Techniques for Carotid Interventon

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Disclosures

- Inventor of Angioguard; fixed and recurring payments from JNJ
- Advisor: JNJ, Guidant

Understand the Patient

- What is the Cause of the Patient's Sxs?
- What is there baseline neurological status?

  Neurological Hx and Exam
  Head CT or MRI
  Carotid US

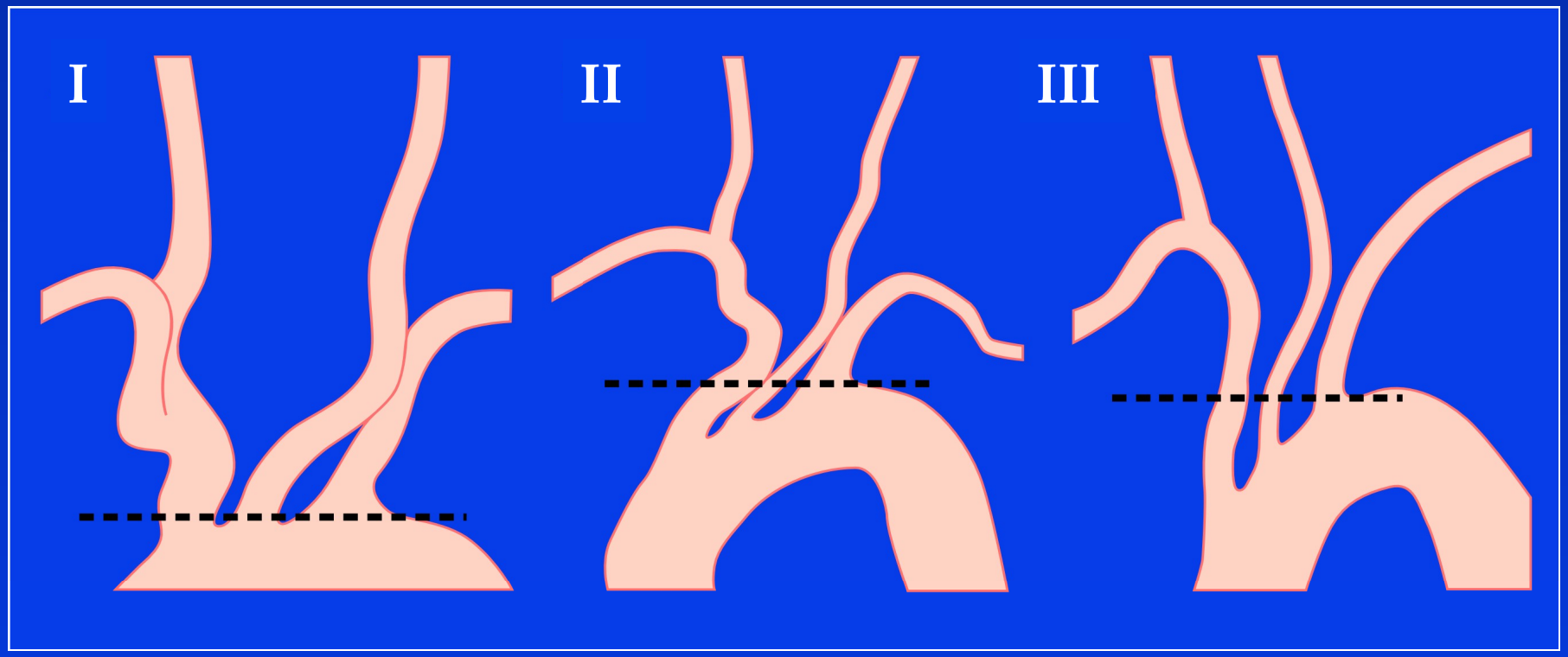
Anti-Platelet and anti-thrombotic

- **Pre-Procedural:**
  - ASA 325 mg/d
  - Clopidrogel: 1 week pre
    - » 450 mg at least 4 hrs pre-procedure
- **Intra-Procedural:**
  - Heparin: 75 u/kg
  - AngioMax: less data
- **Post-Procedural:**
  - Clopidrogel: 75 mg/d for 3 to 4 weeks
  - ASA 325 mg/d

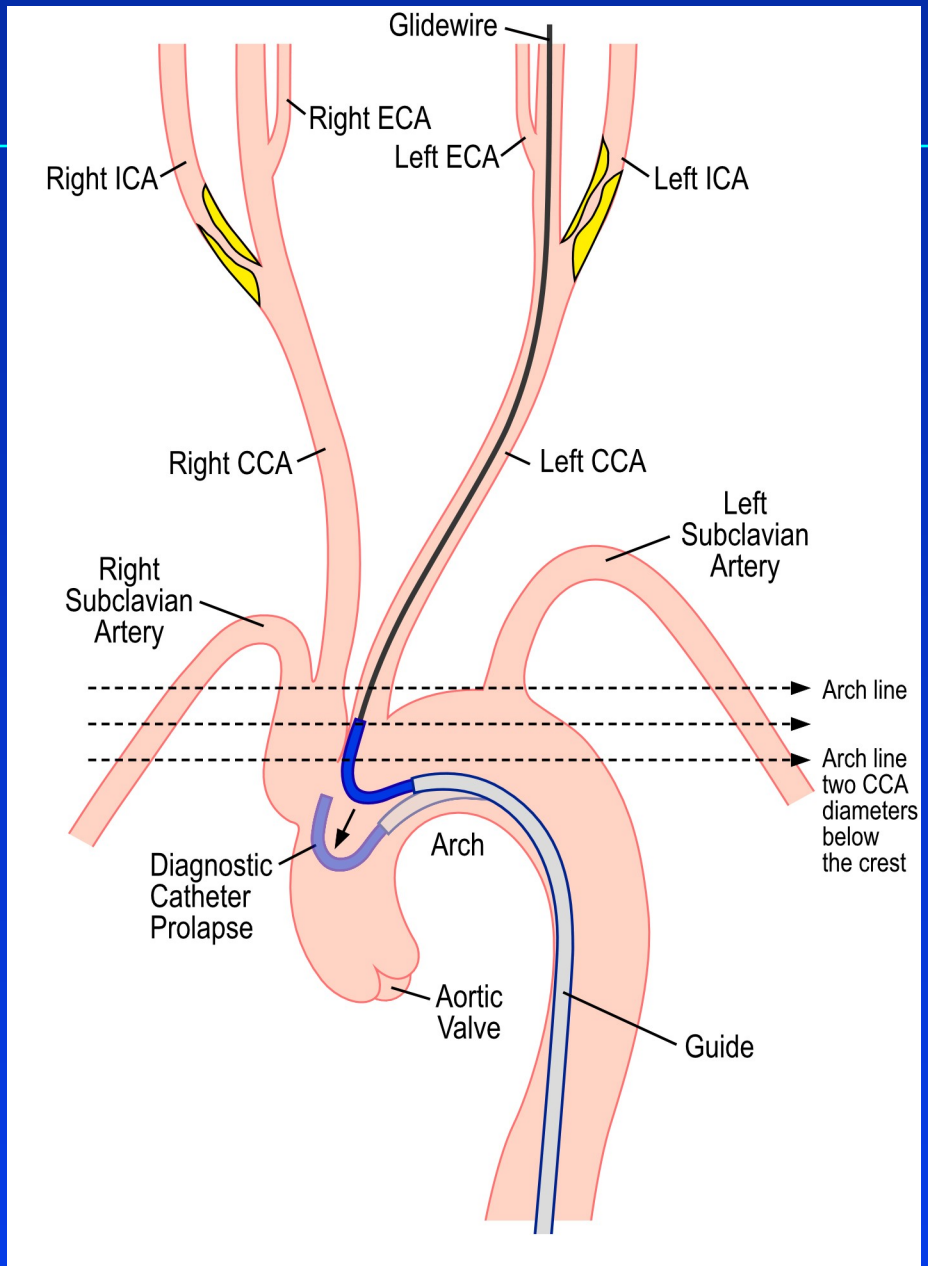
Immediate need for major surgery

- PTA Only
- ASA
- US 6 weeks later and Stent if needed

Aortic Arch Classification

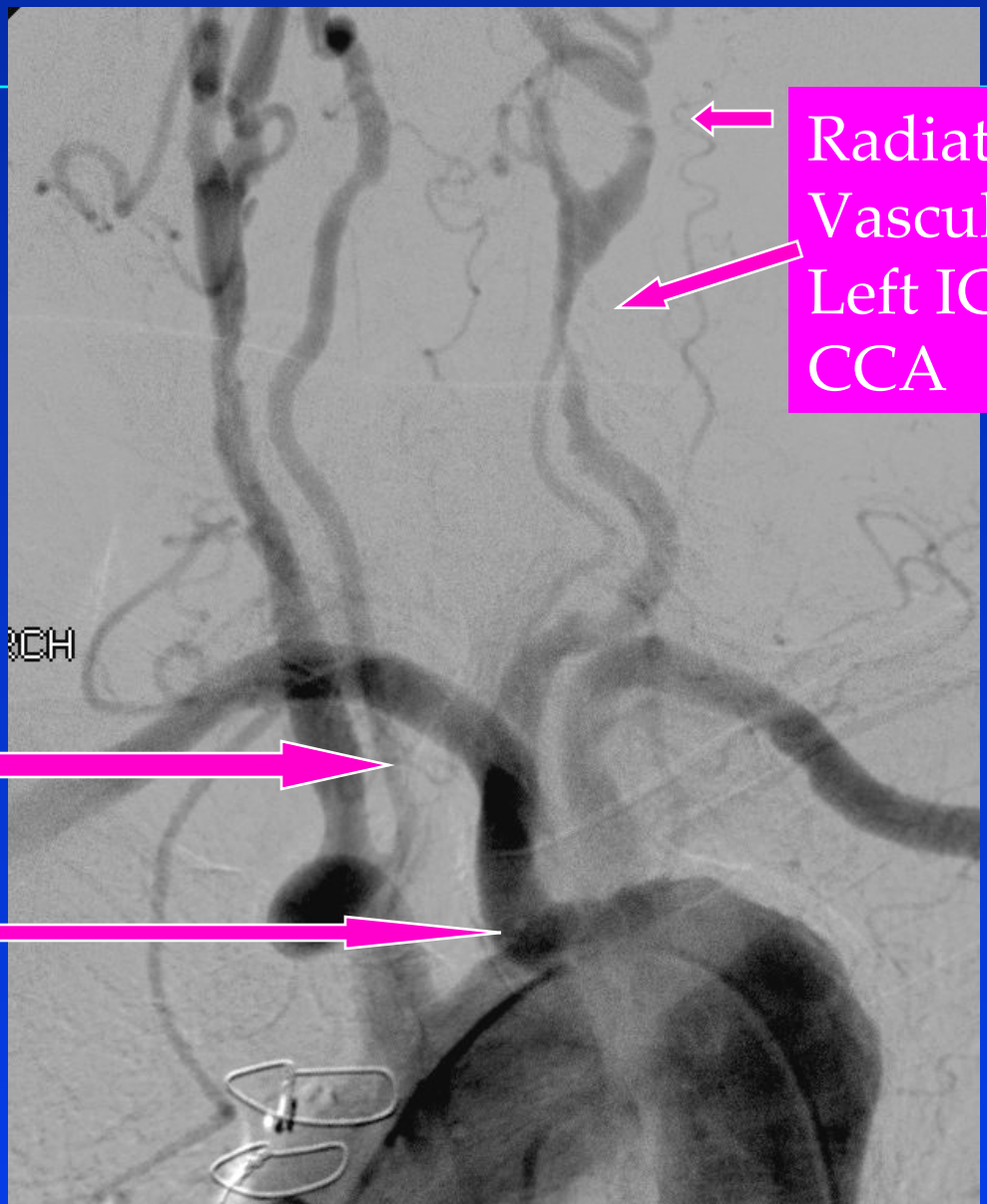


Diagnostic Catheter Prolapse



Ref 15

Anomalous Origin of the Right Subclavian from the Left Side of the Aortic Arch



Radiation Vasculopathy In Left ICA and CCA

R Vertebral orignates From Innominate Artery

R Subclavian

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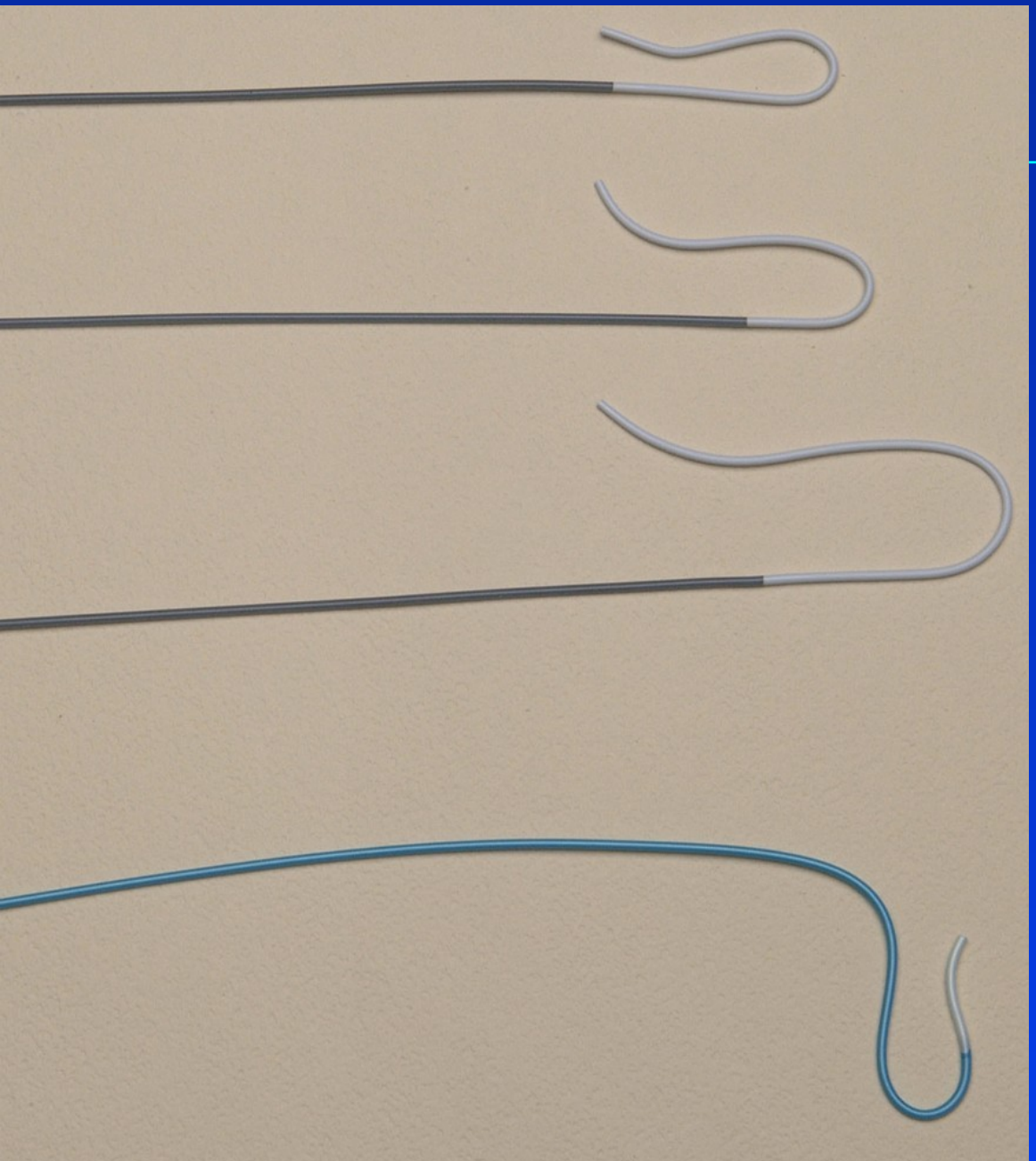
Diagnostic Cerebral Angiography Catheters



