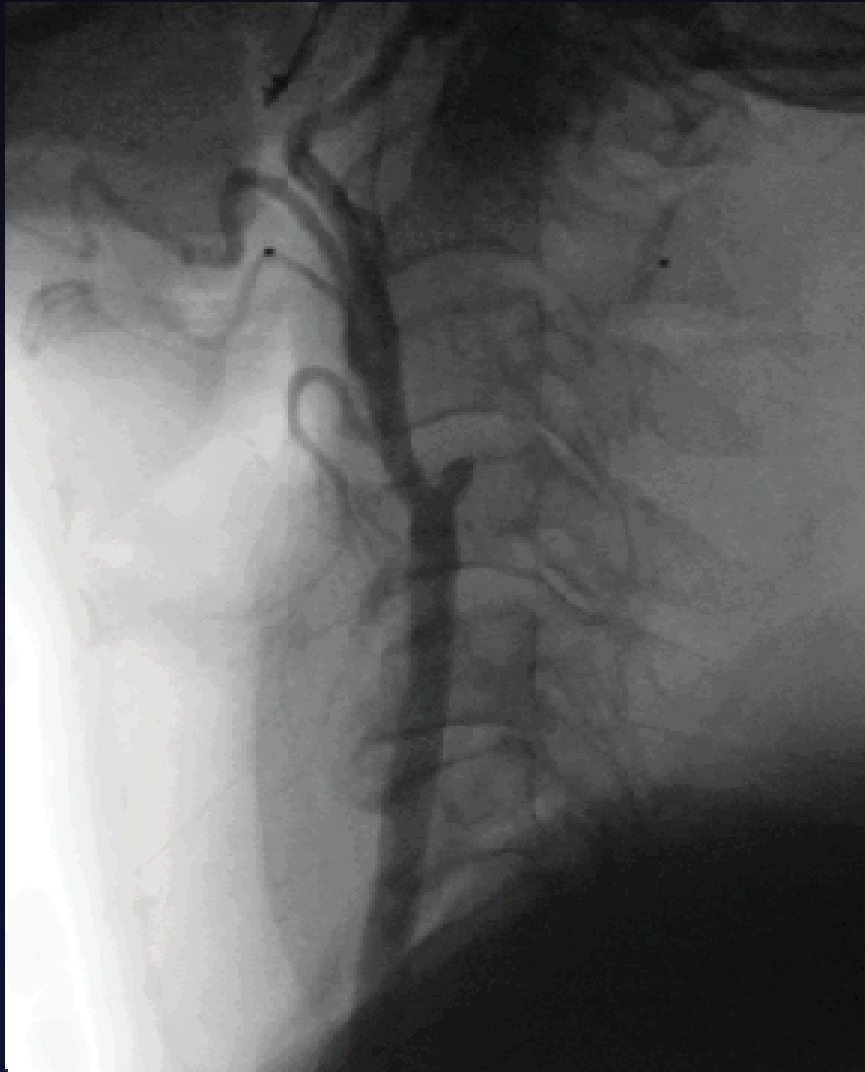
CA; carotid artery

Results - Types of Stents



Results - Presenting Symptoms





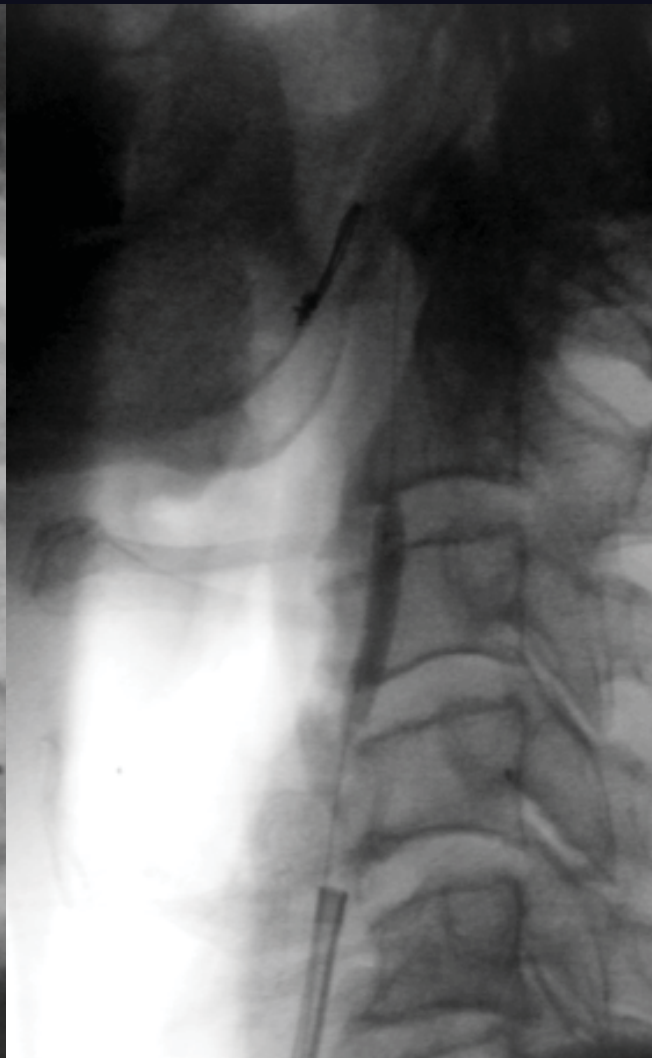
Total occlusion of LICA



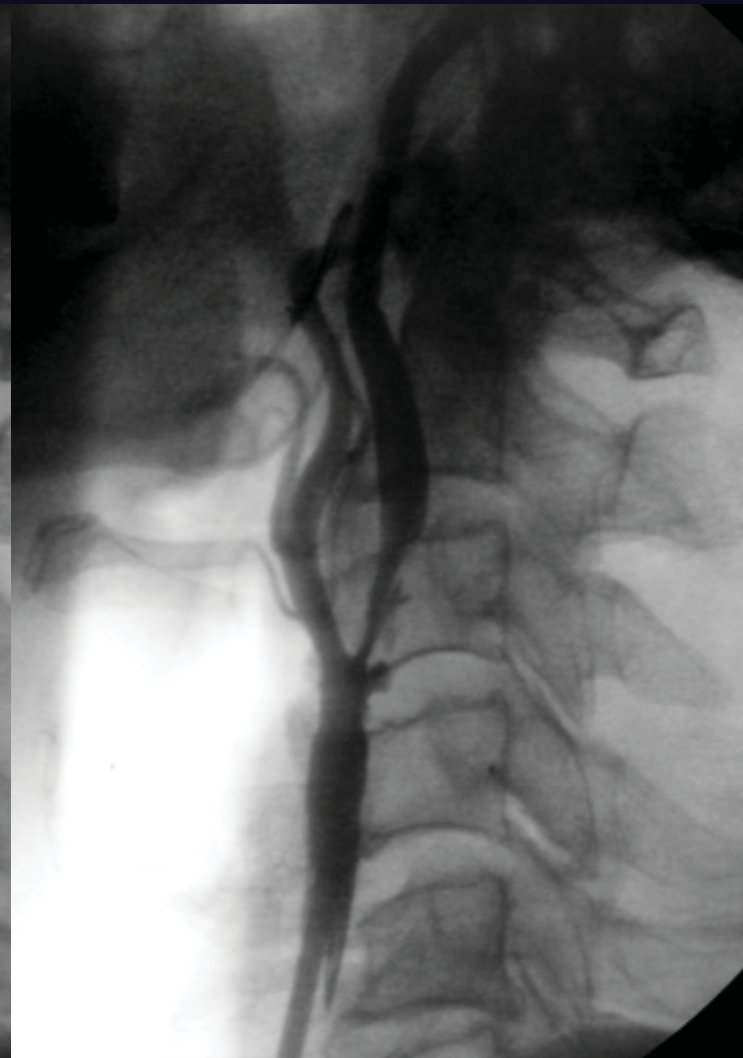
Critical stenosis of RICA



Pre-



Balloon Inflation



Post-balloon

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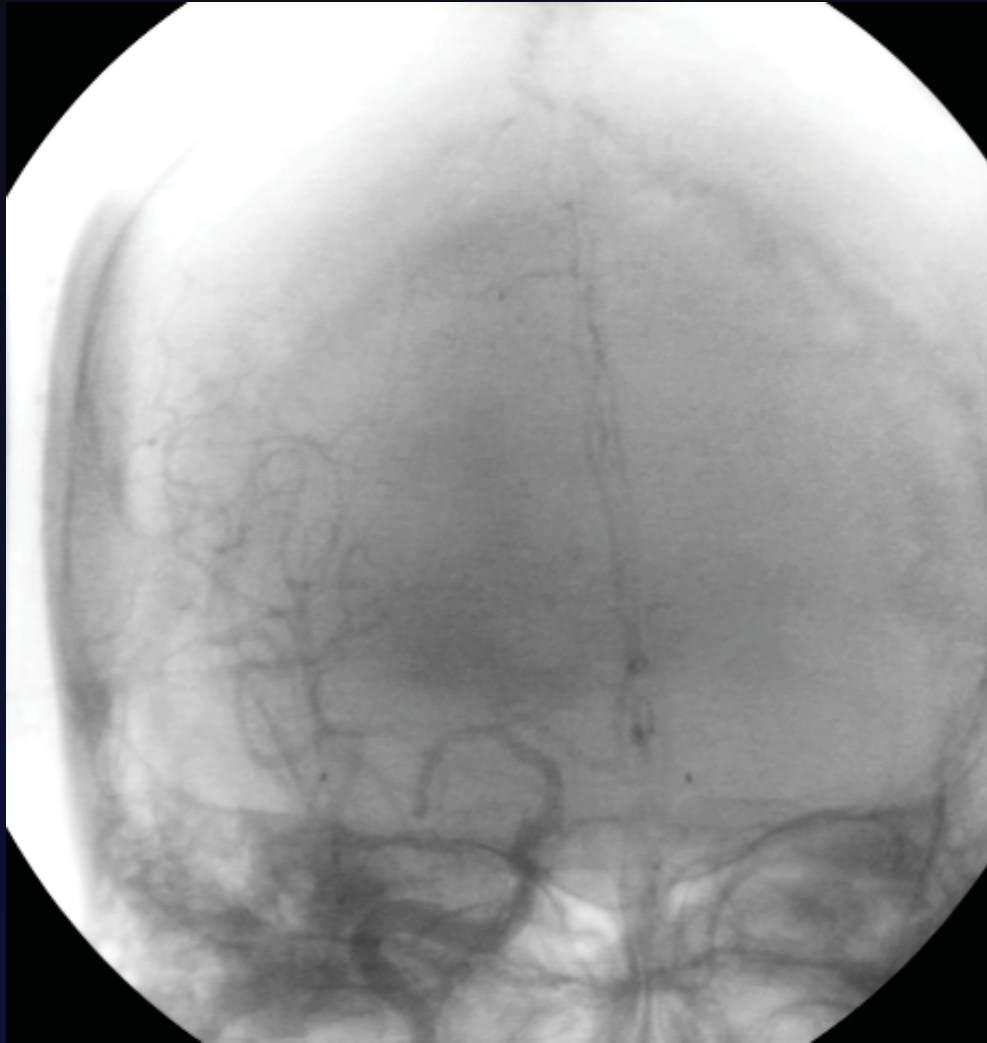


Stent placement
(Self expandable nitinol stent)

