Technique Of Carotid Stenting

Decision Making Analysis To Overcome Challenges

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Presenter Disclosure Information

Name: Subbarao Myla, MD

Within the past 12 months, the presenter or their spouse/partner have had the financial interest/arrangement or affiliation with the organization listed below.

Company Name:	Relationship:
• Johnson & Johnson	Research Grant/Speaker
• Guidant	Research Grant/Speaker
• Boston Scientific	Research Grant/Speaker
•Abbott	Research Grant/Speaker
•Enotex	Research Grant/Speaker
•EV3	Research Grant/Speaker

Critical Decision Making

- Carotid Access Issues
- **Carotid Filter Issues**
- **Carotid Stent Issues**
- Neuro Rescue

Carotid Access

- Can I Safely Get There?
  - CCA Access
- Can I Safely Get There?
  - Distal Protection Device into ICA

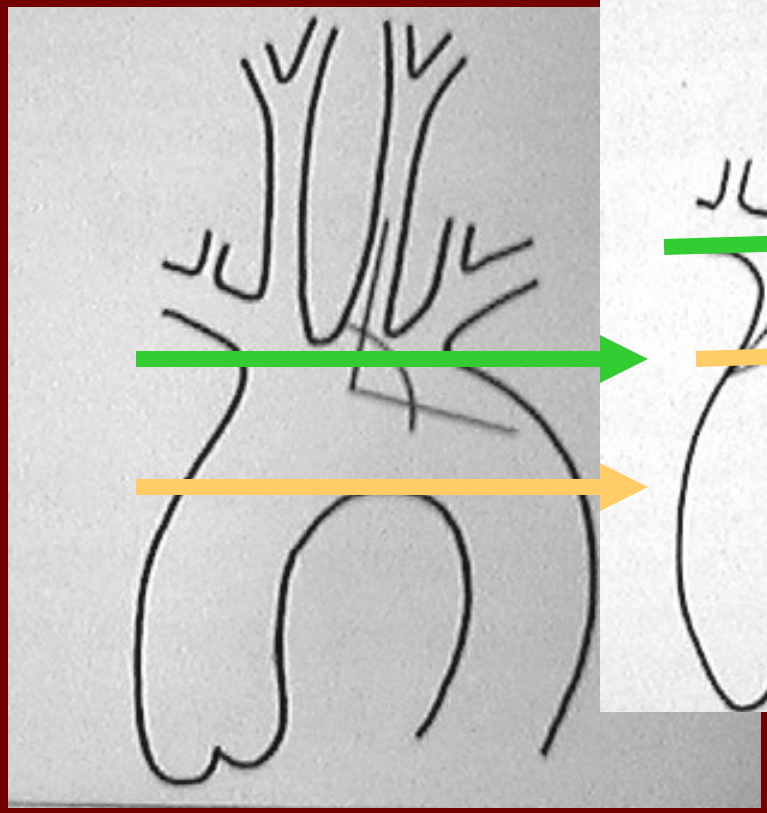
Critical Issues

- Which Carotid Access Technique?
  - Front Loading Telescopic Technique
  - Back Loading Serial Stiffening Technique
  - TAD Wire Method
  - Remote Carotid Access