SIMMONS 1

SIMMONS 1 1/2

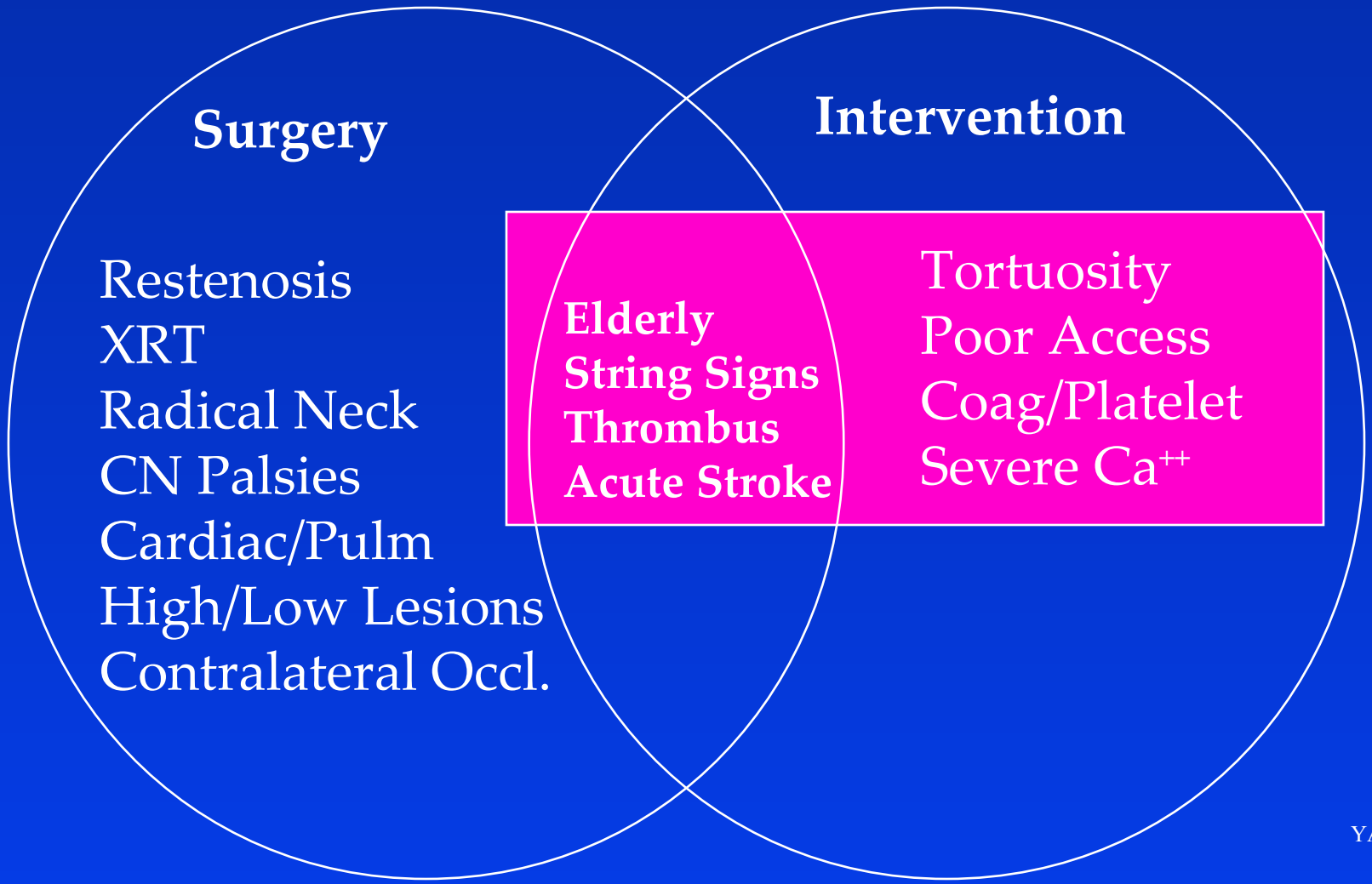
SIMMONS 2

HN2 / VITEK

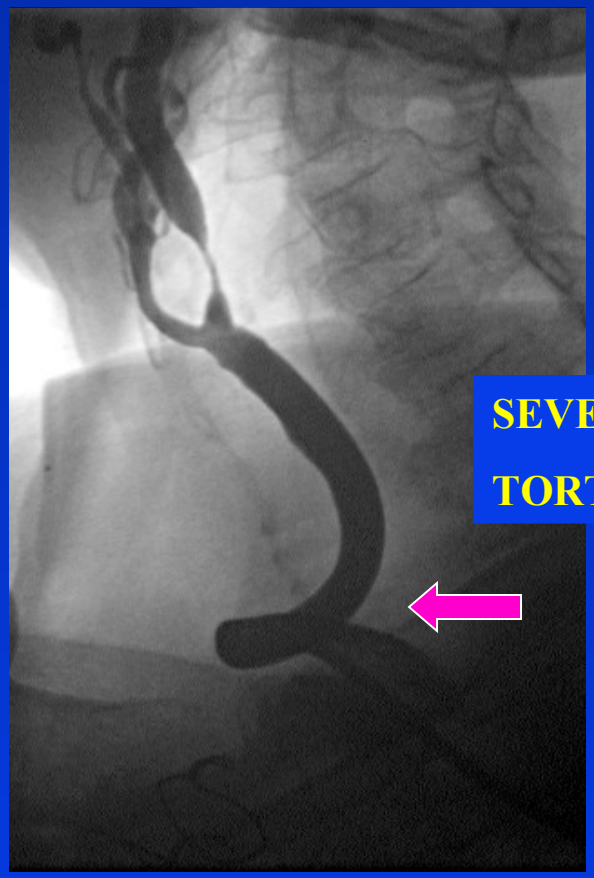
Carotid Stenting Procedure

- Cerebral Angiogram:
  - Aortic Arch
  - Ipsilateral oblique & lateral cervical of both Carotids- siphon
  - AP and Lateral Intracranial bilaterally
  - Both subclavians in a contralateral oblique projection for Vert ostia
  - Dominant Vert injection with intracranial lateral and steep cranial AP

Factors that Increase the Risk of Carotid Revascularization

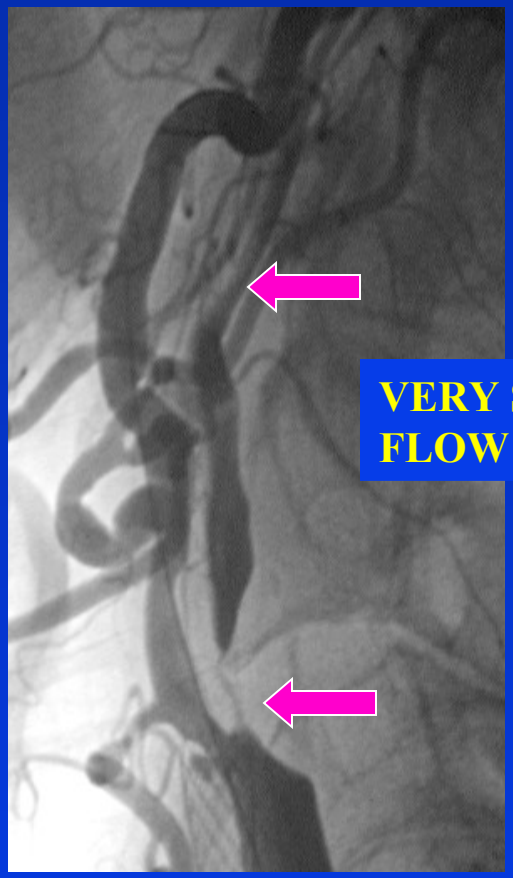


Unfavorable Anatomy



SEVERE

TORTUOSITY



VERY SLOW FLOW

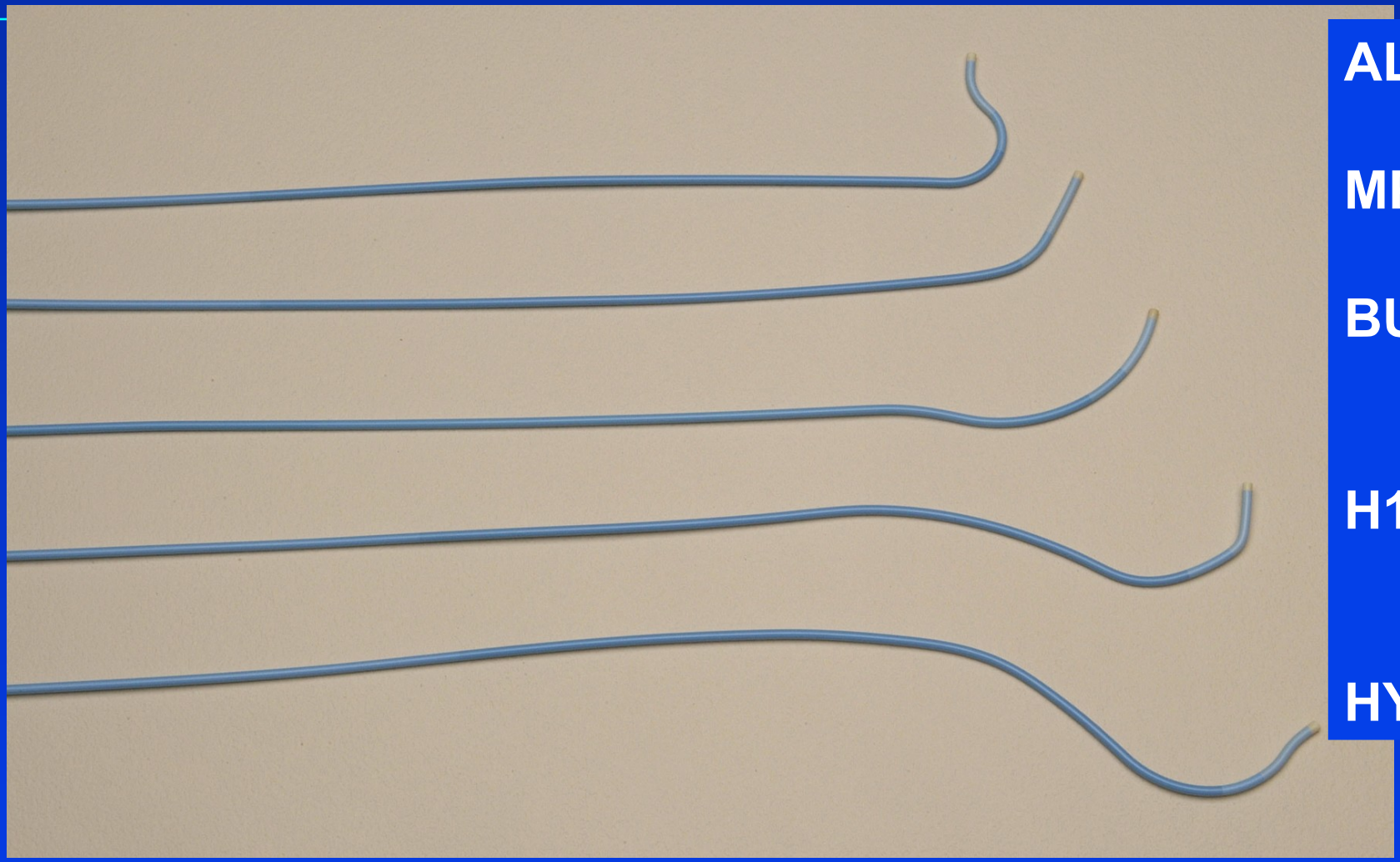
Sheaths vs. Guides

Technique	Advantages	Disadvantages
Guide sheath	6–7 F hole in the groin	No torque option
	Integrated dilator permits smoother transition and advancement into the CCA (see Fig. 7)	Potential for kink in angulated vessel takeoff (anomalous left CCA)
	Allows placement of diagnostic catheter inside the sheath for one-step access	Larger volume of contrast, slightly greater risk of air embolism
Guide catheter	Better torque control	8 F hole in the groin
	Least chance for kink	During advancement over 0.035-inch guide wire into the CCA, the abrupt transition at the tip may predispose to scraping and emboli
	Allows retrieval of filters by advancement into the stent. The torque control allows orientation of the guide catheter towards ICA better in tortuous anatomy	Difficult to place diagnostic catheter inside guide catheter for one step access, the relative stiffness and size mismatch do not provide smoother transition

CCA: common carotid artery; ICA: internal carotid artery.

Ref 14

CAROTID GUIDE CATHETERS



TELESCOPING ACCESS SETUP

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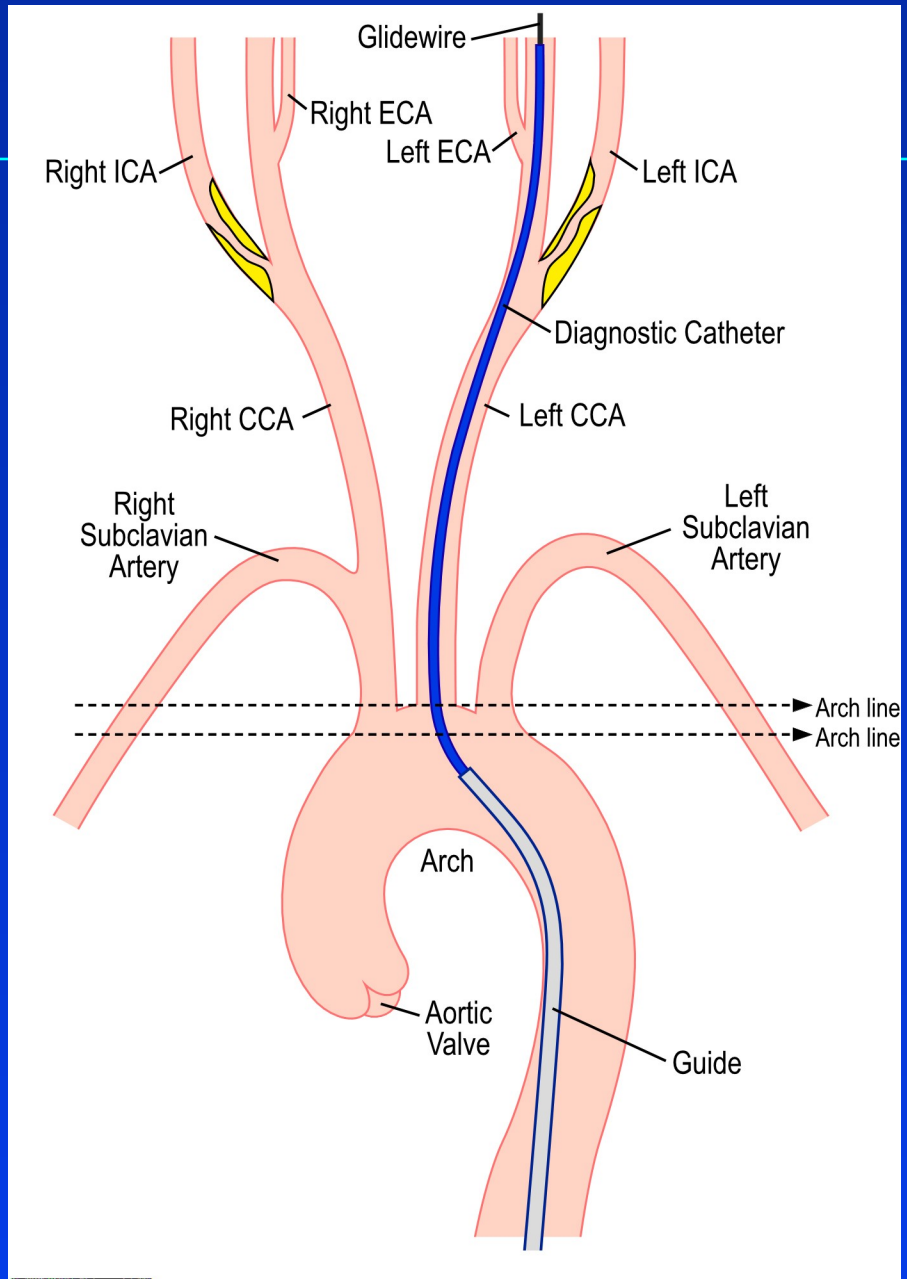
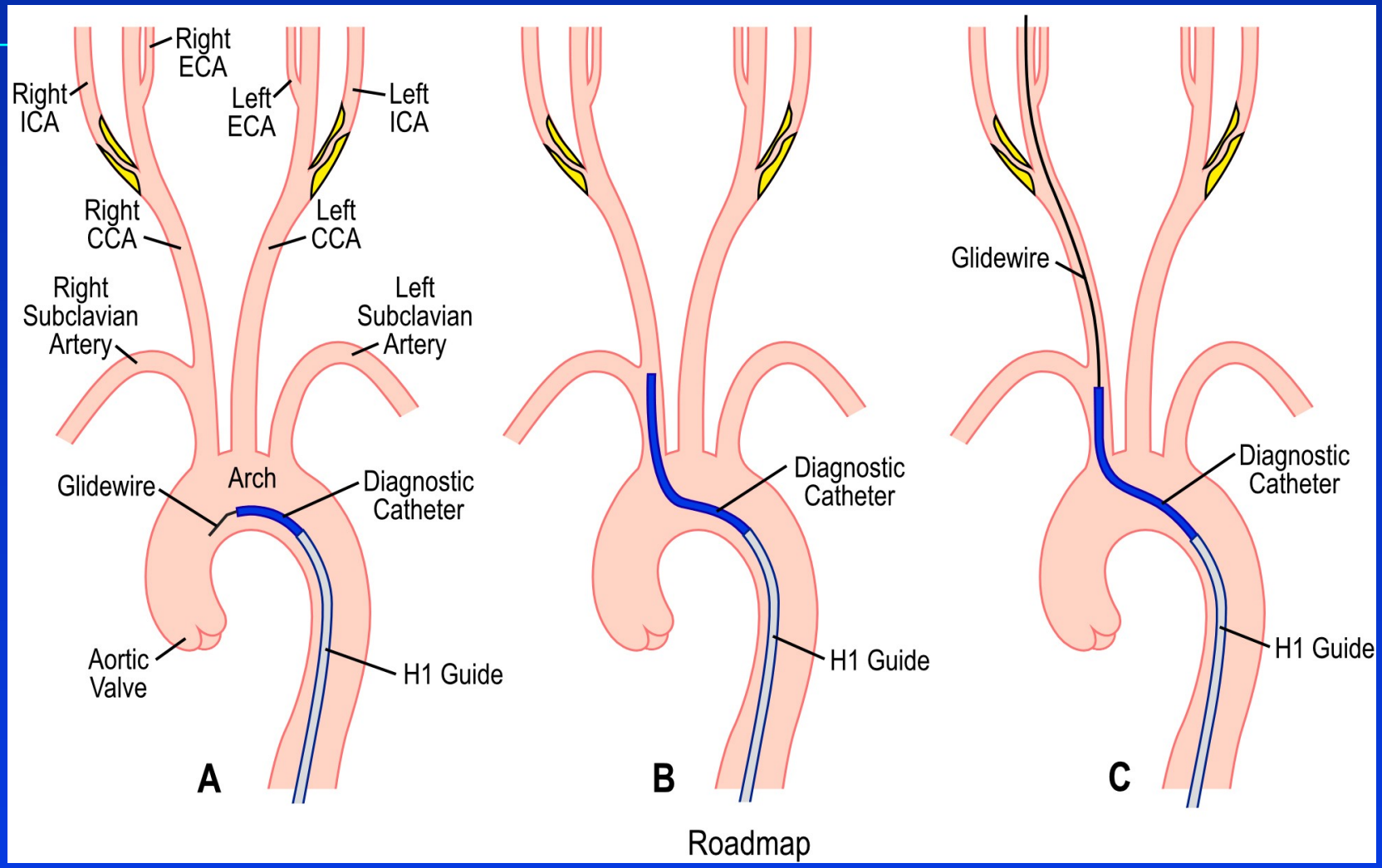
Telescoping Access for Carotid Stenting