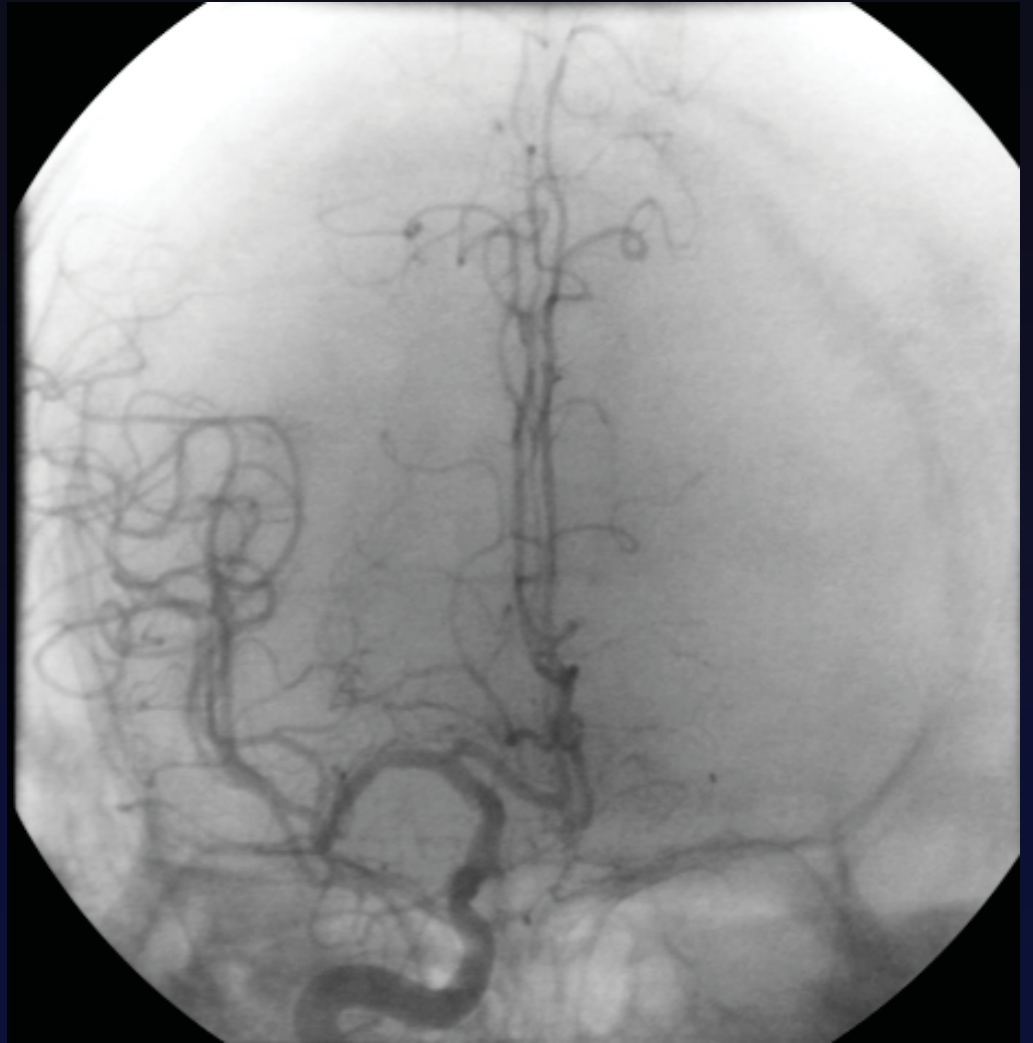


Post-Inflation

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Pre-



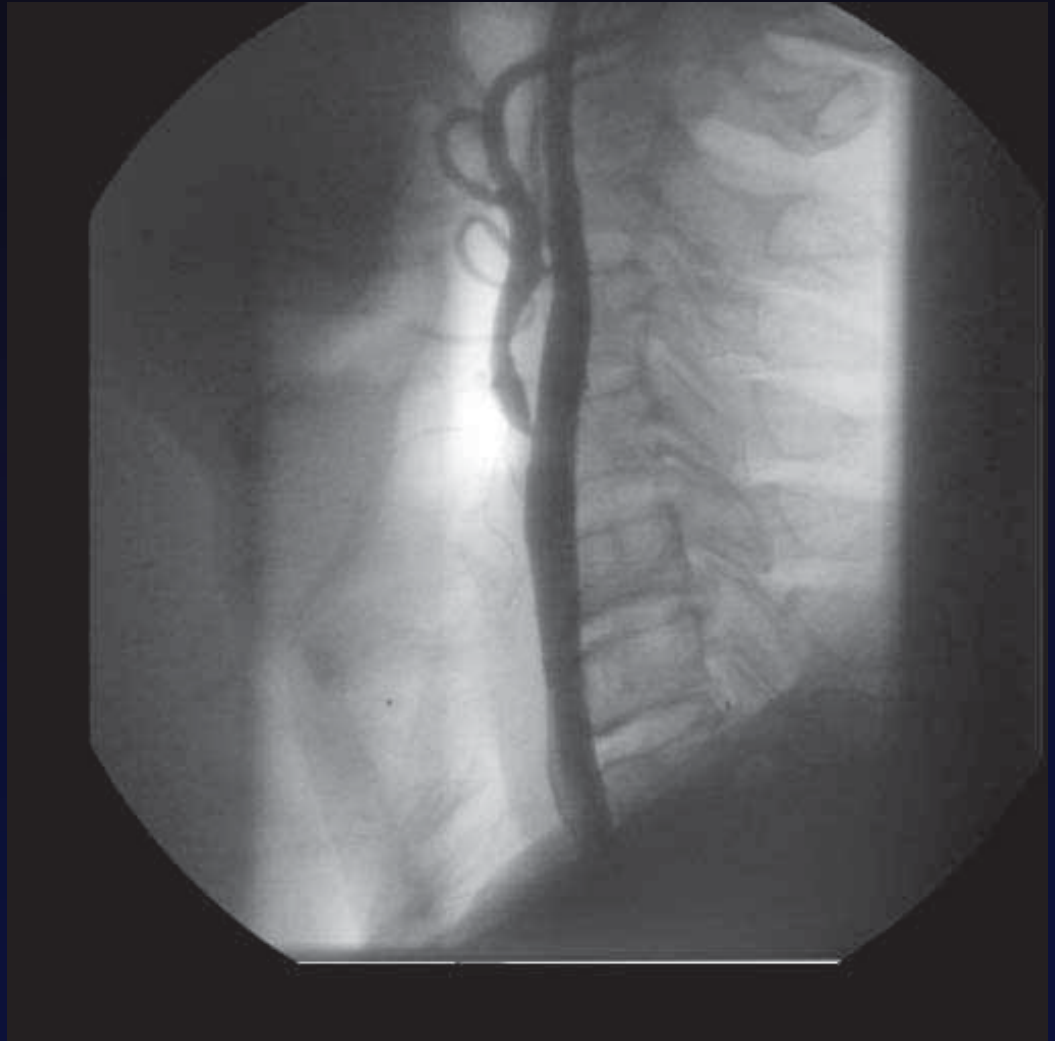
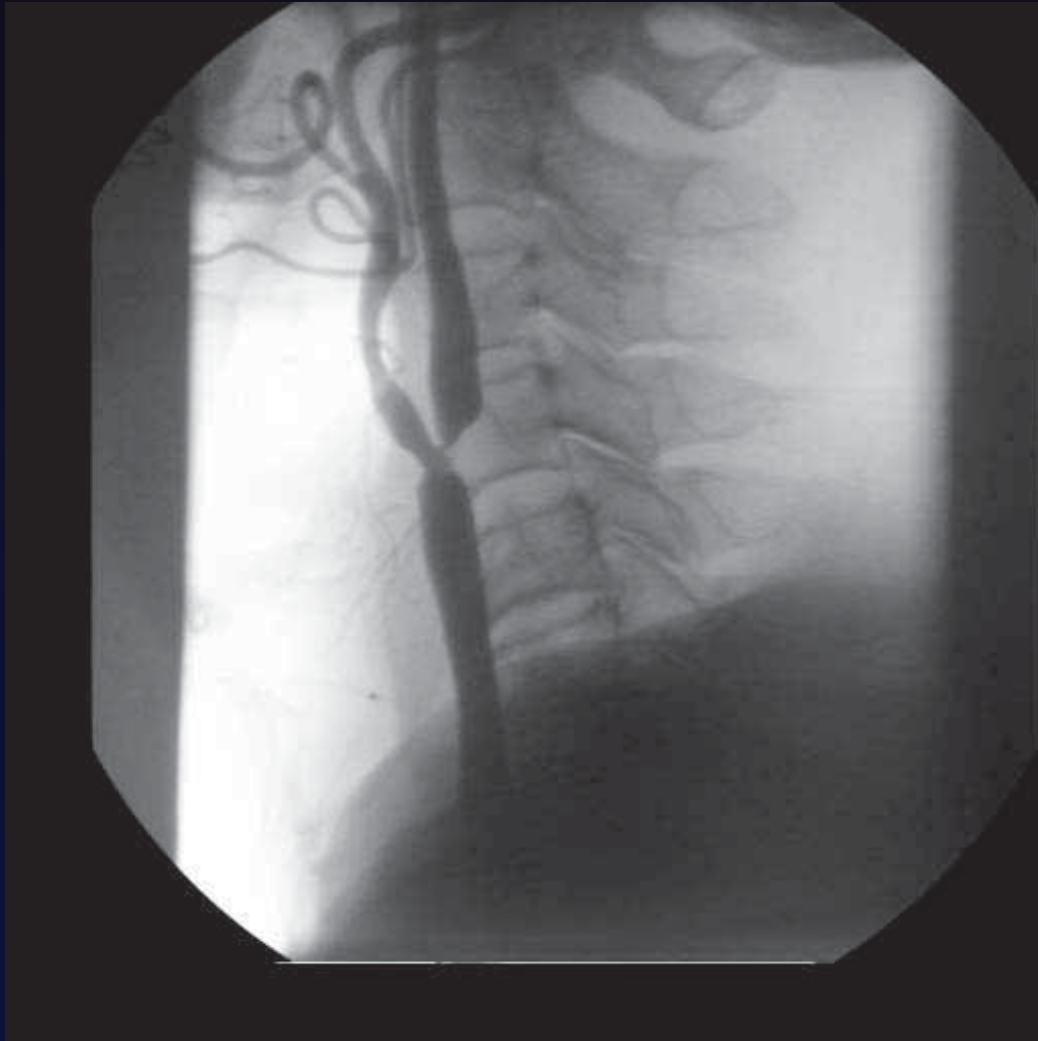
Post-stenting cerebral angiography