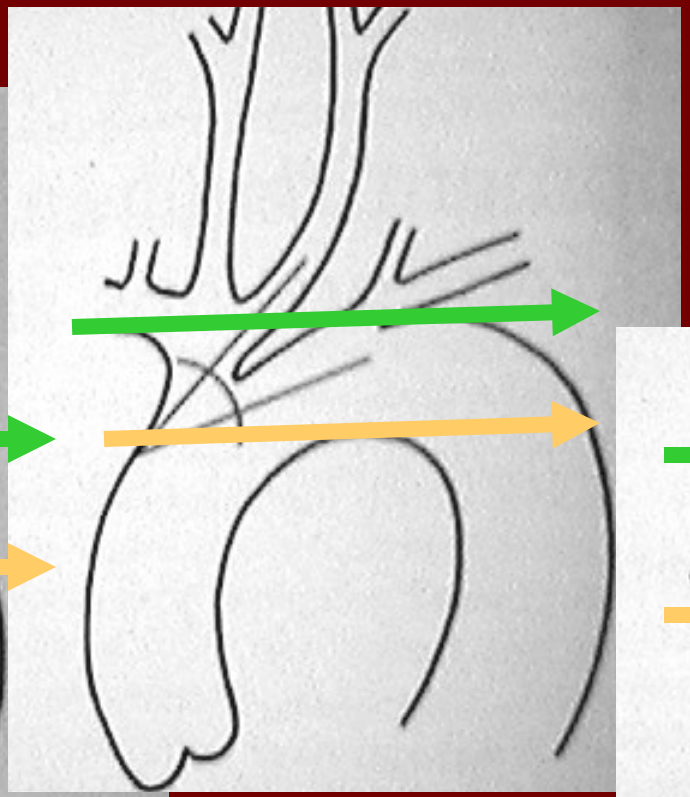
Carotid Access Determinants

- Aortic Arch Type
- CCA/ECA Disease
- Carotid Tortuosity

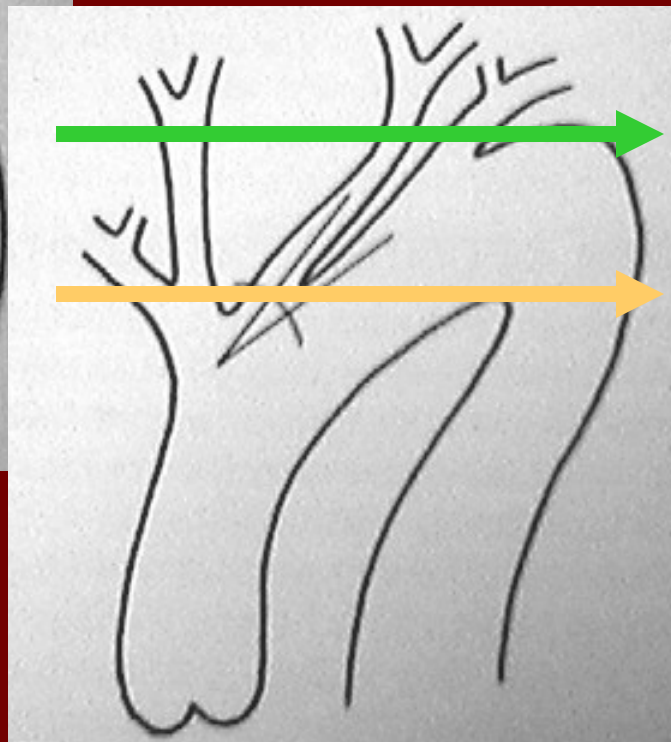
Arch Types (Myla 1996)



Type I Arch



Type II Arch



Type III Arch

Aortic Arch

- Need to visualize the arch
  - Assess the Arch Type
    - Type I
    - Type II
    - Type III
  - Arch Disease
    - Ulceration
    - Atheroma
  - Arch Anomalies
  - Ostial Stenosis

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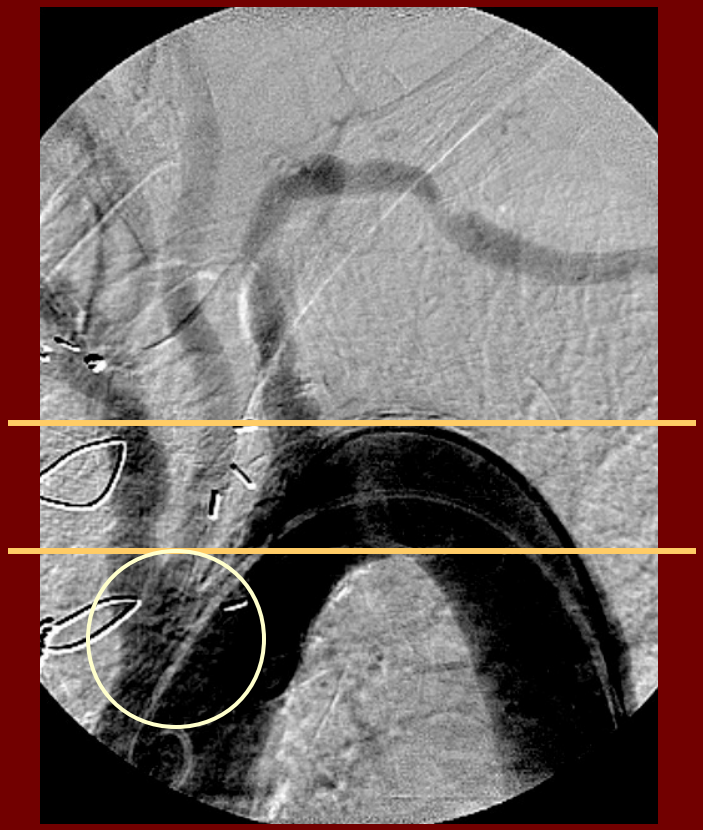

