Technique Of Carotid Stenting
Decision Making Analysis To Overcome Challenges

Subbarao Myla MD FACC
Hoag Memorial Hospital Presbyterian
Newport Beach, CA
USA
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:
- Johnson & Johnson
- Guidant
- Boston Scientific
- Abbott
- Enotex
- EV3

Relationship:
- Research Grant/Speaker
- Research Grant/Speaker
- Research Grant/Speaker
- Research Grant/Speaker
- Research Grant/Speaker
- 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
Need to visualize the arch

- **Assess the Arch Type**
  - Type I
  - Type II
  - Type III

- **Arch Disease**
  - Ulceration
  - Atheroma

- **Arch Anomalies**

- Ostial Stenosis
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
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
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
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
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
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/Accunet
  - 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
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