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Four Vessel Stenting

M/75

RICA



Pre -

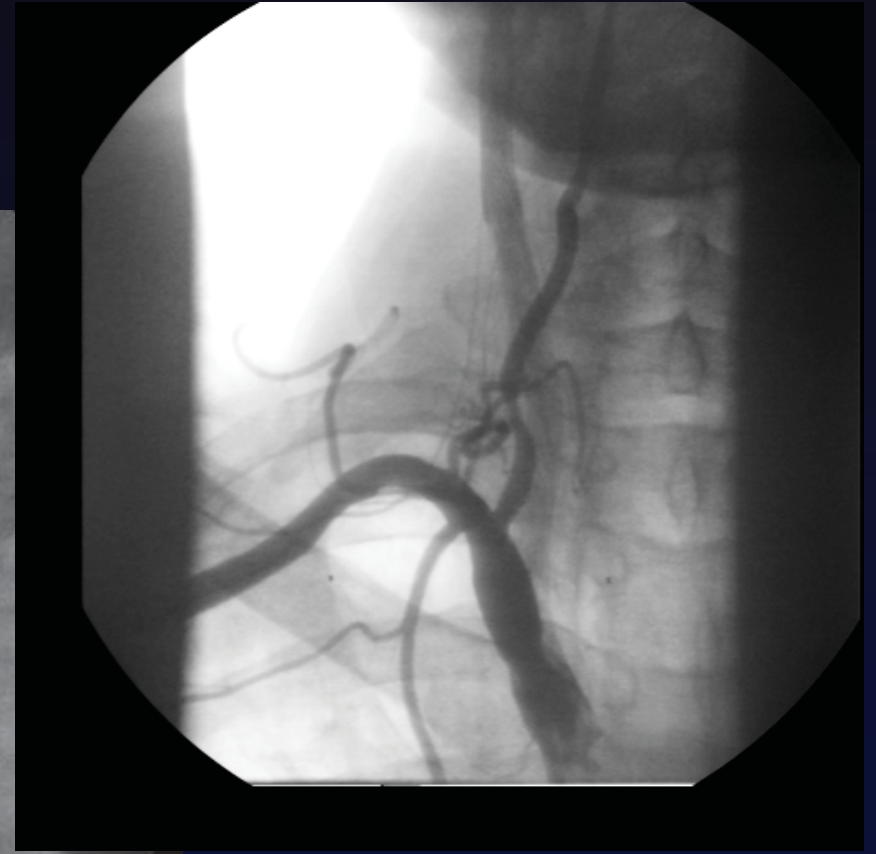
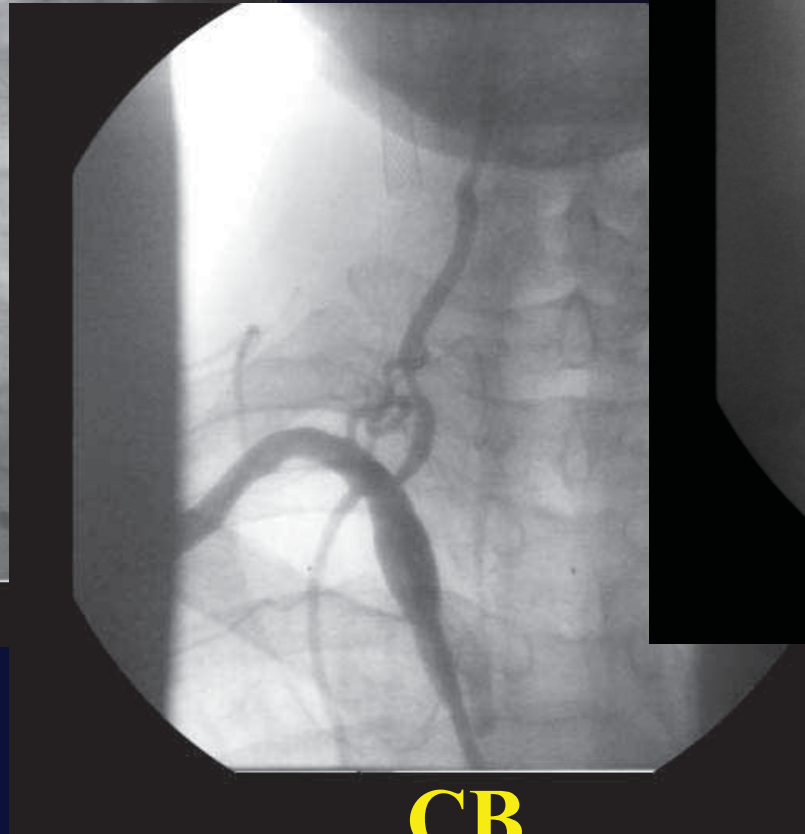
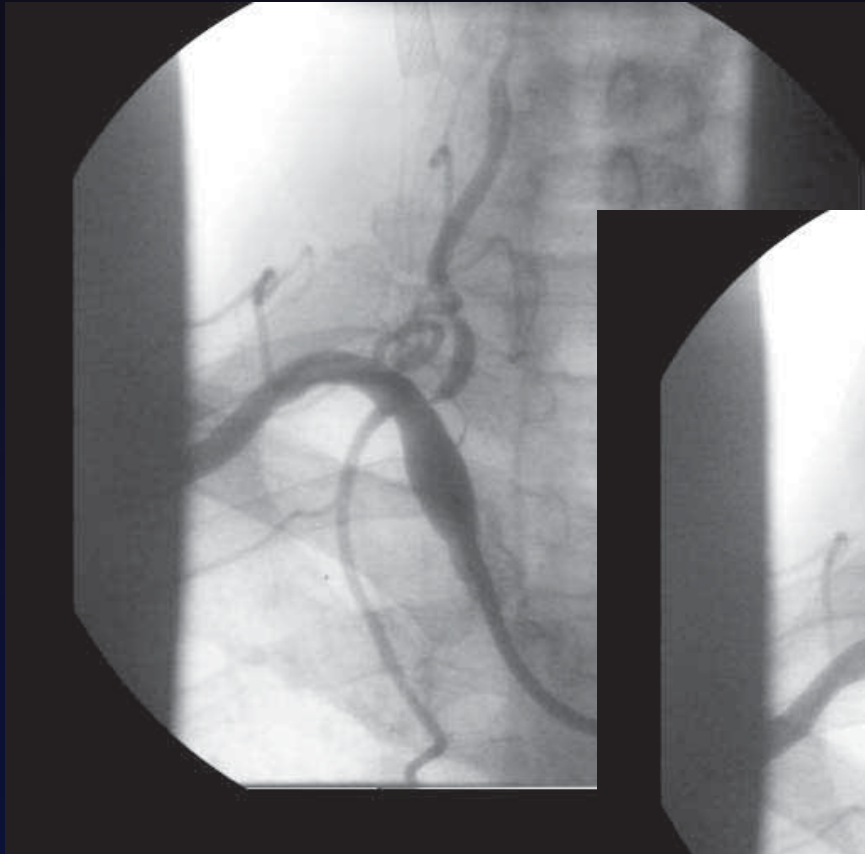