Aortic Arch

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  - Assess the Arch Type
    - Type I
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  - Arch Disease
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Carotid Access Determinants

- Aortic Arch Type
  - Type I Arch
    - Telescopic Method_Cook Shuttle Select
  - Type II Arch
    - Serial Stiffening Method_SM2 Supracore_Shuttle
  - Type III Arch
    - Remote Access_Vitek_8F JCL 3.5

Carotid Access Determinants

- CCA/ECA Disease
  - **Type I Arch**
    - **Simple Lesion**
      - **TAD Wire method**
    - Complex Lesion
      - 0.038 Stiff Angled Glide in CCA method
  - **Type II Arch**
    - **0.038 Stiff Angled Glide/Nitrex Wire method**
  - Type III Arch
    - Remote Access with Guide catheter

Carotid Access Determinants

- Carotid Tortuosity
  - Type I Arch
    - Telescopic access
    - Serial Stiffening Method
  - Type II Arch
    - Serial Stiffening Method
    - Remote Access
  - **Type III Arch**
    - **Avoid Them**
    - Direct Carotid Stick
    - Remote Carotid Access

Critical Issues

- **Should I Choose Guide Catheter or Guide Sheath?**
- Should I Keep Guide C/S In distal CCA or proximal CCA?
- **When do I choose large size Guide C/S?**

Critical Issues

- Should I Choose Guide Catheter or Guide Sheath?
  - Individual Preference
    - GC more stable allows torque
    - GS smaller size smoother transition (No ledge effect)
  - **Carotid Tortuosity**
    - **GC allows torque**
  - Remote carotid access
    - GC More stable

Critical Issues

- When do I choose large size Guide C/S?
  - Usual Sizes
    - Guide Sheath 6F Larger Size 7F
    - Guide Catheter 8F Larger Size 9F
  - **Large Sizes**
    - **Anticipate Buddy wires**
      - **Carotid Tortuosity**
    - **Beginner**
      - **Avoid air embolism**
      - Allow contrast injection for precise device placement

Carotid Filter Issues

- **Should I Pre-dilate Before Filter Placement?**
- **What to do with slow Flow/occlusion in a filter?**
  - **Is this Filled Filter?**
  - **Is this carotid Spasm?**
- What is happening at the filter site?
  - Is this Spasm, Kink or dissection?
- **What do to when the retrieval sheath fails to advance?**
- **How to Handle a detached filter?**

Carotid Filter Issues

- What to do when filter doesn't Advance?
  - Poor guide support
  - Carotid tortuosity
  - Severe stenosis
  - Large filter
  - Sharp entry angle
  - Sharp exit angle