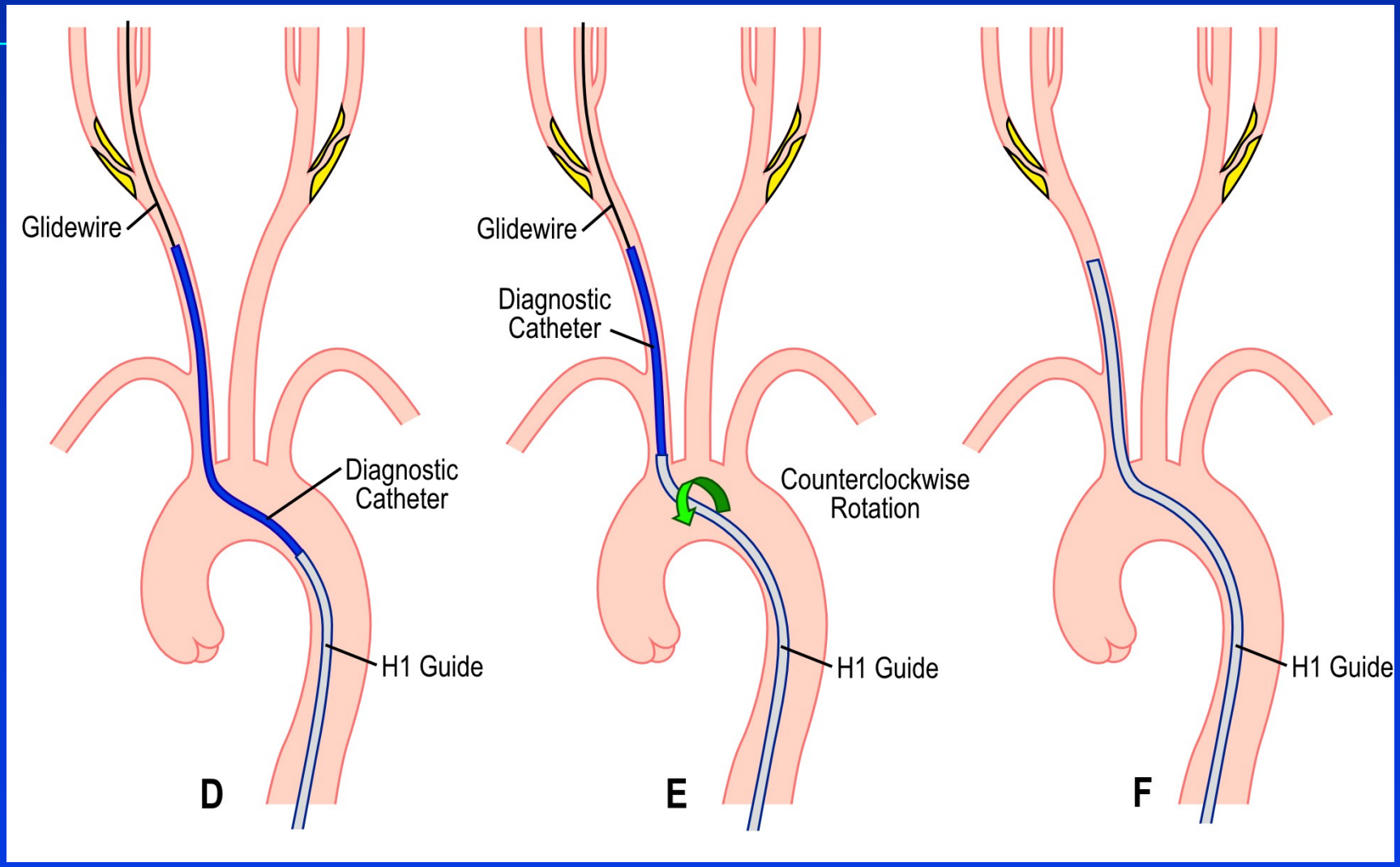


Ref 15

Access Strategies for Carotid Stenting: Telescoping Technique



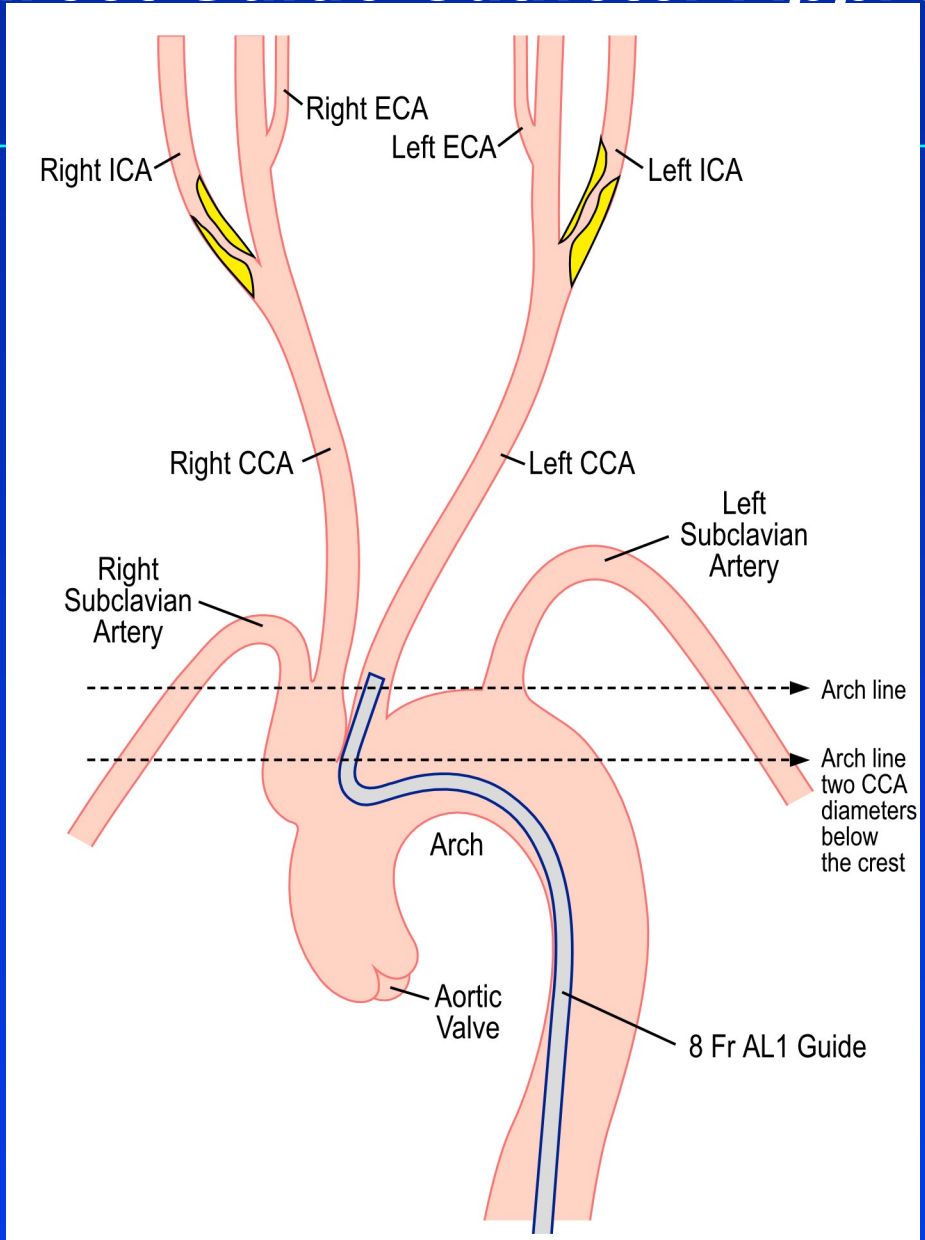
Access Strategies for Carotid Stenting: Telescoping Technique



Access Strategies for Carotid Stenting

- Coronary Technique – Type I or II Arch
  - Guide over Stiff angled Glide Wire, engage CCA directly, keep proximal to low mid
- Bovine Arch-
  - Reshaped Amplatz 1 Guide
  - Stiff 0.014 or 0.018 buddy wire into ECA

Access Strategies for Carotid Stenting: Direct Guide Catheter Approach



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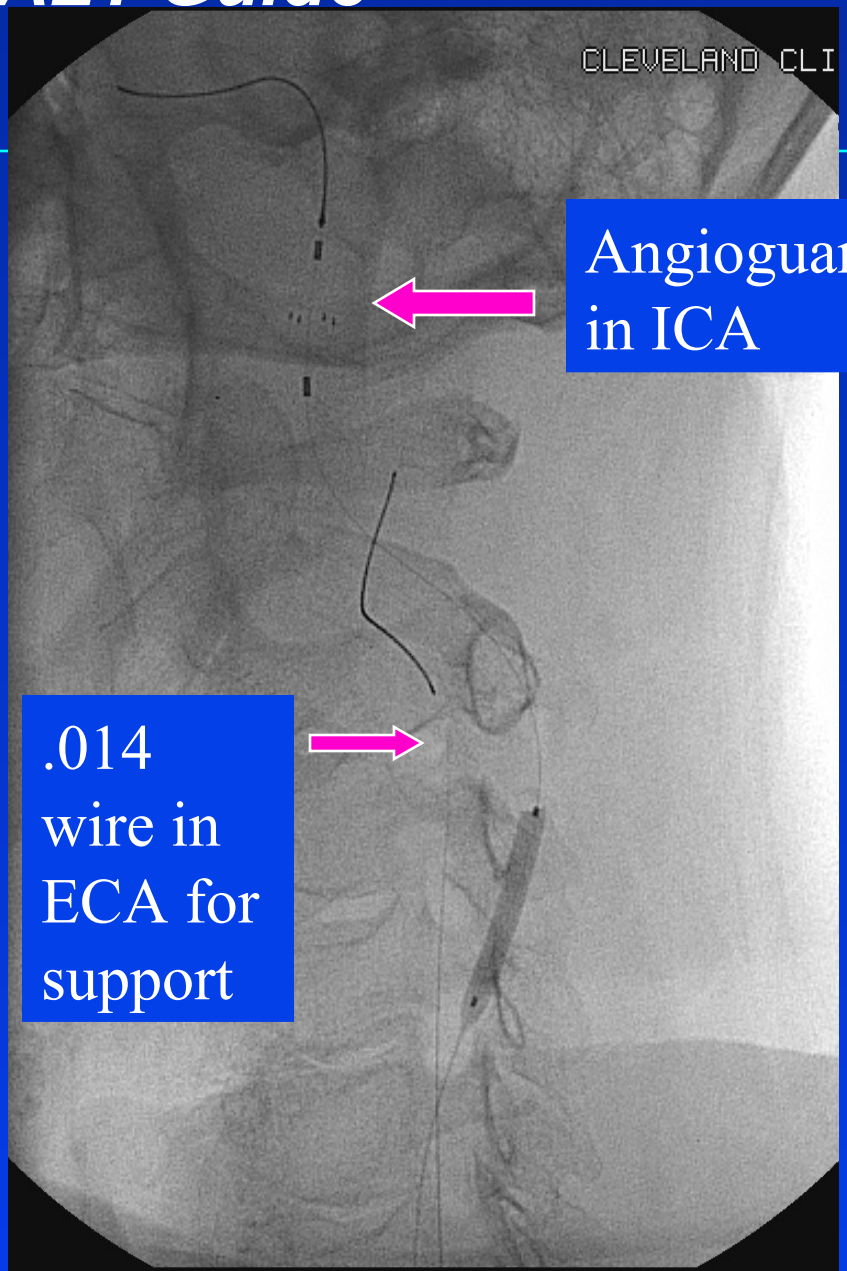
LAO ARCH