Post -

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Four Vessel Stenting

RVA



Pre -

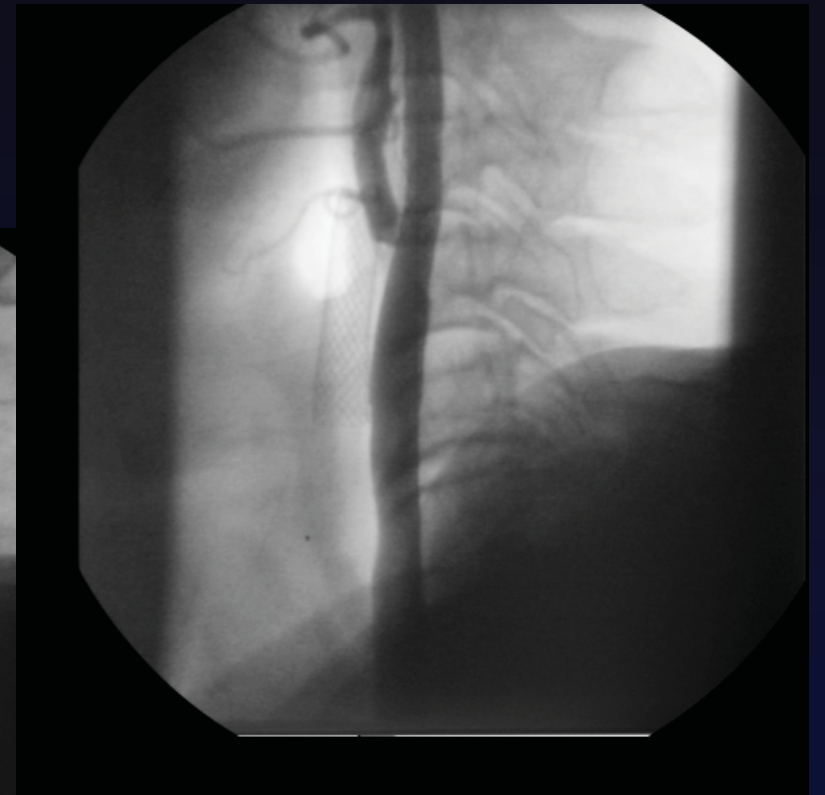
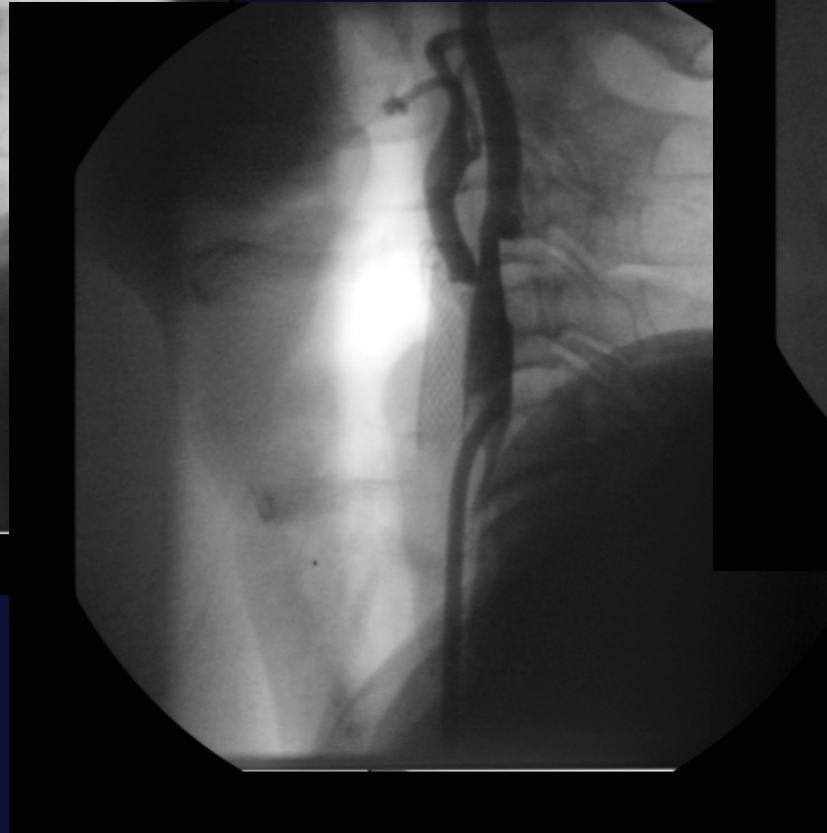
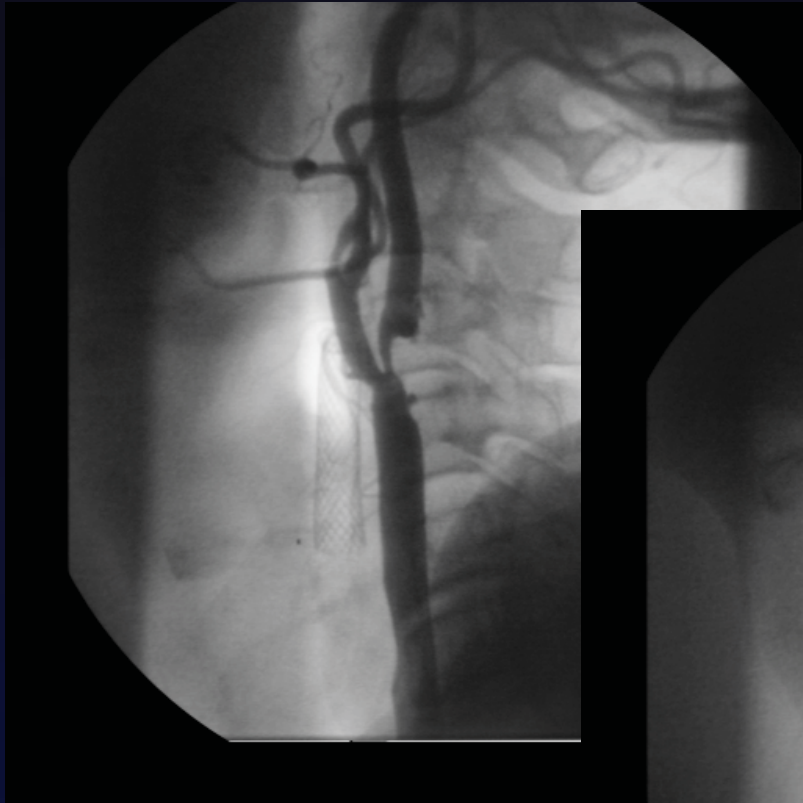