Internal Carotid Artery

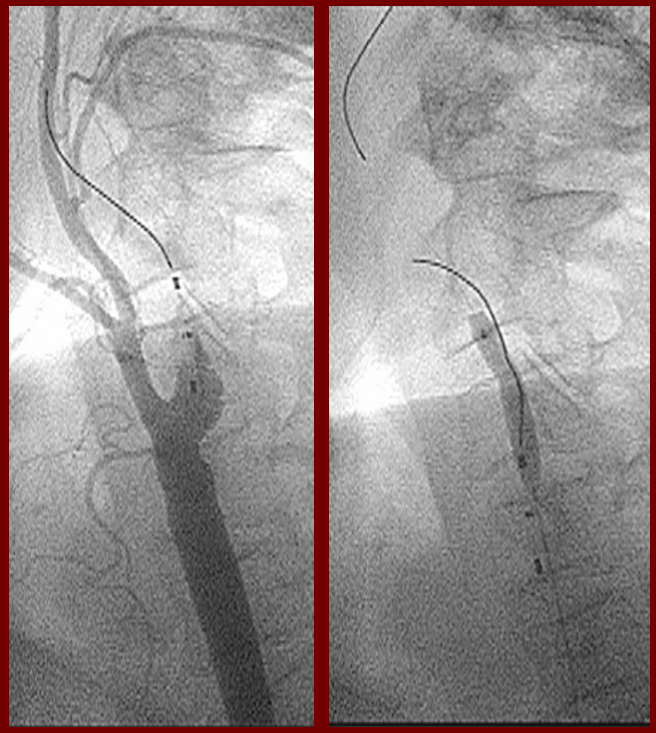
- **Sharp Entry angle**
- Sharp Exit angle
- Distal ICA bends
- Distal ICA kinks
- Distal ICA loops
- FMD
- Arteriosclerosis
- Aneurysm

Internal Carotid Artery

- Sharp Entry angle
- **Sharp Exit angle**
- Distal ICA bends
- Distal ICA kinks
- Distal ICA loops
- FMD
- Arteriosclerosis
- Aneurysm

Carotid Filter Issues

- What to do when filter doesn't Advance?
  - Solutions
    - Power Guide support
    - Pre-dilatation
    - Buddy Wire
    - Buddy Catheter
    - Bare wire/Spyder
    - Percusurge
    - Proximal Protection



Carotid Filter Issues

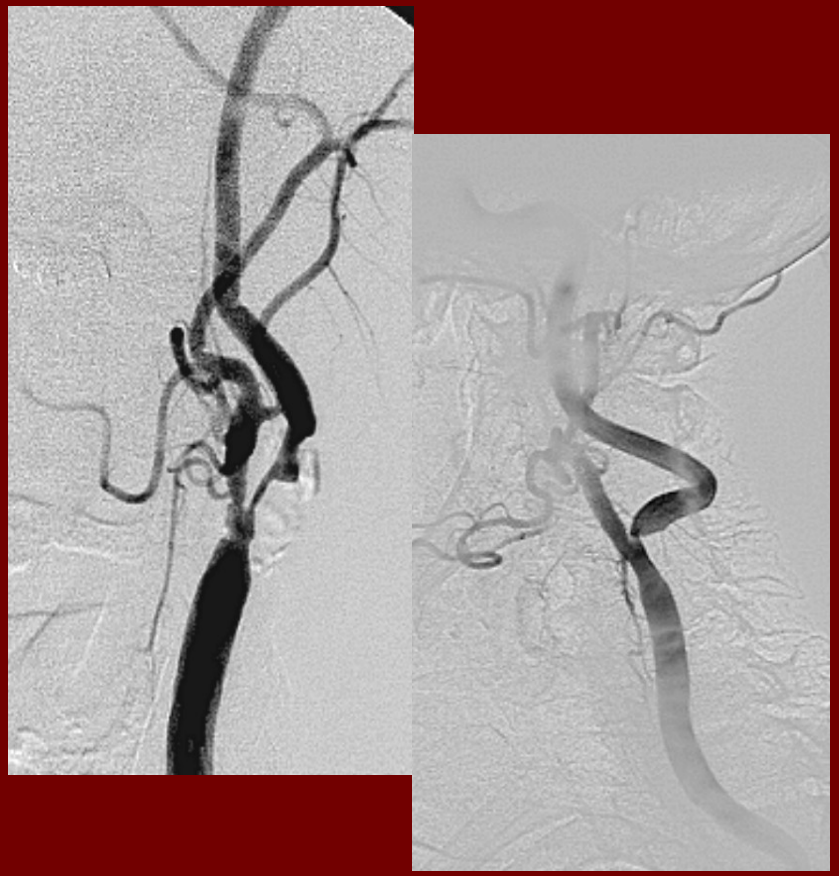
- Should I Pre-dilate Before Filter placement?
  - Carotid Tortuosity
    - **Fixed Wire Filters**
      - **Pre-dilate severe stenosis**
      - **Reduces friction during filter travel**
    - Bare Wire Filters
      - No need to pre-dilate
    - In situ Wire Filters (Spyder)
      - No need to pre-dilate