P STENT

Buddy Wire in ECA for Support in Bovine L CCA engaged with AL1 Guide



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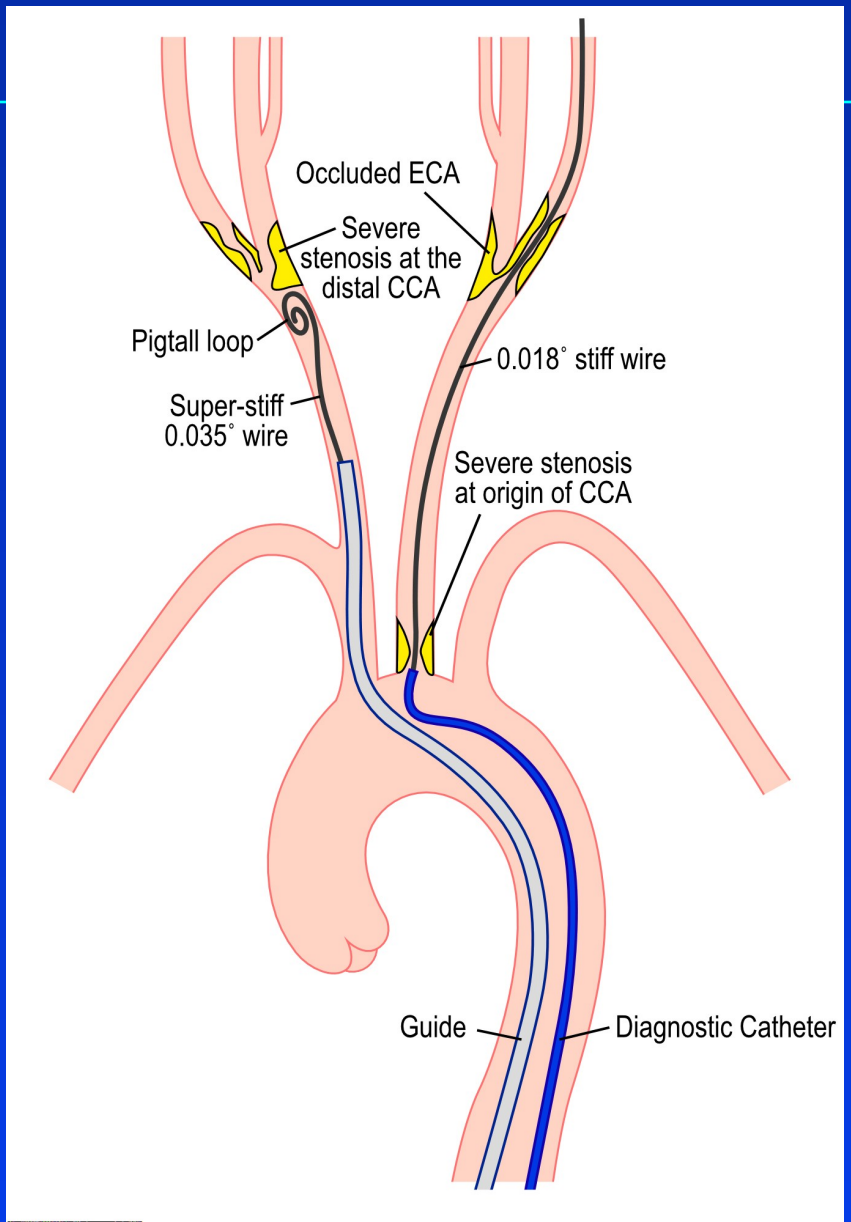
Access Strategies for Carotid Stenting

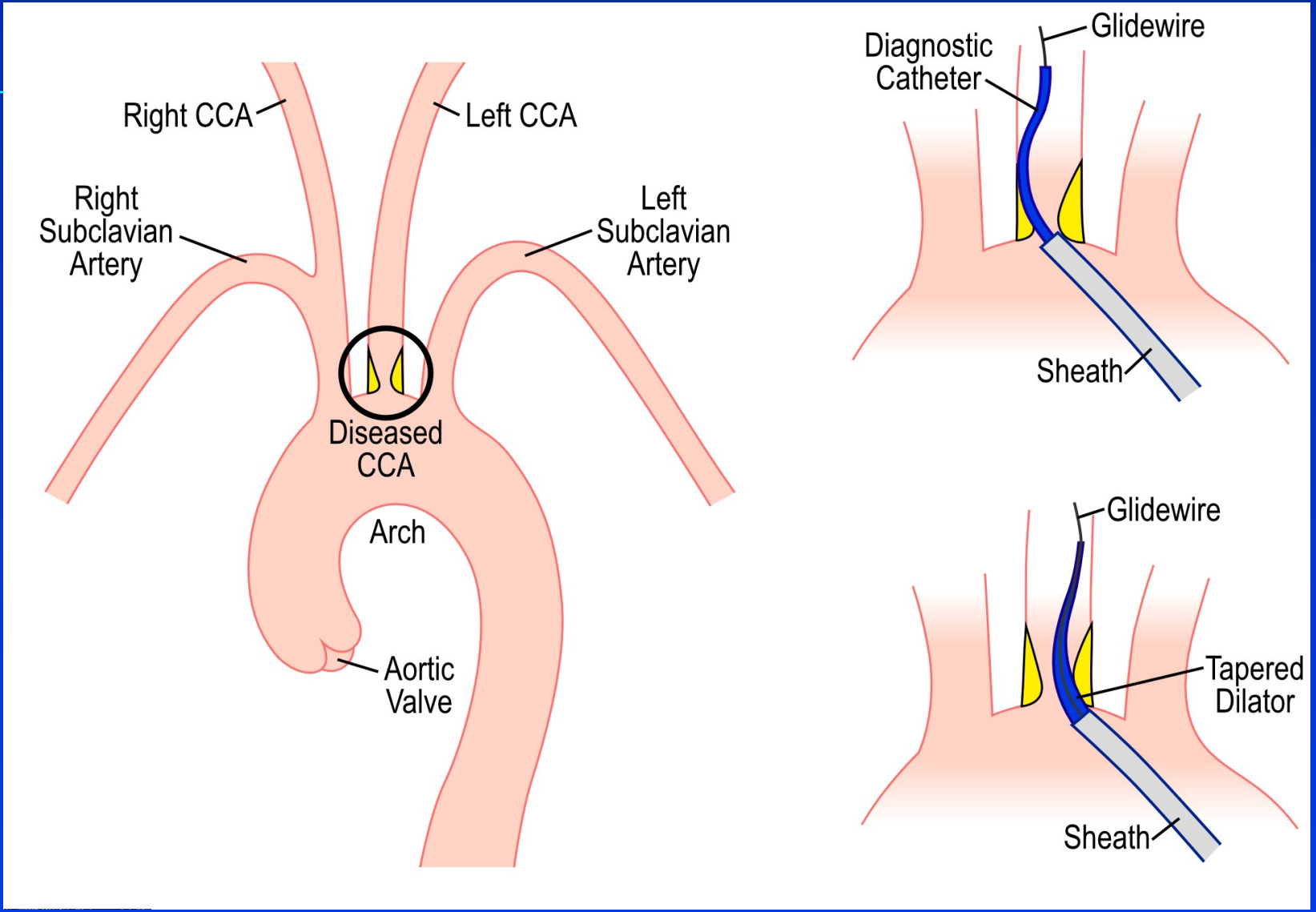
- Type III (severe)-
  - Vitek or Simmons 1.5 over Stiff Glide
  - Place DX cath into ECA
  - Exchange for Super Stiff Amplatz Wire with 3 cm tip
  - Remove Dx Cath
  - Place Guide/Dx Cath or Sheath/Intoducer over Amplatz Wire

Approaches in Presence of Severe ECA or CCA Disease



Ref 14

Approach in Presence of Mild CCA Ostial Disease



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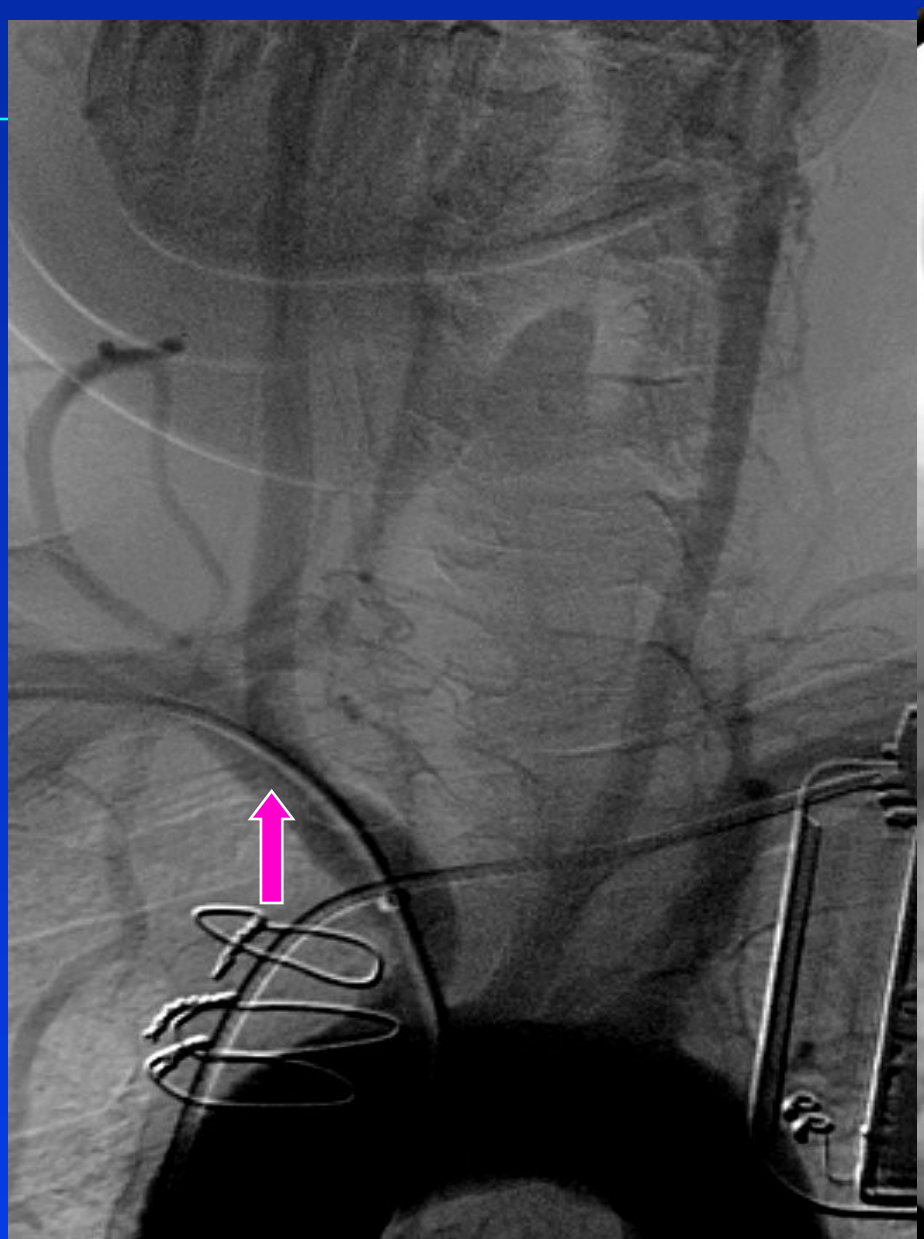
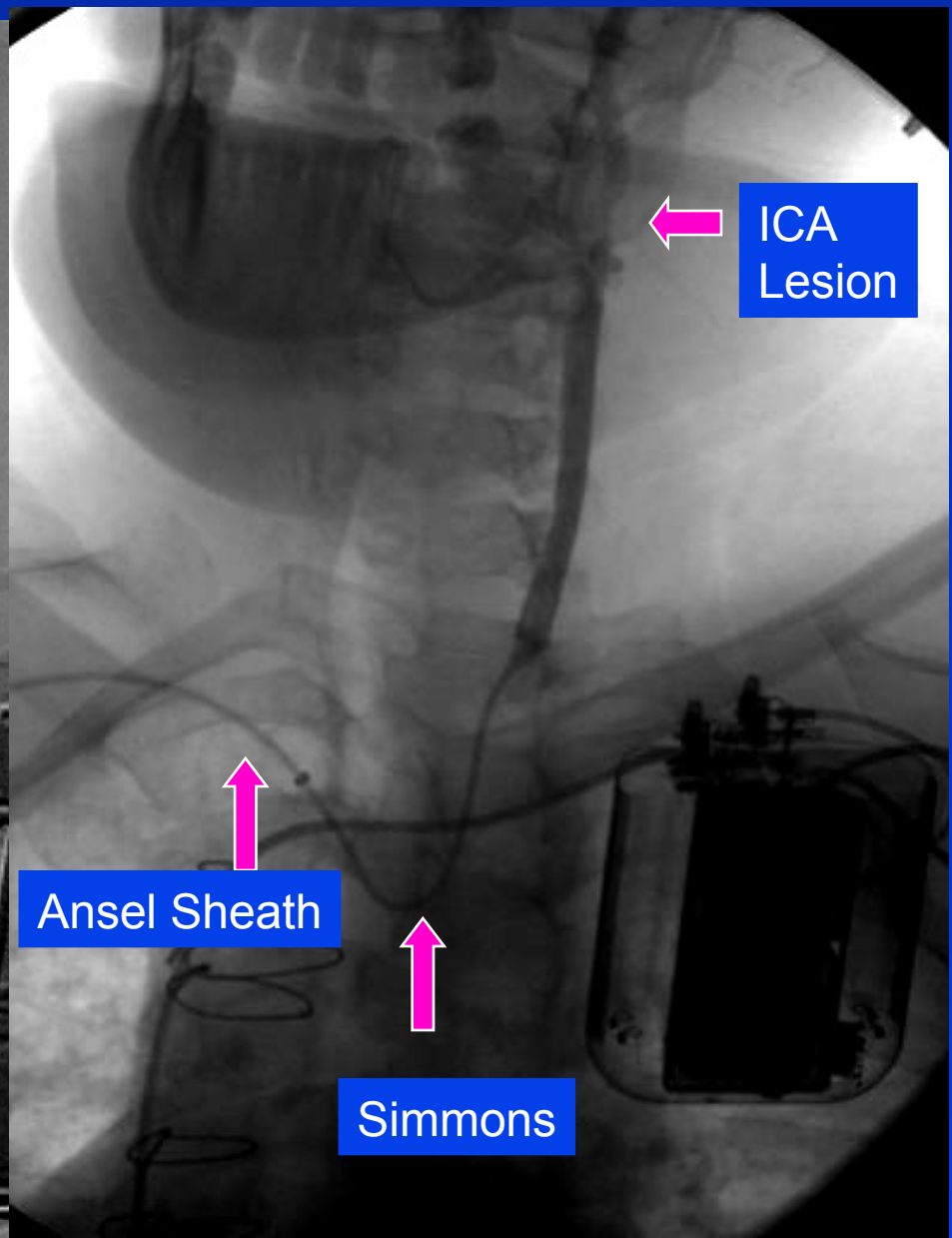
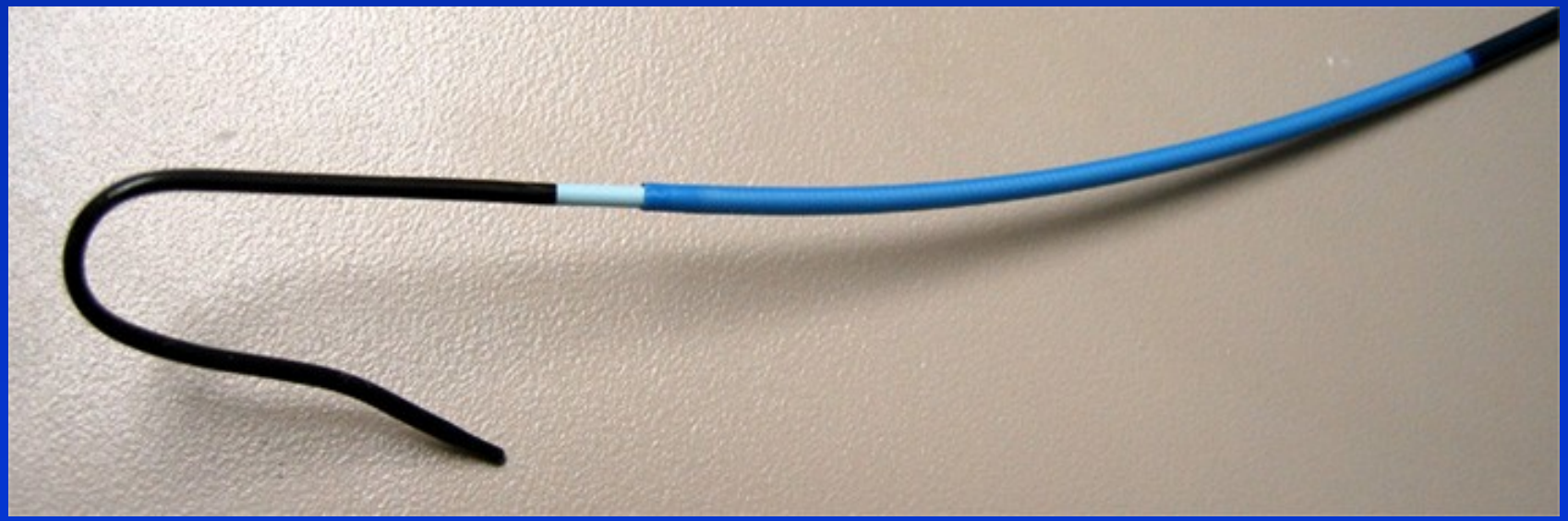
Brachial Approach in the Absence of Femoral Access. *Pt with bilateral AKA, 2 CABGs, Recent MI, Pending 3rd CABG*