Post -

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Four Vessel Stenting

LICA

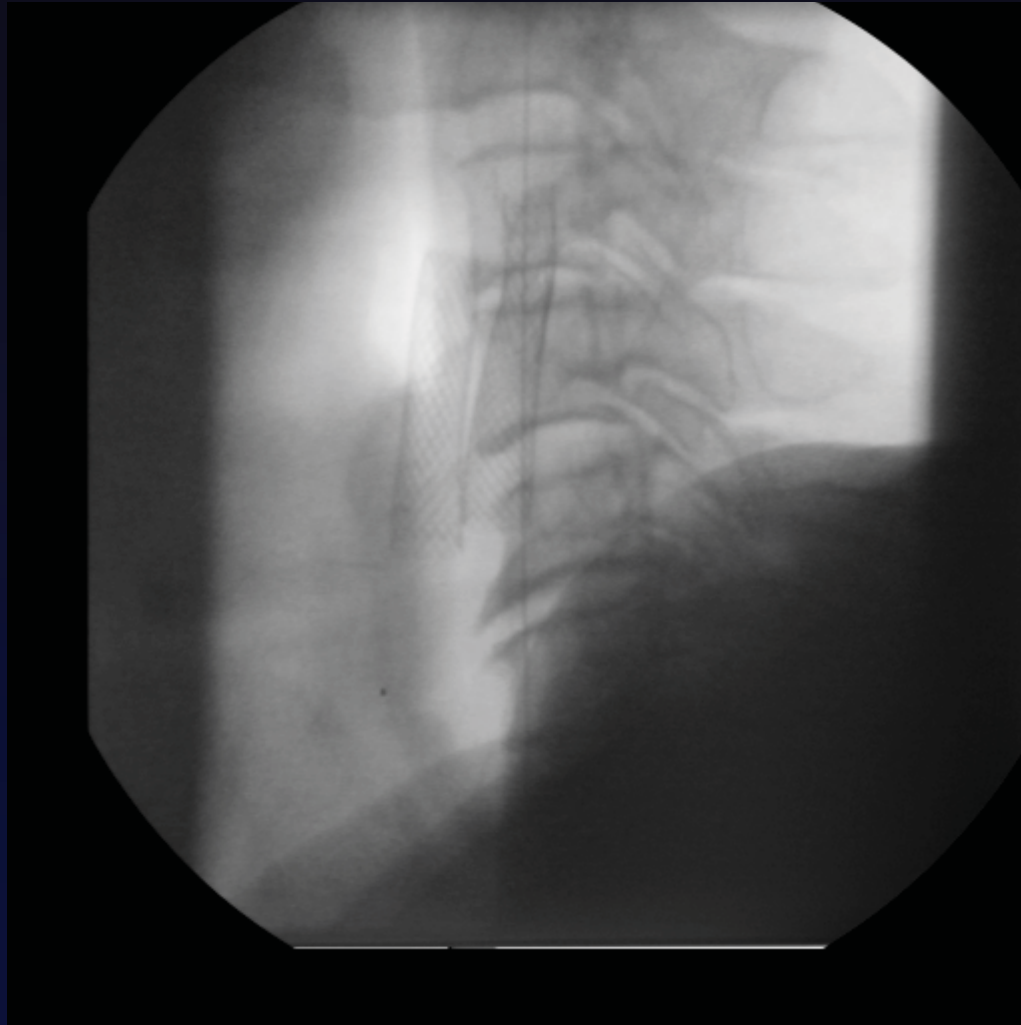


Pre -



Post -

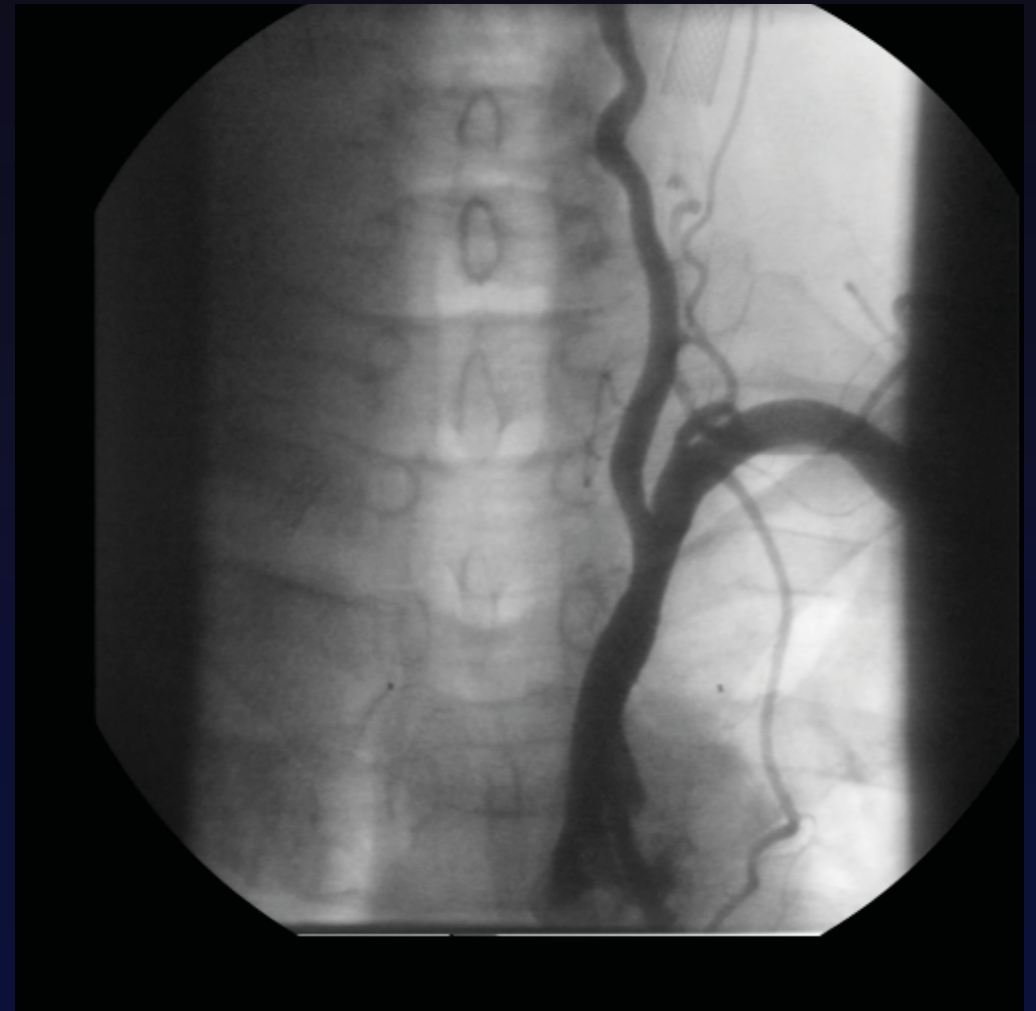
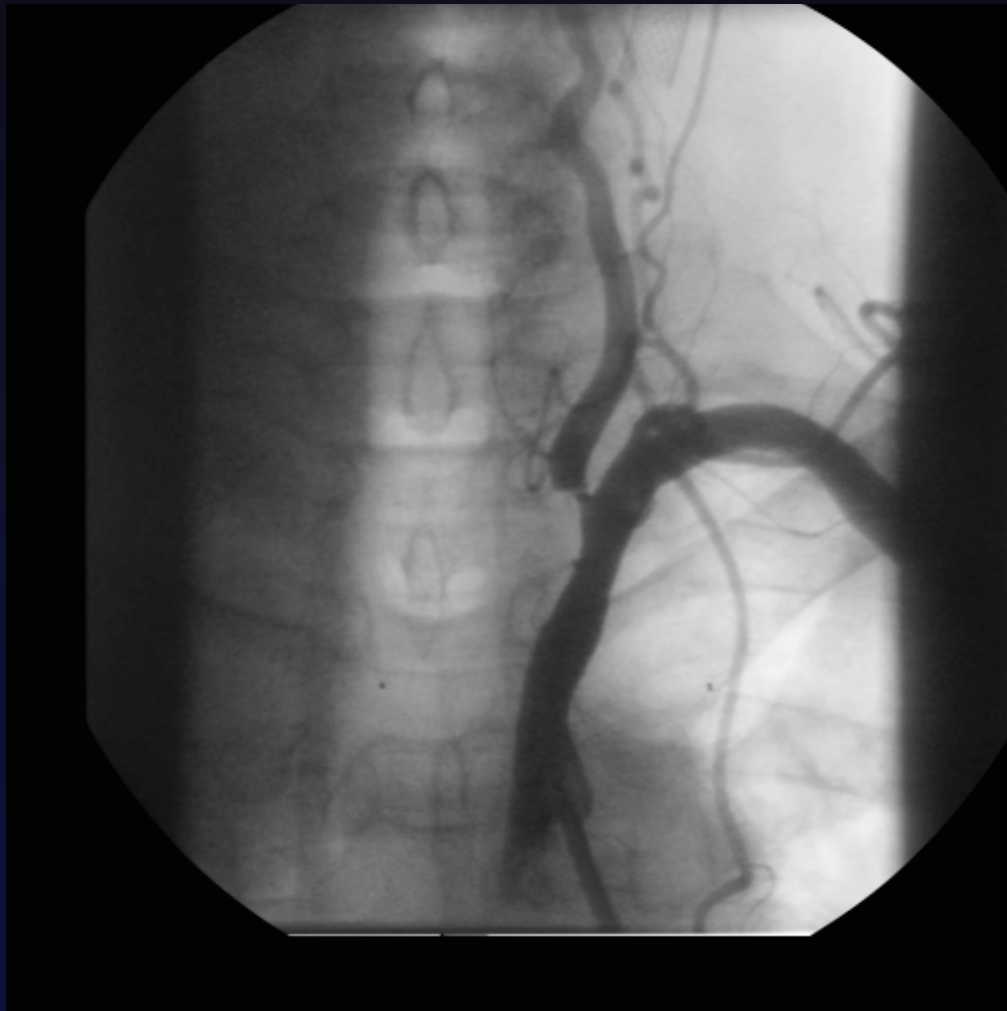
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Four Vessel Stenting