Carotid Filter Issues

- Should I Pre-dilate Before Filter placement?
  - Carotid Lesion Severity
    - **Pre-dilate for subtotal occlusions**
      - Segmental
      - Long lesions
      - String signs
    - No need to pre-dilate
      - Short
      - Focal subtotal occlusions

Carotid Filter Issues

- Should I Pre-dilate Before Filter placement?
  - **Carotid Complex Lesion Morphology**
    - Sharp Entry Angle
    - Sharp Exit Angle
    - Absent clear path through Lesion



Carotid Filter Issues

- Should I Pre-dilate Before Filter placement?
  - Carotid Filter Profile
    - **Large Bulky Filters**
      - **Pre-dilate**
    - Small Filters
      - No need to pre-dilate

Carotid Stent Issues

- **Should I Pre-dilate Before Stent placement?**
- What Stent Dimensions Should I Choose?
- **Should I Post Dilate After Stent Placement?**

Carotid Stent Issues

- Should I Pre-dilate Before Stent placement?
  - Carotid Stent Profile
  - Carotid Lesion Severity
  - Carotid Tortuosity
  - Operator Experience
  - Carotid Lesion Complex Morphology
    - Sharp Entry Angle
    - Sharp Exit Angle
    - Heavy Calcification

Carotid Stent Issues

- Should I Post Dilate After Stent Placement?
  - Objectives
    - Minimal Final lumen diameter
    - Safe retrieval of DPD
    - Avoid Stent migration

Carotid Stent Issues

- Should I Post Dilate After Stent Placement?
  - Carotid Stent Type
    - Closed Cell Design
    - **Open Cell Design**
  - Carotid Lesion Type
    - Heavily Calcified
  - Residual Lesion severity
    - Large residual

Carotid Landing Zone Issues

- What to do with Inadequate Landing Zone?
  - Can this be modified?
    - Buddy wire
    - BareWire
    - More proximal placement of Guide sheath in CCA to relax the vessel
    - PTA/stenting of stenosis
  - No
    - CEA
    - Proximal Protection
    - Unprotected stenting

Carotid Filter Issues

- What to do with slow flow/occluded Filter?
  - Are Filter Dots Closed?
    - Yes
      - Carotid Spasm
      - Give Nitro
    - No
      - Filter slow flow due to emboli
      - Retrieve Filter

Carotid Filter Issues

- What to do with slow flow/occluded Filter?
  - Angioguard/Rubicon/Filterwire/Accu net
    - Filling defect below filter dots
      - Aspirate with Percusurge Export
      - Close Filter
    - Filling defect above filter dots
      - Close filter and remove
    - Incidence
      - Slow flow 10- 20%
      - Aspiration 2-5%

Carotid Filter Issues

- What to do when Retrieval sheath doesn't advance?
  - Anatomical Adversity Issues
    - Carotid Tortuosity
    - Sharp Lesion Angles
    - Guide wire bias
    - Inadequate post dilatation
    - Open cell stent design with "gater backing"
    - Calcified lesion

DPD Retrieval Catheter Issues

- Retrieval Catheter (RC)
  - Close Cell vs. Open Cell Design
  - Carotid Adverse Anatomy
    - Tortuosity
    - Sharp Lesion Angle
    - Heavily Calcified Lesion
    - Significant Residual Lesion
  - RC Design
    - Coaxial System
    - Single Stiff catheter
    - Single Soft Catheter

DPD Retrieval Catheter Issues

- Retrieval Catheter (RC)
  - Closed Cell stent
    - Least Problems
    - Neutralizes anatomical adversity
  - Open cell stent
    - Worst Problems
    - Single Stiff Recovery Catheter
    - Anatomical Adversity