5F Simmons 1 in 6 F Shuttle

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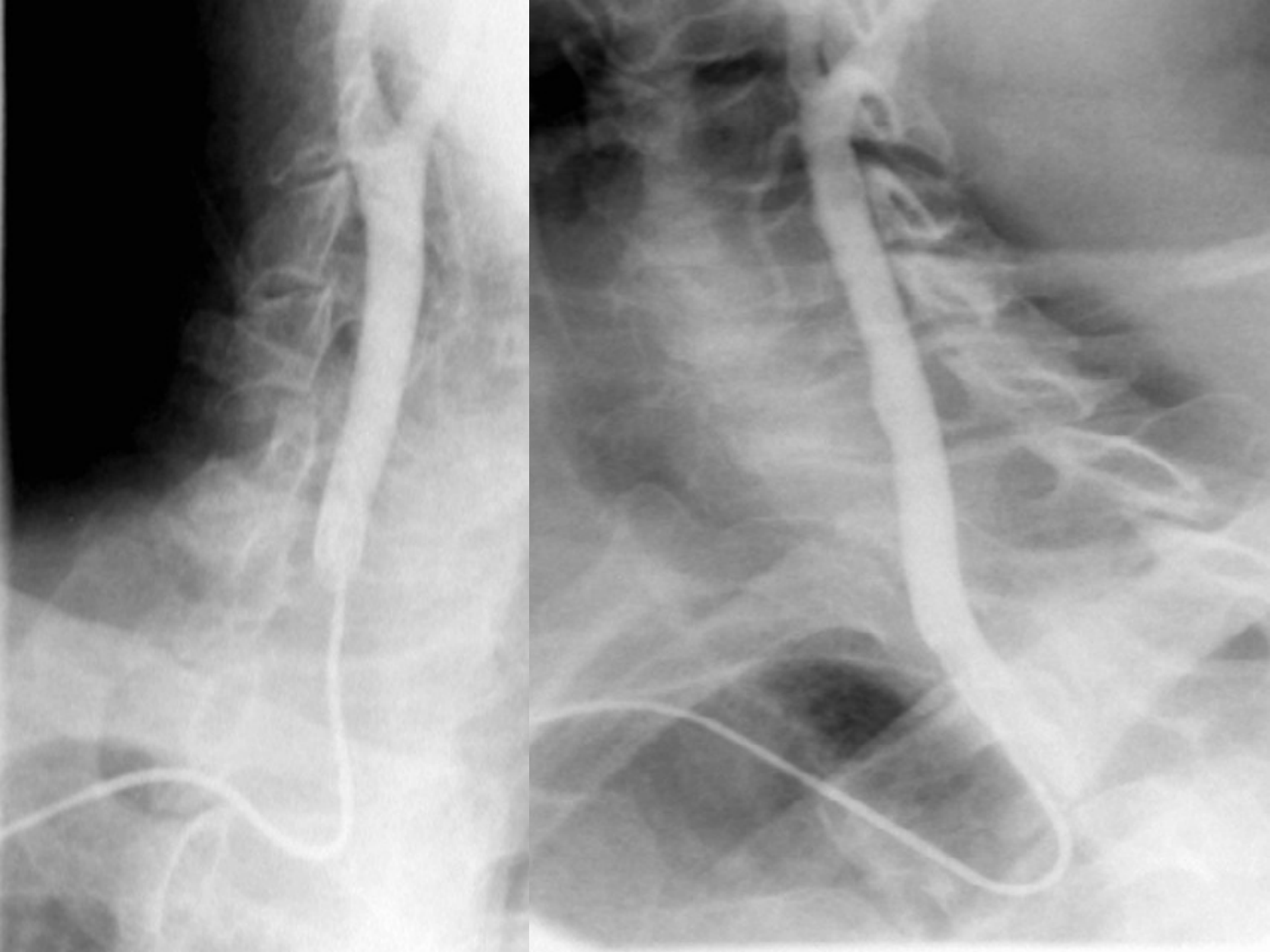
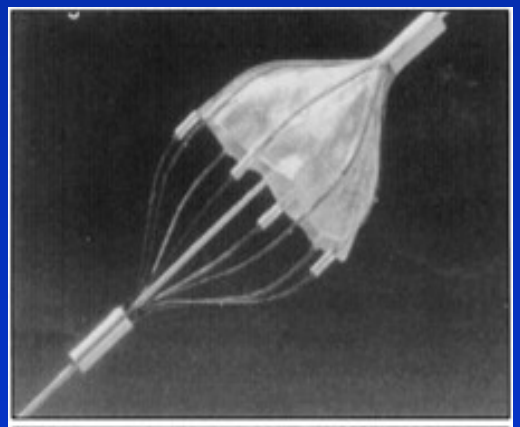
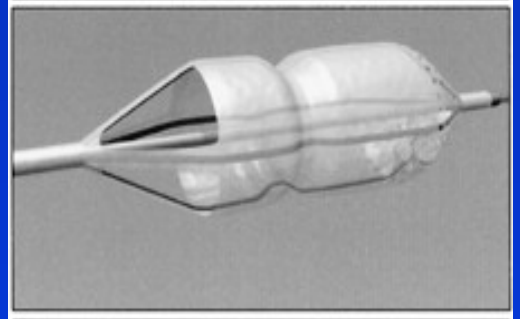
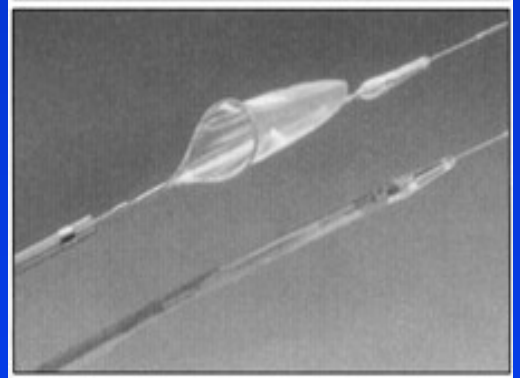


Emboli Prevention Devices

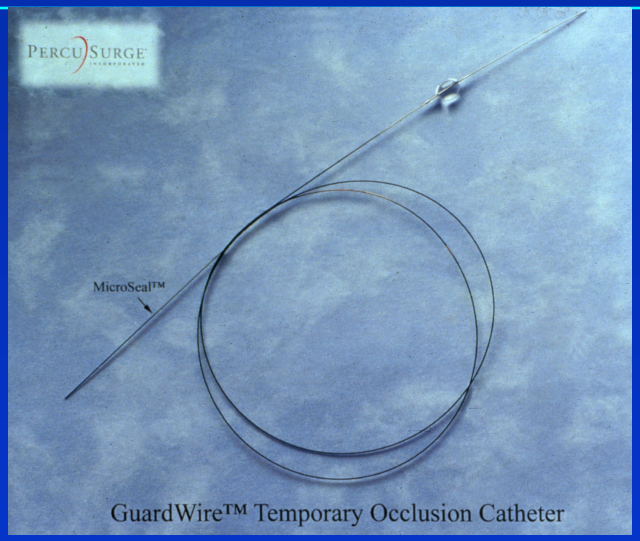
Filters



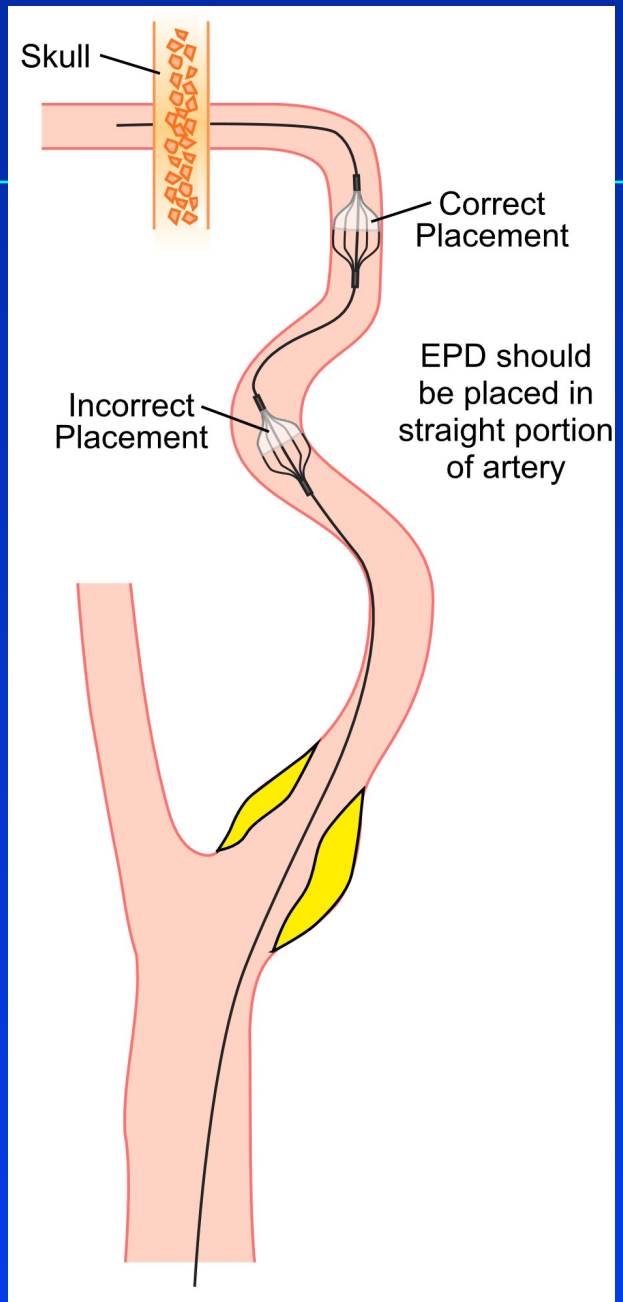




Occlusive



Proper Placement of EPDs



Emboli Prevention Devices

- Guide Support is Critical
  - Deployed EPD may be pulled down through lesion
- Distal tortuosity
- Less support and control
- Ischemic Intolerance with balloon occlusion – check for collaterals

Emboli Prevention Devices

- Filters may develop slow or no flow
- Particularly with soft, large plaques
- Do not immediately capture and withdraw filter
- Static column of blood with suspended particles that will embolize when filter is collapsed
- Aspirate with 125 cm 5 Fr MP catheter before capturing filter

Management of Filters with Slow Flow

Difficulty with Access and Crossing with Filter

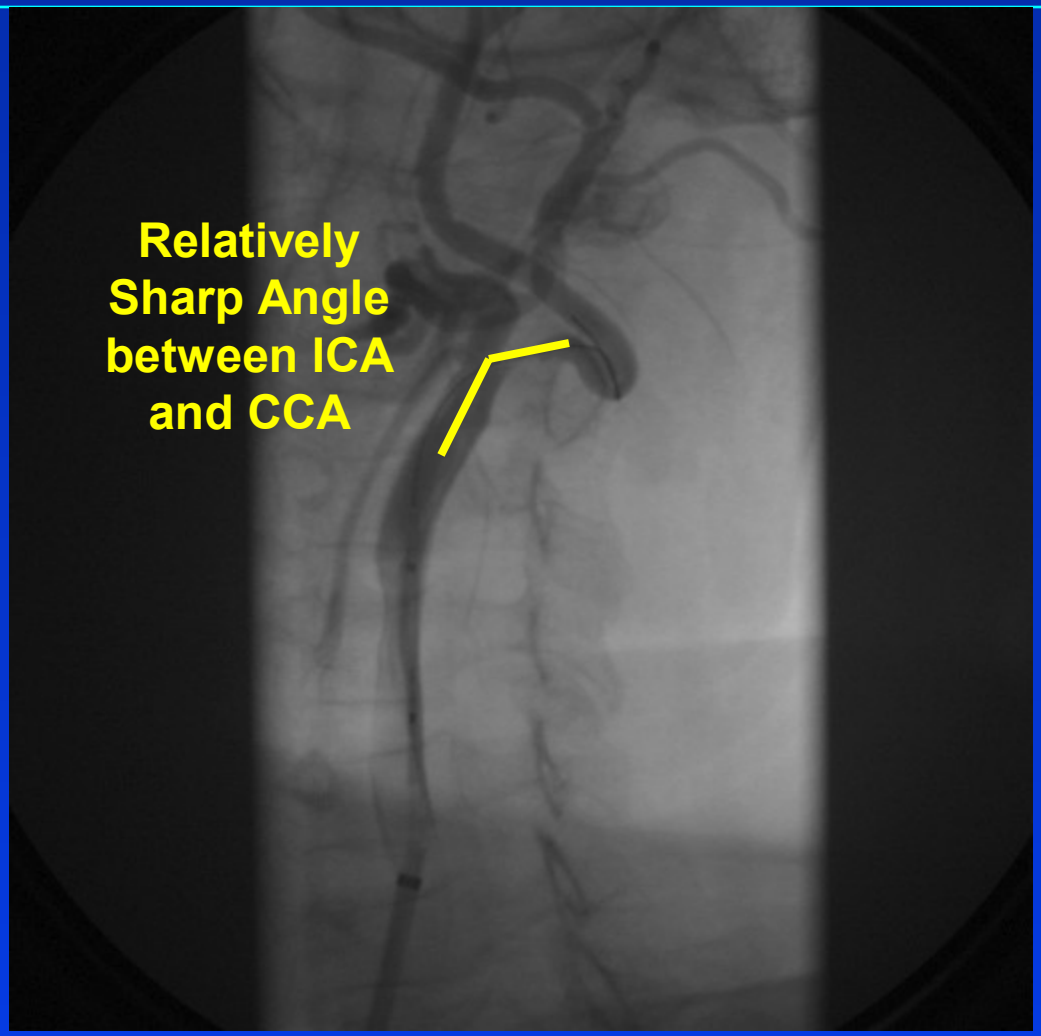
Issues Affecting Passage of Filter EPD in Tortuous Vessels

- Carotid Artery is fixed in position at the aortic arch and at the base of the skull. If one area is straightened, tortuosity or redundancy elsewhere will be worsened.
  - Common Carotid Artery
    - » Proximal Tortuosity will be transmitted to ICA if the proximal vessel is straightened by a sheath/guide
- Internal Carotid Artery
  - Angle of Takeoff of ICA from CCA
  - Calcification of ICA
  - Extra-cranial Tortuosity distal to origin