LVA



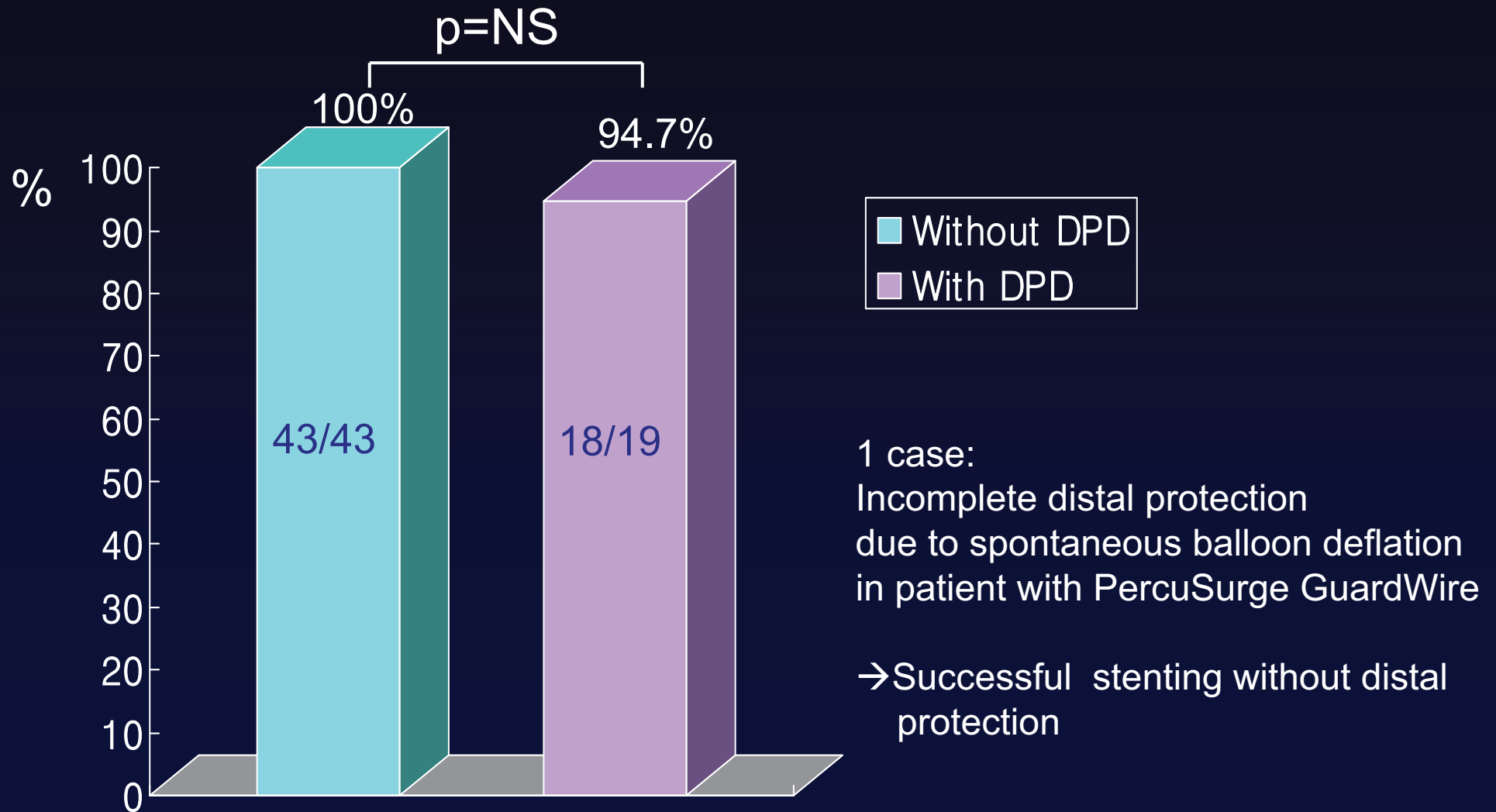
Pre -



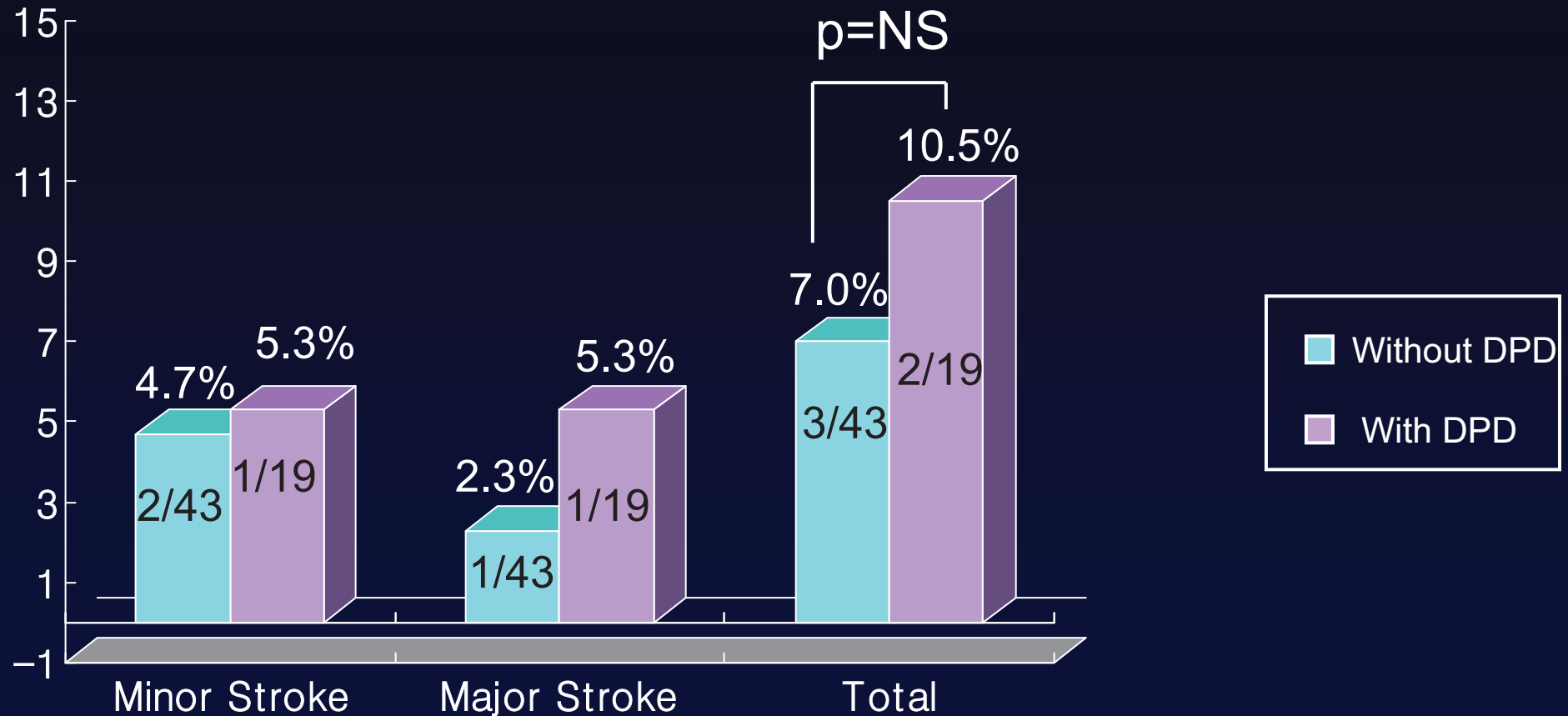
Post -

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Results Procedural Success



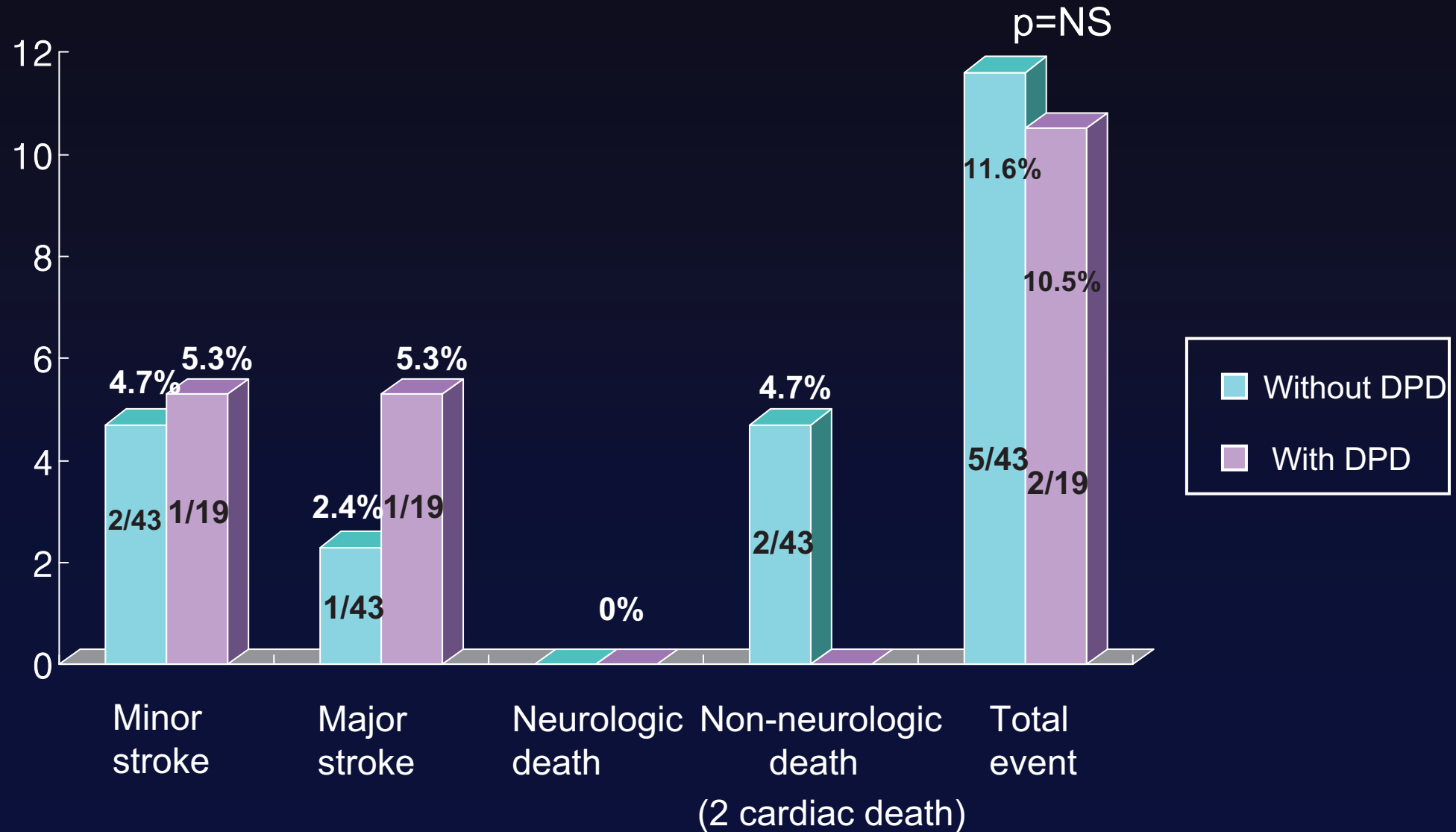
Results 30-day clinical outcome



Major stroke: 2 hemorrhagic stroke due to hyperperfusion,
No major embolic stroke

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Results – 6 month clinical outcome



Results - Baseline QCA data

	Pre	Post
RVD(mm)	5.93 ± 1.45	
MLD(mm)	1.46 ± 0.78	5.01 ± 1.28
%DS	77.4 ± 8.4	13.7 ± 12.9
Length(mm)	18.8 ± 10.1	

Results

PercuSurge GuardWire Experience and Result

- Technical success rate: 12/13 (92.3%)
- Balloon inflation time: 6 min 27sec \pm 1min 42sec
- Aspirated material: 12/12(100%)
- Direct stenting: 6/12(50%)
- Clinical Results: 1 hemorrhagic stroke developed within 24 hrs after stenting due to hyperperfusion