Carotid Filter Issues

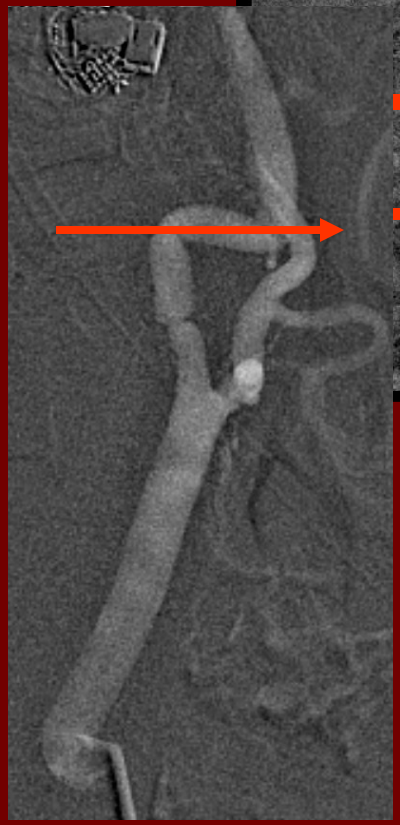
- What to do when retrieval sheath doesn't advance?
  - Don't panic and pull on filter!
  - Neck rotation
  - Advance sheath distally
  - Neck compression
  - Bent tip retrieval sheath
  - Buddy-wire
  - Additional balloon dilatations

Filter Detachment

- RC Catheter advancement problem
- Filter slides down and impinges on stent
- Guide catheter prolapse into Aorta pulls Filter down

Filter Detachment

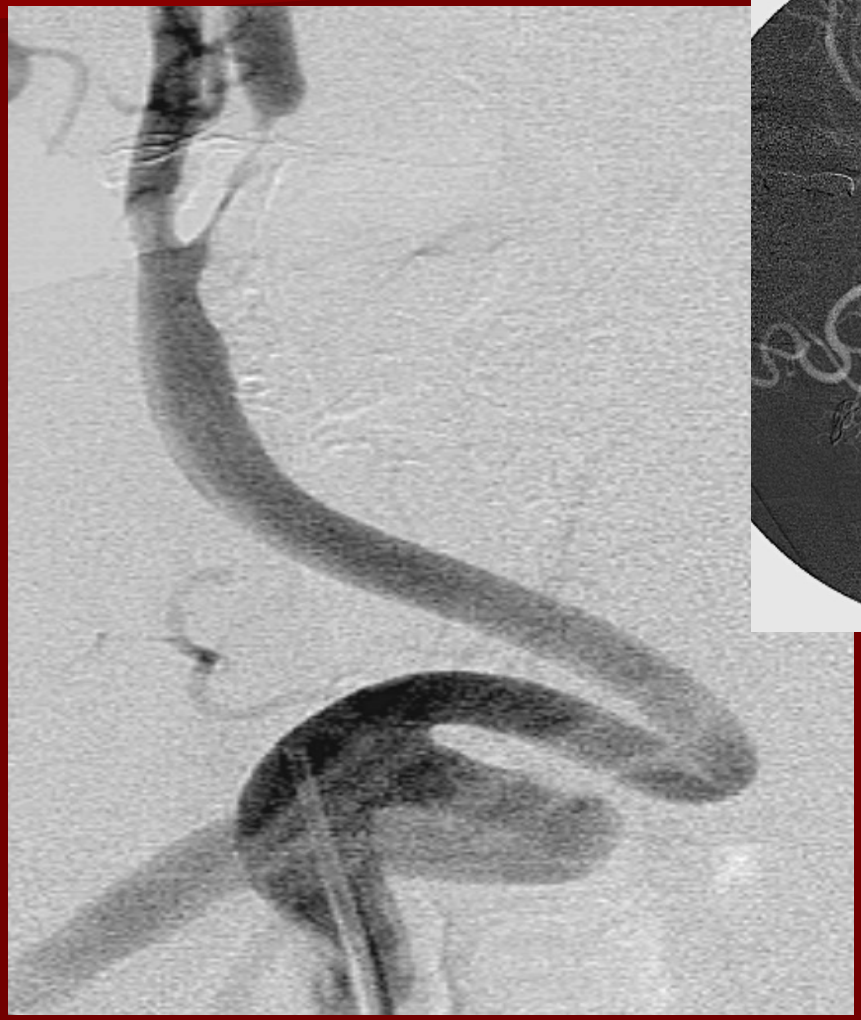
- Preventive Strategies
  - Avoid cases with poor landing zone
  - Always Keep guide tip in view
  - Never force pull Filter into RC
  - Use salvage Measures for RC problems
  - Change RC type