Issues Affecting Passage of Filter EPD in Tortuous Vessels

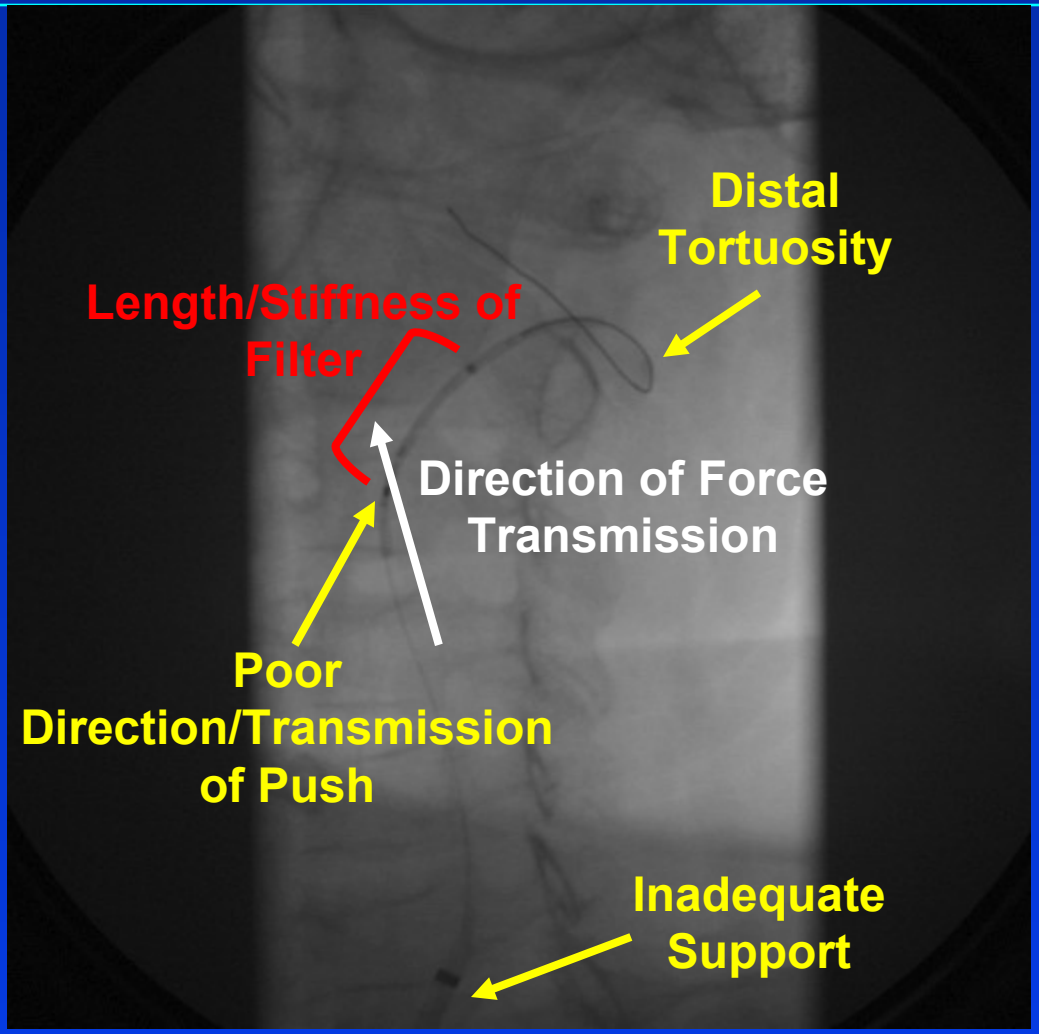
- Support
  - 8 Fr Sheath > 8 Fr Guide > 6 Fr Sheath
  - Guide may be able to direct EPD at better angle
- EPD – Filter of EPD is relatively inflexible. The length of the filter may adversely affect passage of EPD in tortuous ICA's.

Angle of Takeoff of ICA from CCA

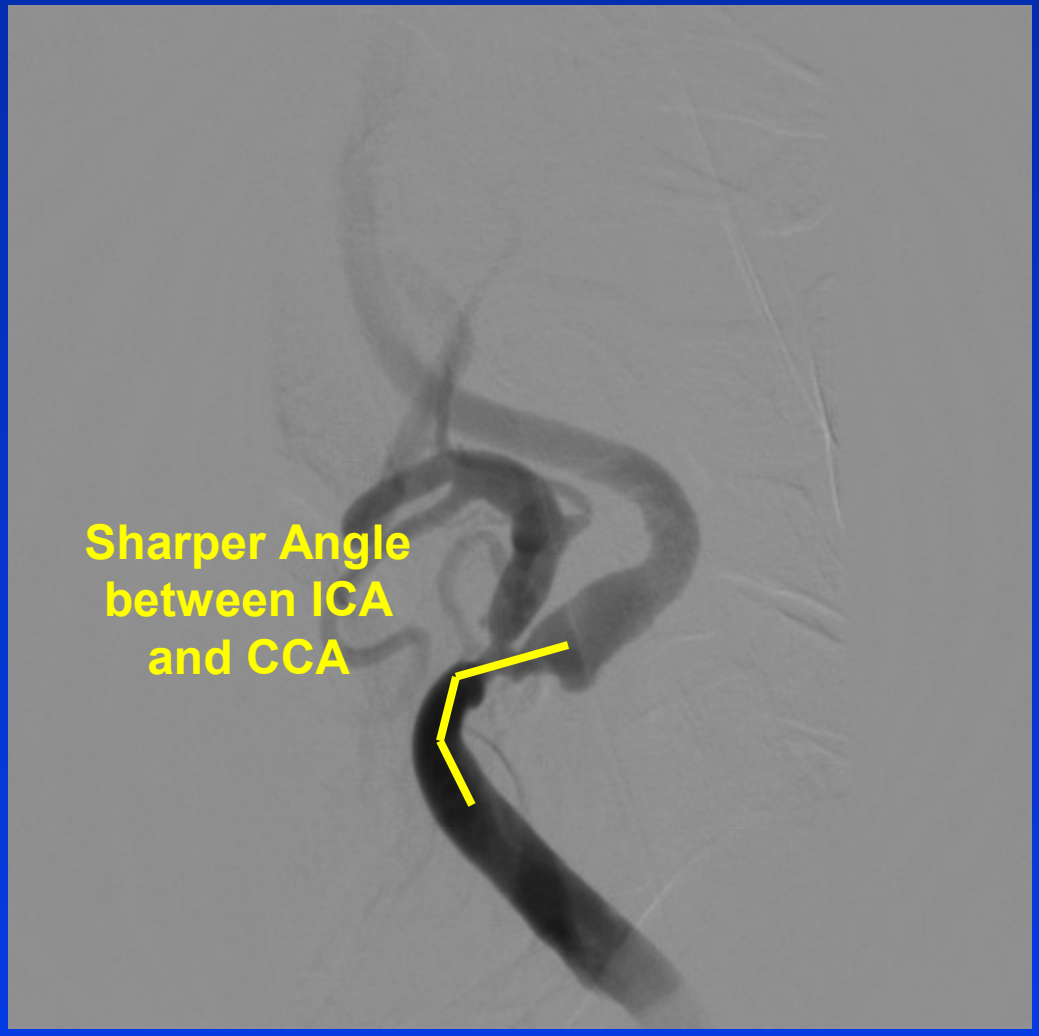


Analysis of Passage Failure

Analysis of Passage Failure

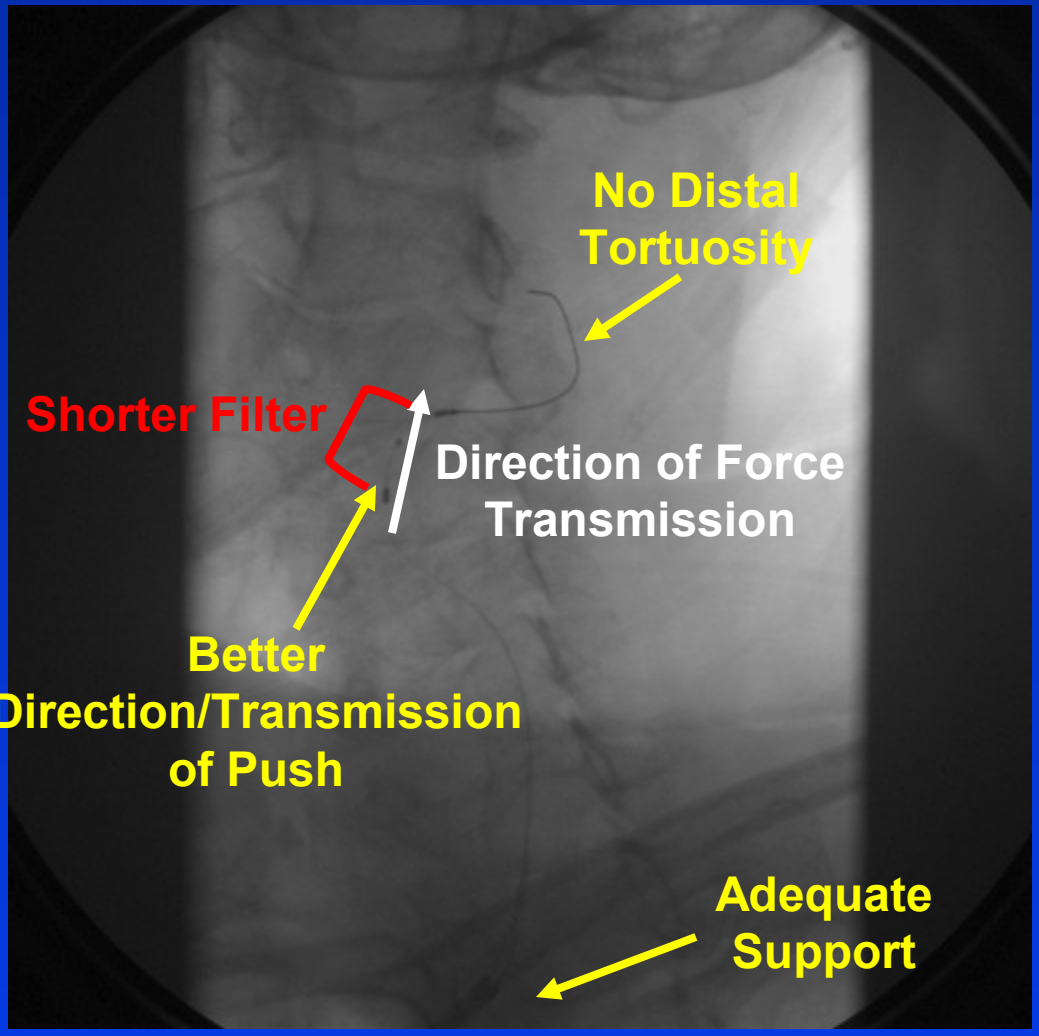


Sharp Angle / Tortuosity Example 2



Passage of EPD through ICA with Sharp Angle

Passage of EPD through ICA with Sharp Angle

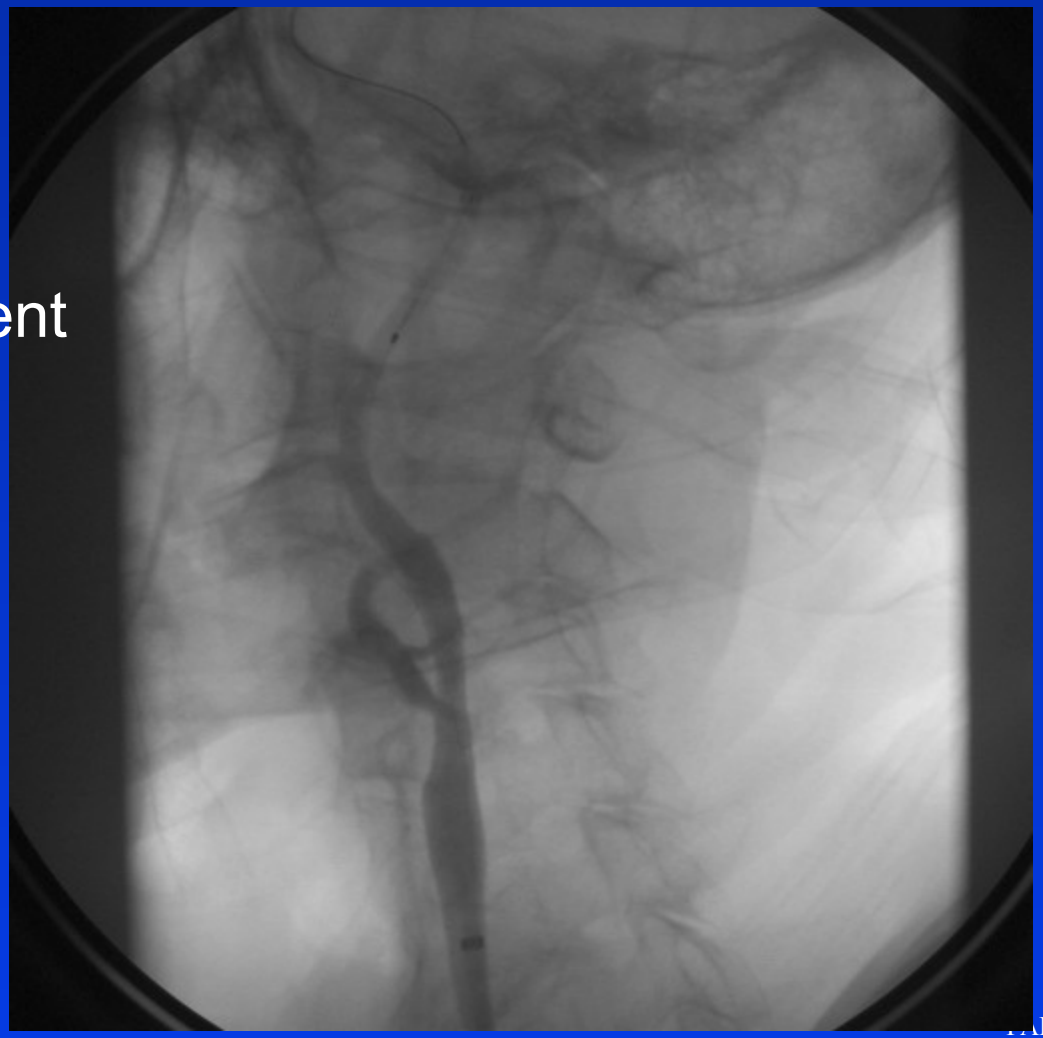


Issues Affecting Passage of Filter EPD in Tortuous Vessels

- Strategies
  - Use either 8 Fr Guide or 8 Fr Sheath for better support
  - Use EPD with better passage profile
  - Use buddy wire in either ECA or ICA
    - » Use 0.014 wire in ICA, 0.014-0.035 in ECA
    - » Buddy wires in ICA should improve angle and tortuosity without causing **pseudostenosis**. If pseudostenosis results, consider using less stiff wire as buddy or place in ECA.
  - As last resort, predilate (which changes angle, severity of stenosis, and compliance of ICA origin).