Results

EPI Filter Wire Experience and Result

- Technical success rate: 6/6 (100%)
- Visible filtered material: 2/6(33.3%)
- Clinical Results: 1 minor embolic stroke developed within 30 days after stenting

Hyperperfusion Syndrome

Sundt et al. first described in 1981
Recognized complication of CEA

- Triad: Unilateral headache, Focal seizure, ICH
- Symptoms: Usually developed 5 to 7 days after CEA
- Speculations: Elevated ipsilateral cerebral blood flow
- Incidence of ICH after CEA: From a recent review of the literature
0.3 to 1.2%

Associated with elevated BP at the time of presentation

- **ICH after carotid stenting**

Gachon data (N=58): 2/58 (3.5%)

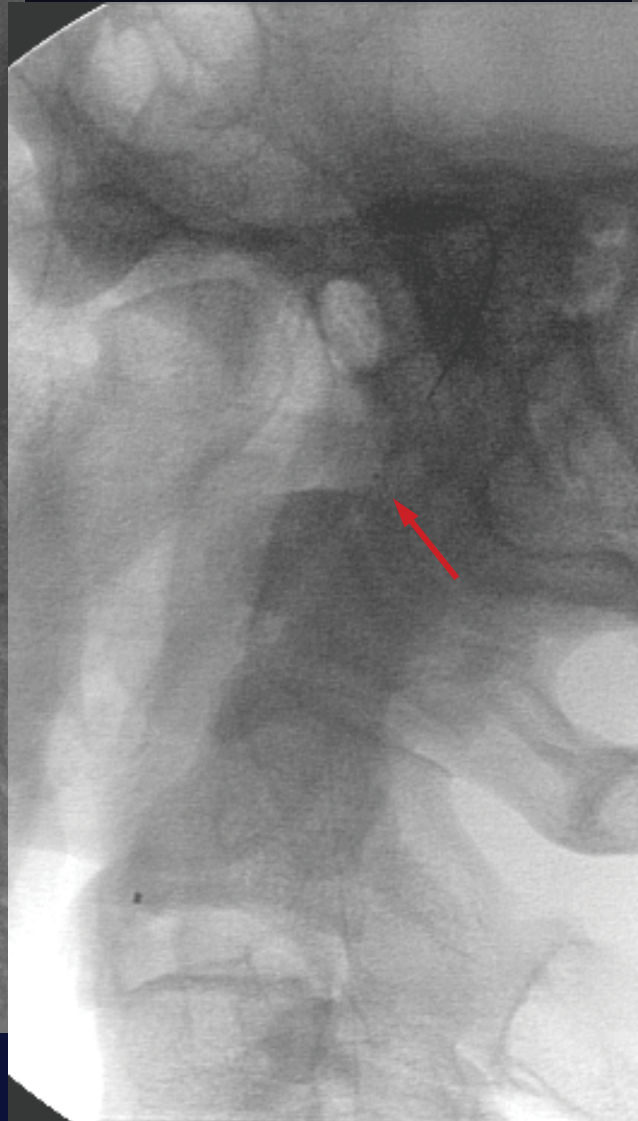
Morrish et al (N=90): 4/90 (4.4%)

Patient Profile of ICH post-stenting

	Patient 1	Patient 2
Age/Sex	74/M	76/M
Target lesion	RICA	LICA
% stenosis (%)	95	99
Presenting Sx	yes	yes
Contralateral carotid artery stenosis	occluded	No significant stenosis
Residual stenosis after CAS (%)	10	20
Time to onset of neurologic Sxs	7 days	1 hour
Clinical Outcome	fatal	fatal



Pre



PercuSurge Guardwire



Post

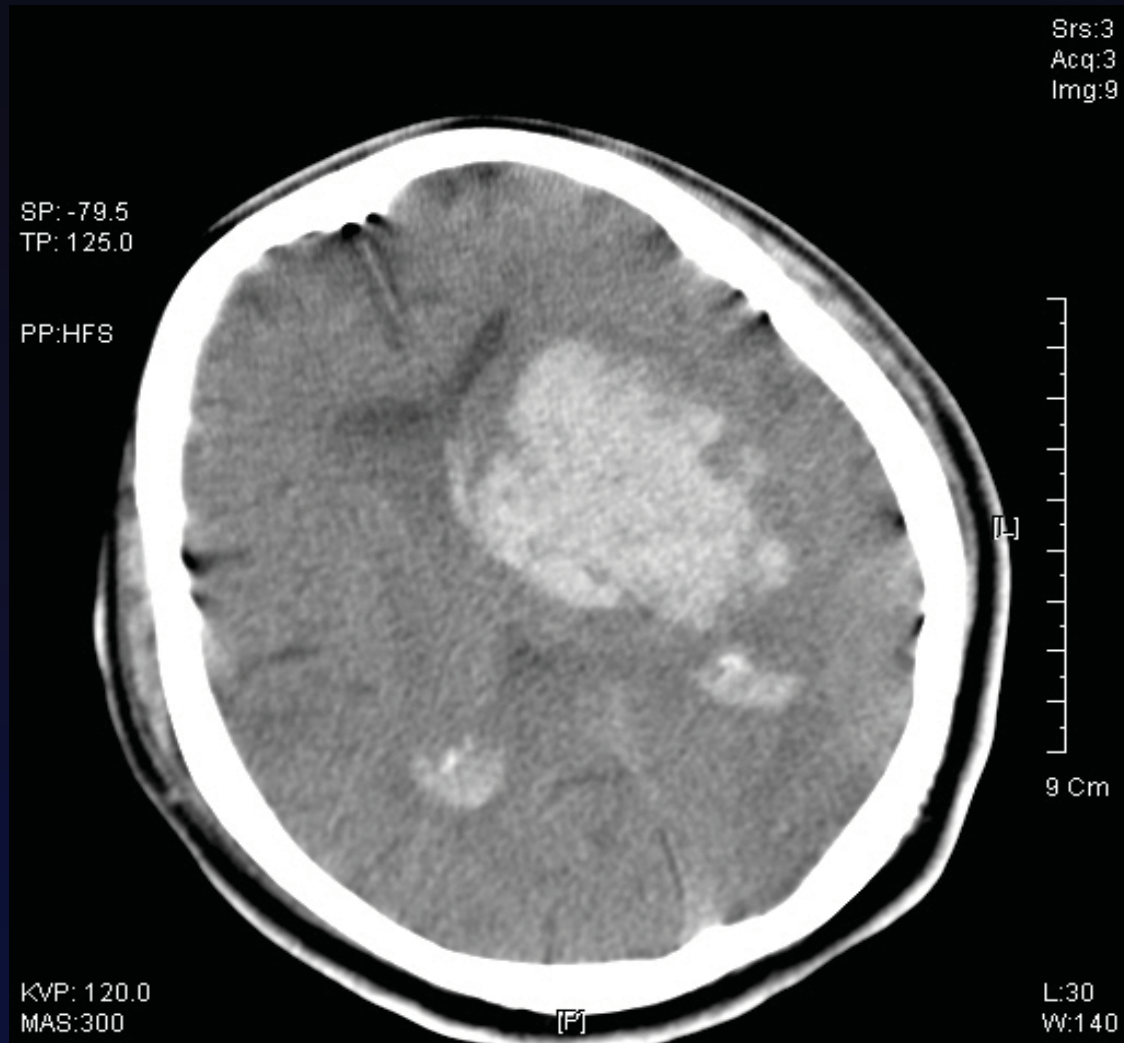


Pre-



Post-stenting cerebral angiography

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Left basal ganglia hemorrhage after stenting

Summary

- Clinical event rate during the 30 days(short term) and 6 month(mid-term) of follow-up was not significantly different in carotid artery stenting between protected and non-protected group.
- 2 hemorrhagic strokes developed in patients with subtotal carotid artery occlusion, and severe carotid stenosis combined with contralateral occusion

Conclusions

- Carotid stenting is a safe and feasible procedure with high immediate success rate and **relatively low major clinical events during the follow up periods.**
- However, intracerebral hemorrhage can occur after carotid stenting possibly due to cerebral hyperperfusion injury.
- Furthermore, the use of neuroprotection devices will contribute to the decline in embolic event rates.