Lessons Learned/Avoid These S

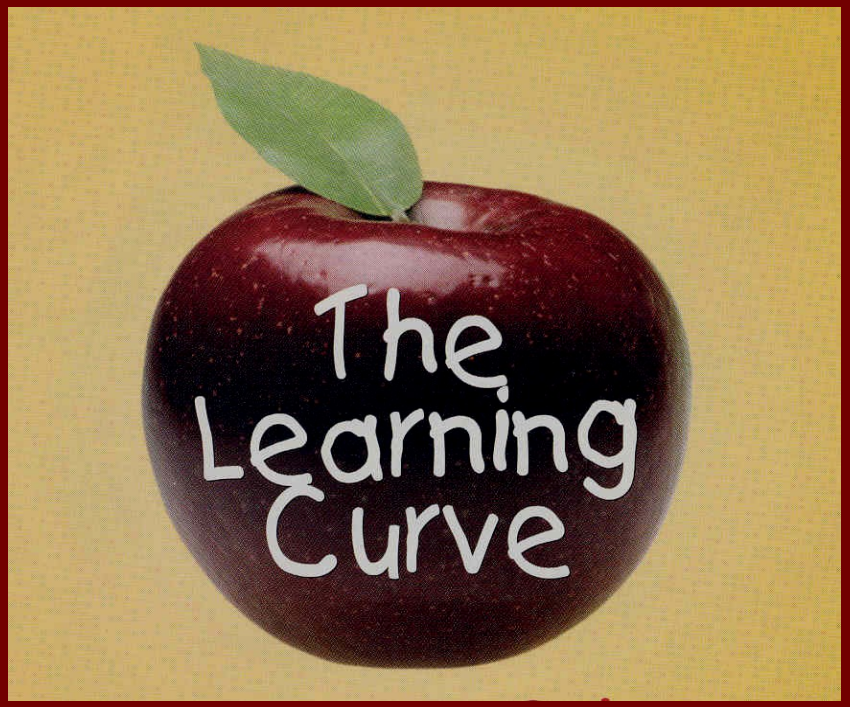
- STEEP Arch (Type III)
- SEVERE tortuosity
- SHARP Entry Angle
- SHARP Exit Angle
- INSUFFICIENT Landing Zone
- UNSATISFACTORY Collaterals

Lessons Learned/Avoid These S



Technical Pearls

- Remote Access for Type III Arch
- Liberal Use of STIFF Buddy Wire
- Know limitations of DPD Devices



Neuro Rescue Reality Bites!

- Does Neuro Rescue Exist?
  - Intra-cranial Thrombolysis
    - Extrapolated Data from acute stroke lysis
    - Anecdotal cases
    - Stroke during carotid stenting mostly atheroembolism
    - Does risk benefit favor Thrombolysis?

Neuro Rescue Reality Bites!

- Neuro Does Rescue Exist !
  - Intra-cranial Thrombolysis
    - Some thrombus in symptomatic patients
    - Secondary thrombus due to occlusion/stasis
    - Mechanical jet effect of injection
    - Allows clot extraction/distal migration
      - Snare
      - PTA
      - MERCI Device

Neuro Rescue
Decision Time!