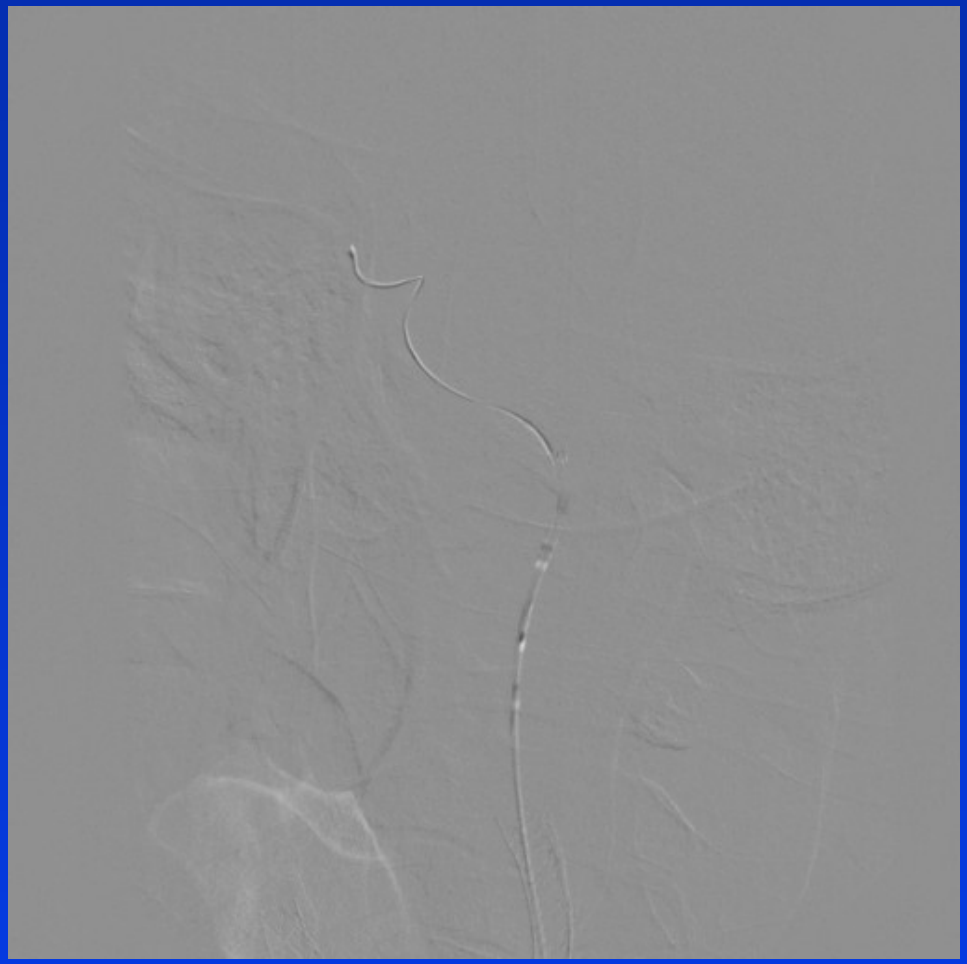
Severe LICA stenosis

- 8.0/40mm Acculink stent



EPD Retrieval: Cine Run

- Unable to retrieve Accunet Filter
- Discontinuity between filter and 0.014 inch wire
    - Wire moved independently of filter
- Repeated attempts to use retrieval sheath results in diffuse spasm and TIMI 0 flow



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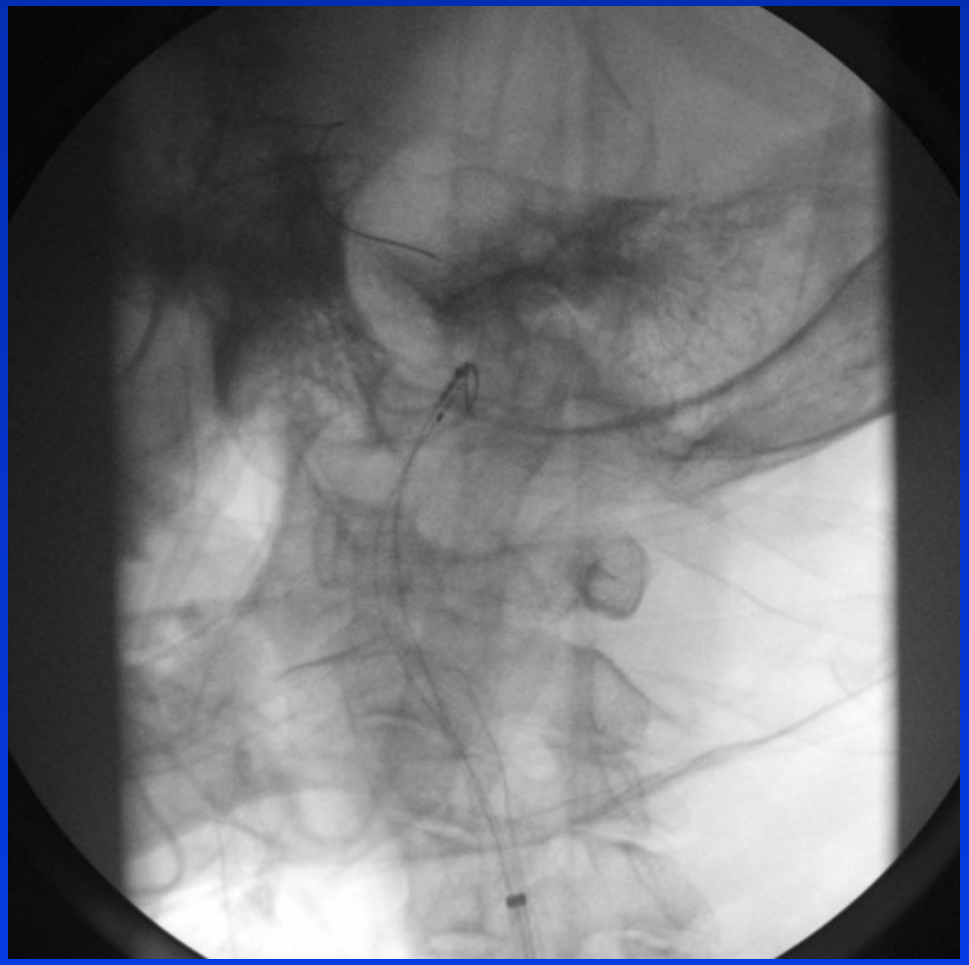
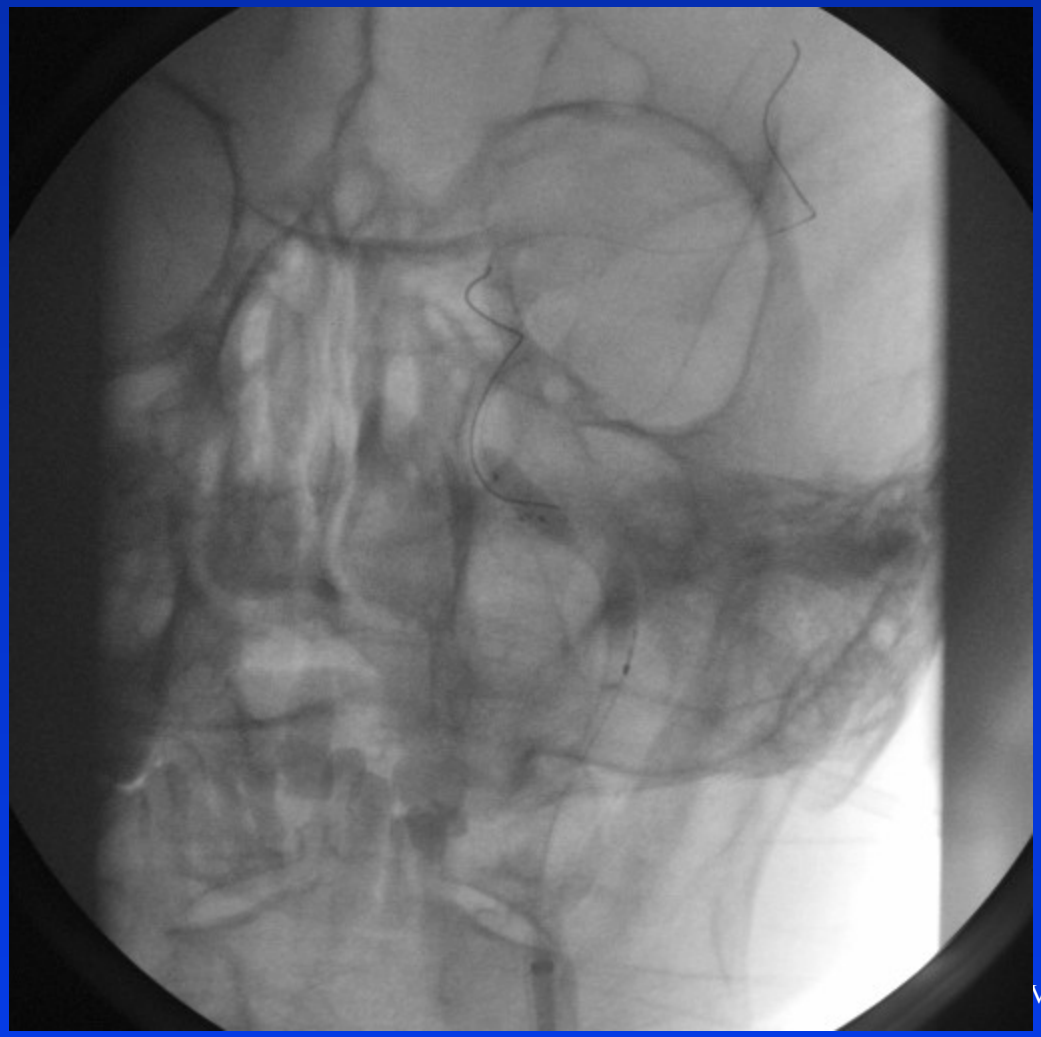
Attempt to Snare Filter

- 0.014 inch hydrophilic Whisper wire advanced distal to filter position
- Attempts to snare filter with 4mm and 5mm Microvena Gooseneck snare unsuccessful



Petrous Carotid Stent Deployment

- 4.0/8 Vision stent

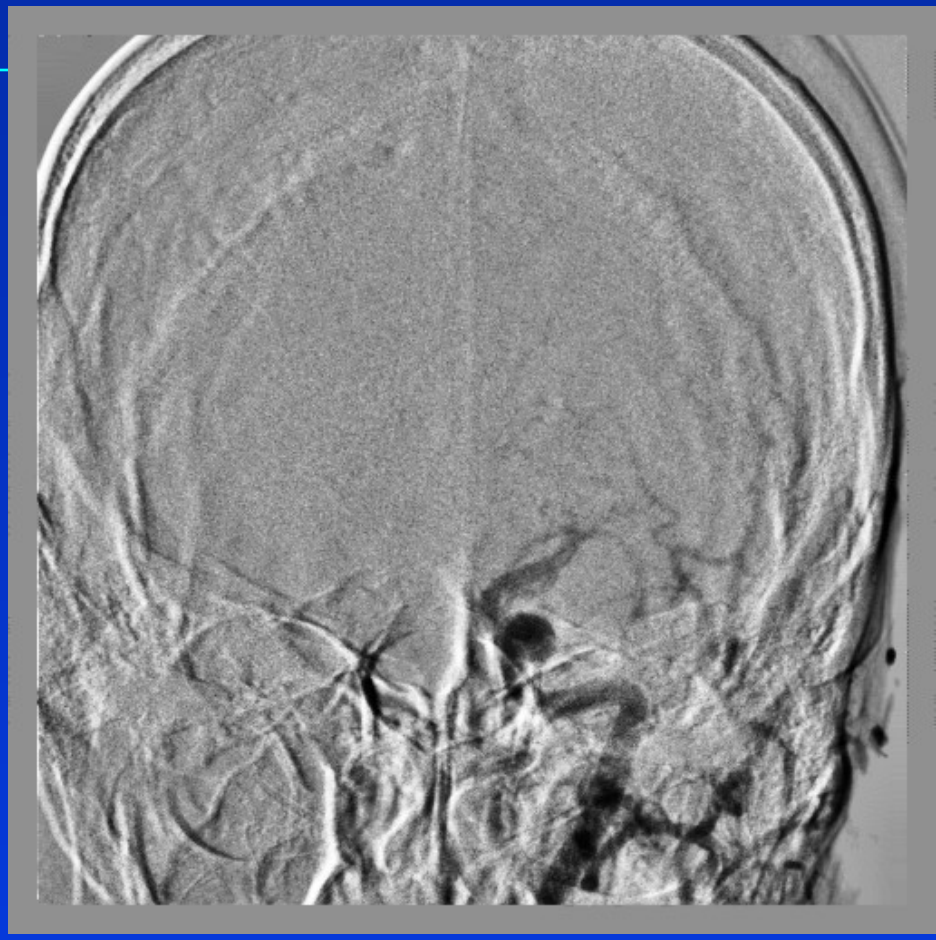


Cerebral Angio: Left hemisphere

Rapid Execution

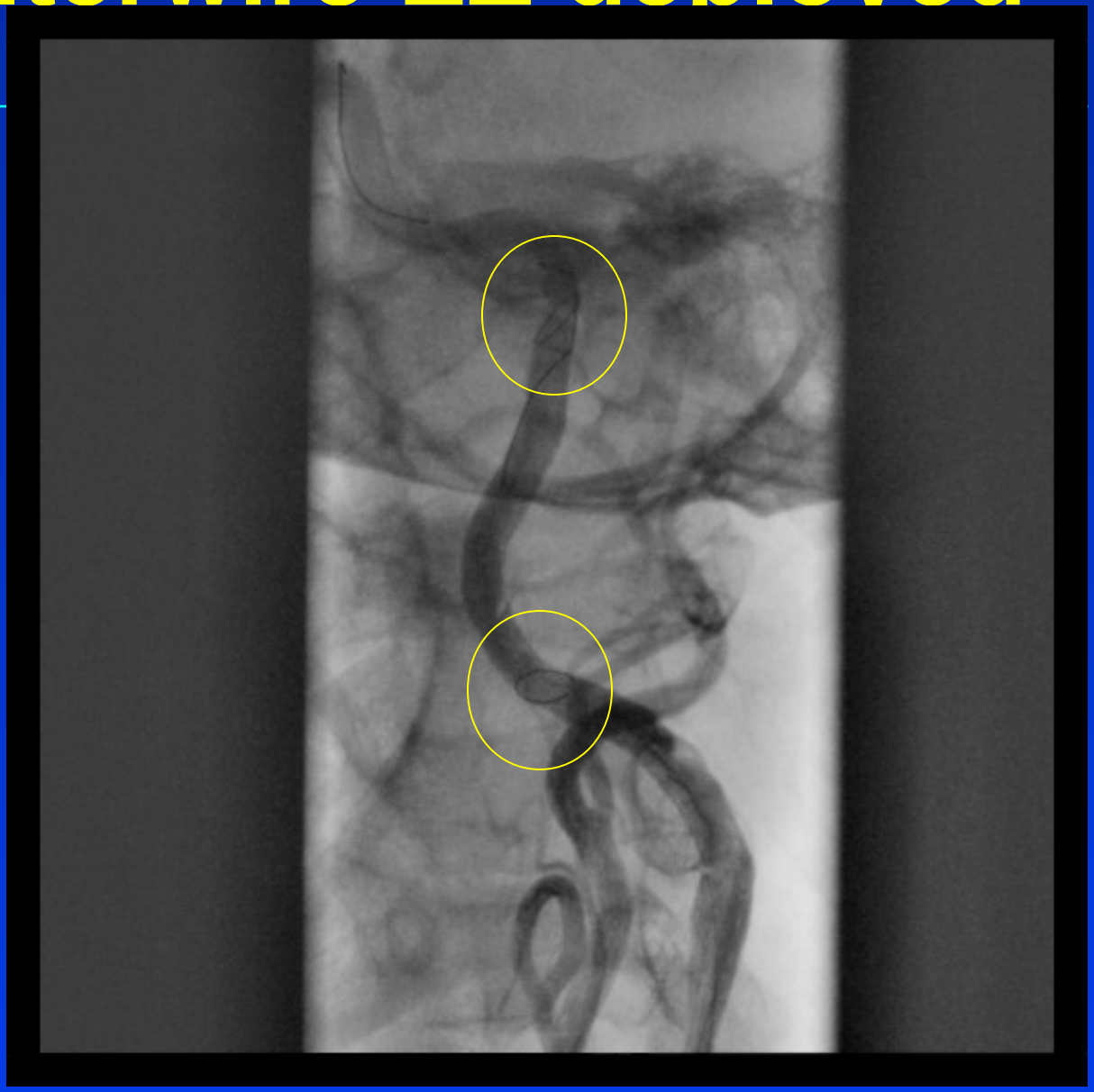
Prolonged Filter Dwell Times associated with Increased Risk of Stroke