- Gather data rapidly !
- Risk benefit analysis

Intra-cranial Thrombolysis

- Critical decision steps
  - Is this a major deficit?
  - Is there a branch vessel cut off?
  - Can catheter be navigated to the target vessel?
  - Is the patient an acceptable candidate for Thrombolysis?
    - Systemic pressure
    - Anticoagulation status
    - No major contra-indication

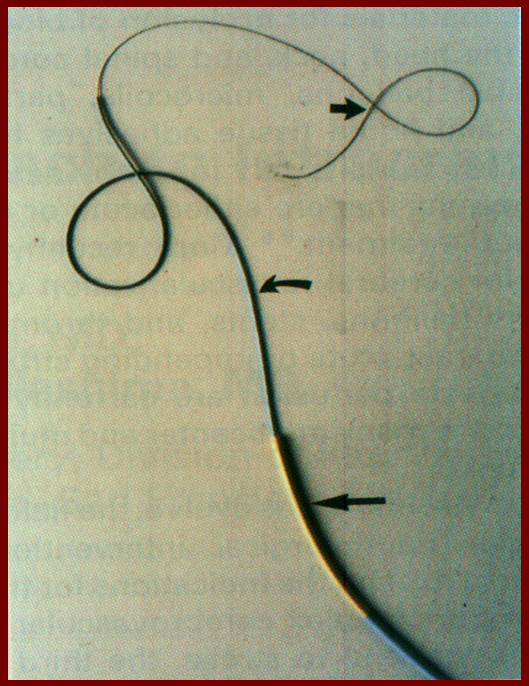
Intra-cranial Neuro Rescue

- Thrombolysis
- Wire manipulation across clot
- Goose neck snare
- PTA
- MERCI concentric retrieval
- TCD
- Prayer

Intravenous Thrombolysis

- Only approved therapy in USA
- Pro-UK not available
- Community standard is Intracranial Lysis with Urokinase, tPA or rtPA
- IV Abciximab/Eptifibatide

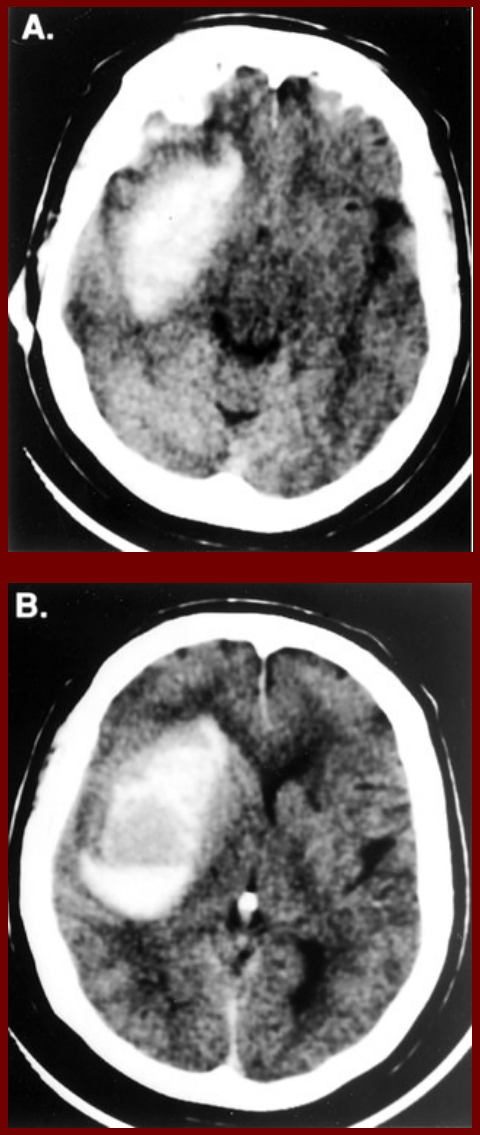
Intracranial Thrombolysis



The Rapid Micro Transit Catheter System, Envoy Guide & Transcend Wire (HIGASHIDA)

Neuro Deficit

- Major strokes are rare after carefully executed carotid stenting with distal protection
- Minor strokes do happen
- Mostly atheroembolism
- Thrombolysis remains the mainstay of rescue



Qureshi et al., *Stroke* 33:1916-1919, 2002

Conclusion

- Technical Analysis helps in the selection of
  - Appropriate Cases
  - Equipment
  - Bailout techniques

- Master The Anatomy You Can Master The Technique!

Carotid Mentoring Project

- www.carotidtraining.com