LICA



- LICA with severe disease and does not fill L hemisphere

2nd filterwire EZ deployed



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LICA final

LICA intracranial final

- Left ACA and MCA now fill from LICA

Double Filter Technique

Distal Filter

Proximal Filter

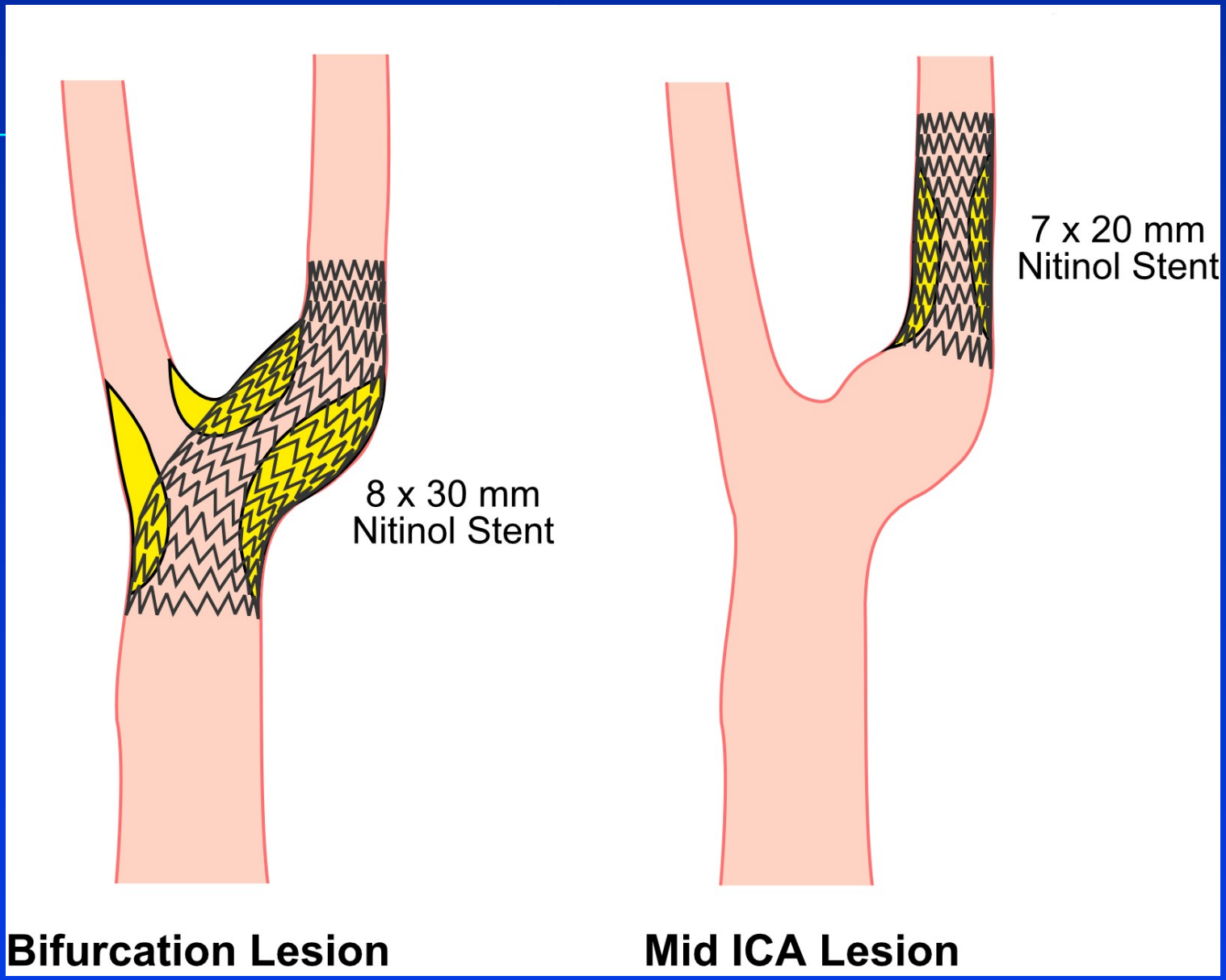
Pre-dilatation

- .014 wires
- Pre-dilatation (2mm balloon) for passage of emboli prevention device
- 4 x 30 mm vs 4 x 20 mm balloons
- Duration of pre-dilatation, long vs short
- Obtain large enough lumen for stent passage without resistance
- No pre-dilatation in certain lesions

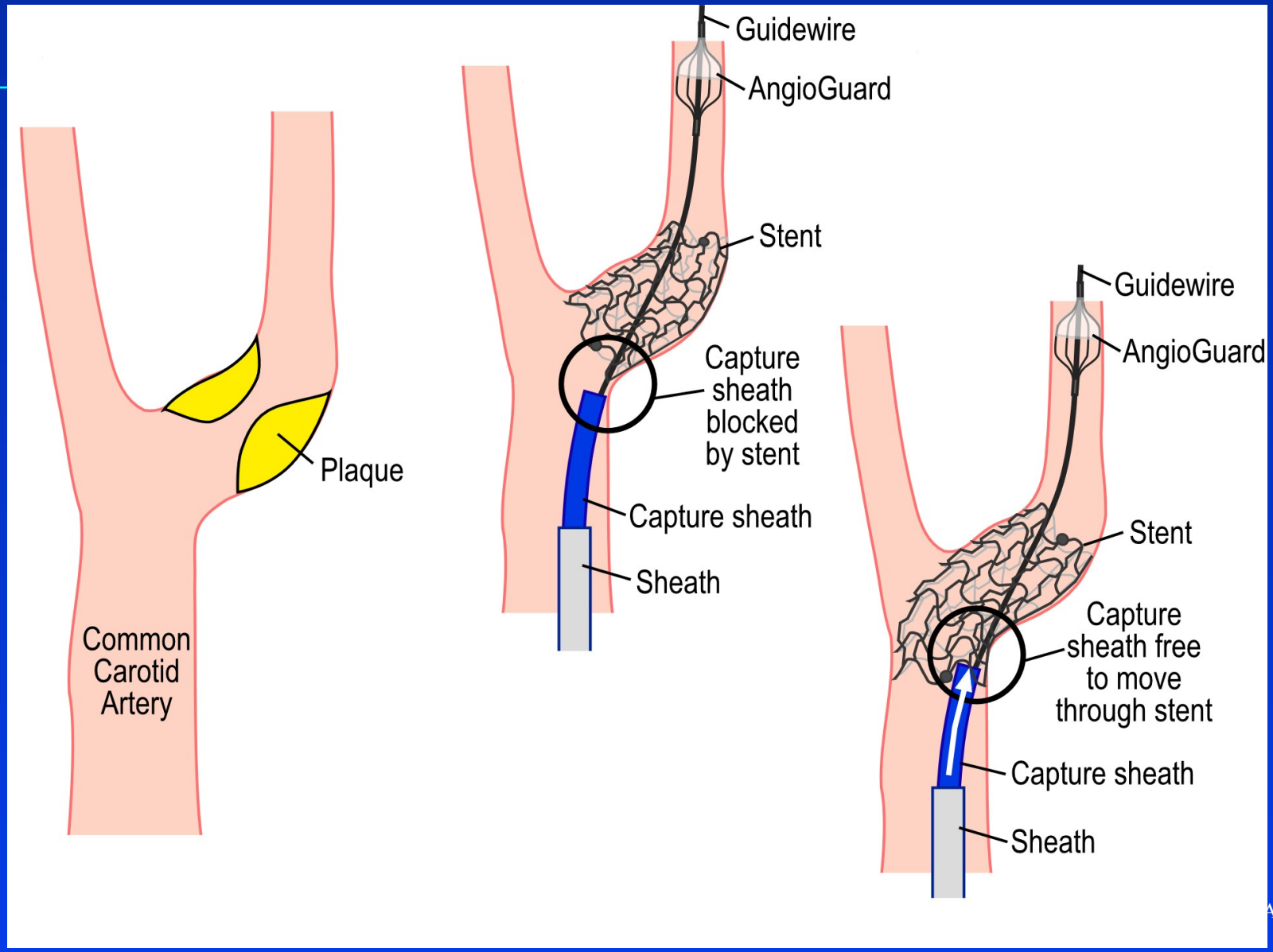
Balloons and Stents

- **Pre-Dilatation:**
  - Monorail Coronary Balloons
- **Post-Dilatation:**
  - Monorail Peripheral Balloons
  - Viatrac (Guidant), Aviator (Cordis)
- **Stents**
  - Precise (5.5 Fr or 6 Fr)
  - Wallstent (monorail, 5.5 Fr)
  - Acculink (6 Fr)
  - Exact (6 Fr)

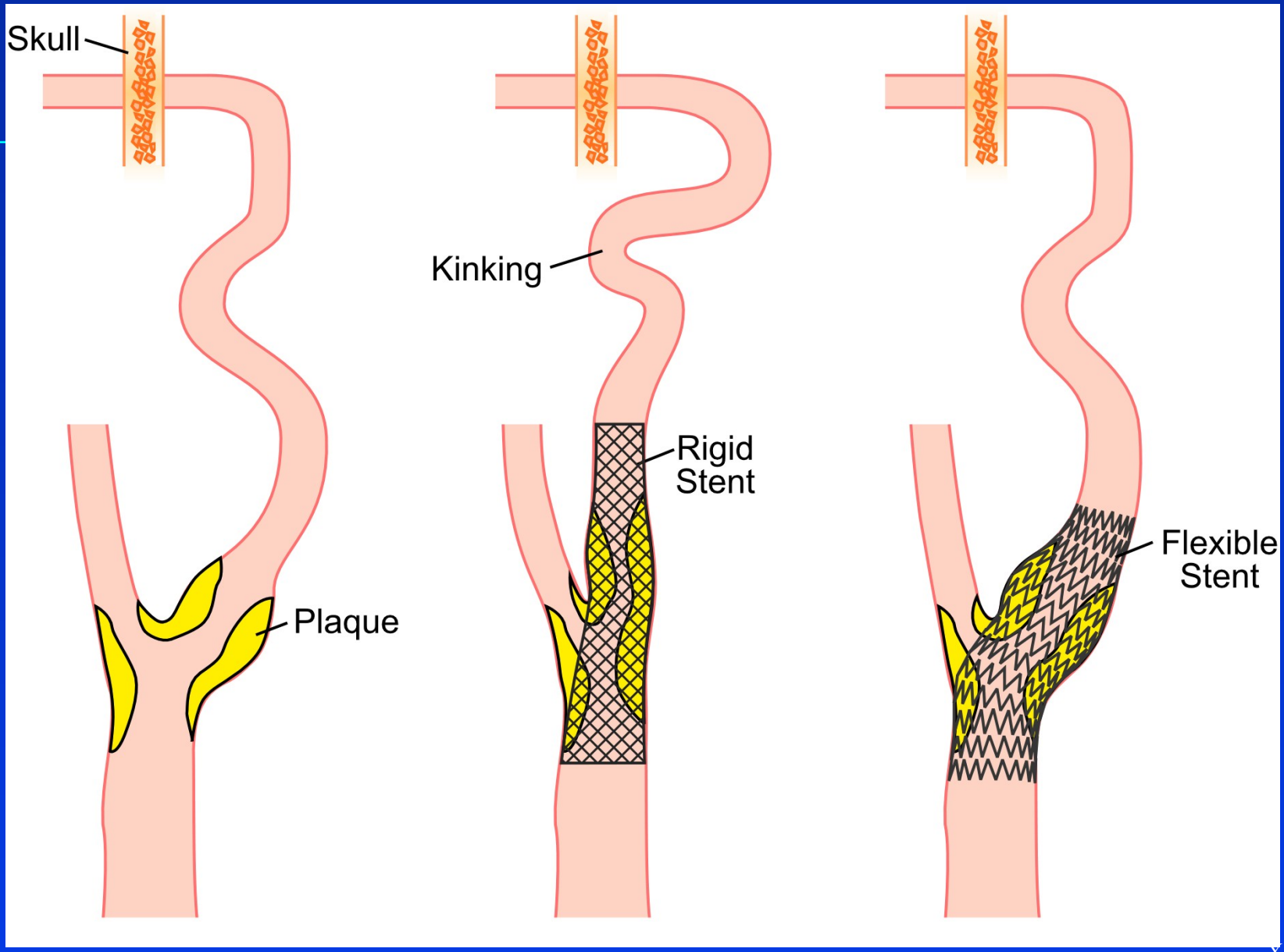
Proper Sizing and Placement of Nitinol Stents



Proper Placement of Nitinol Stents in the Bifurcation to Allow Ease of Stent Recrossing



Effect of Stent Type on Kinking of The ICA



Post-dilatation

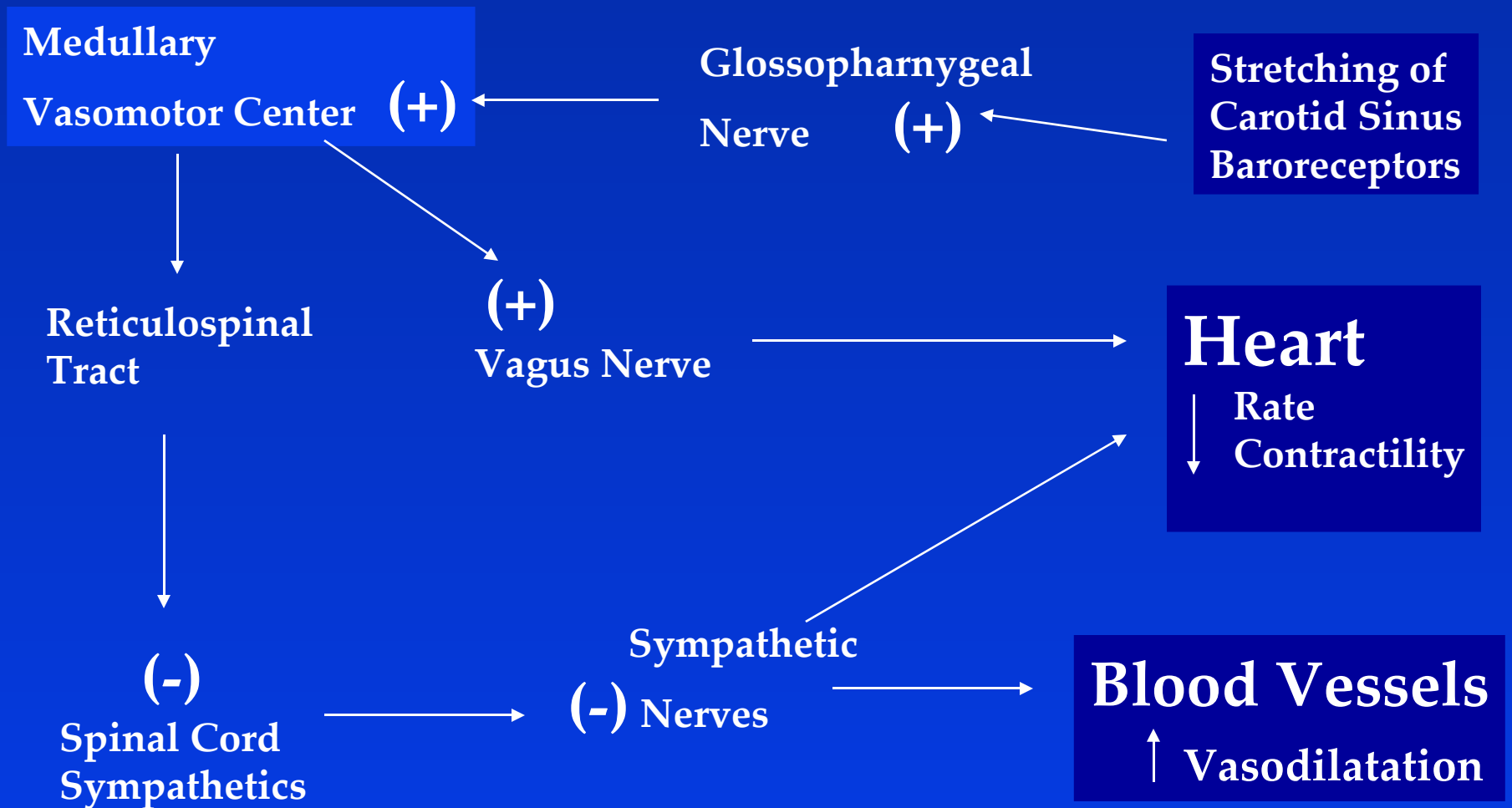
- Size of balloon – 5.5 or 6 mm
- How much residual stenosis is acceptable?

CAROTID SINUS REFLEX
Special Situations

- Critical AS
- Severe 3 VD or L Main
- Severe LV Dysfx , i.e. pre-heart tx

- Pulmonary Artery Catheter
- Lower threshold for temporary pacer

Carotid Sinus Reflex



CAROTID SINUS REFLEX

- ADEQUATE IV (18) ACCESS
- OPTIMIZE VOLUME STATUS
- Continuous ECG and BP
- Atropine, Norepinephrine, pseudoephedrine
- 6F venous sheath only rarely
- Temporary pacing is rarely needed

Conclusions

- Careful Pre-Procedure Evaluation
- 2 days of ASA/Clopidrogel pre and at least 2 weeks post
- Variety of Access Techniques
- Understand various EPDs
- Proper EPD and Stent Placement
- Carotid Sinus Reflex management
- Hyperperfusion Dx and Management