Update in Carotid Artery Stenting & Stroke Management

How to choose the best therapy?

My Indications are based on anatomy

Max Amor M.D  max-amor@wanadoo.fr
C.Breton,Z.Chati,G.Ethevenot,J.Lemoine,J.P.Simon
Clinic Louis Pasteur, Essey-Les-Nancy, France
Potential conflicts of interest

Speaker’s name: Max Amor M.D

X I do not have any potential conflict of interest
STENTING

Surgery

Risks

Embolic Risk
Durability
Antiplatelet Therapy
Bleeding
Local complication
Hypotension

Cardiac Risk
General Anesthesia
Cranial Nerves Injury
Scar&wound compli.
Hypertension

Natural History
under Medical therapy

MULTIDISCIPLINARY EUROPEAN ENDOVASCULAR THERAPY
June 17-19
Anatomy Factors intervene at different levels

- Learning curves effect: Access & techniques
- Results in experienced centers vs beginners
- Results in old patients as compared to younger patients: Access
- Access & contralateral stroke
- Performance and applicability of protecting devices:
  - Lesion, landing zone
- Performance and applicability of stents
  - Maneuverability, lesion coverage
- Results according to the lesion anatomy
4 chapters to consider for each individual.

- Asymptomatic
- Symptomatic
- Time & Delay

- Access
- Protection
- Stenting

Age
General conditions
Patient Preference

Bifurcation
Calcification
Irregular,Ulceration
Length ...

Anatomy of Lesion and Carotid Access
5 Steps to consider for feasibility

Symptoms
Embolic Risks

Step 1
Protection
Reversal of flow
Filter type

Step 2
Access Femoral
Access Radial or Brachial
Common Carotid

Step 3
Stenting
Post stenting dilatation
Retrieval of protection

Step 4
Pré-Dilatation

Step 5
Crossing the lesion

From Step 2 to Step 5 Feasibility depends on Anatomy
1. The anatomy is the main limiting factor to perform CAS

2. The anatomic limitations reside mainly at 2 levels
   - The access to the common carotid
   - The angulations and the nature of the carotid lesion
Access selection for CAS

Femoral access

- Possible
  - Common Access
    - Normal
    - Pathologic
      - Guiding 8 or 7 F if filter
      - 6F Shuttle
  - 9F Introducer if flow reversal

- Impossible
  - Radial Art.
    - 6F Shuttle
    - Manual Compression
  - Brachial Art.
    - 6F Shuttle Guiding 7F
    - 8F Introducer if flow reversal
    - Starclose For Closing

Direct Puncture
The access to the common carotid is difficult or impossible

- Aorto-iliac disease or occlusion ➤ radial or brachial approach, Direct?
- Aortic arch diseased or type II, III, or bovine arch ➤ selection of new guiding catheter, Direct?
- Diseased or stented common carotid ostium ➤ use of braided hydrophilic sheath
Indications for Trans-Radial CAS

- Bilateral Aorto-iliac Disease
- Failure of femoral route
- Hostile Neck + Cervical approach impossible
- Bovine Arch for left carotid stenosis
Mr Can. Tandem Left Carotid stenosis

67 years old man

Prior inferior MI 1997


Cancer recurrence in 2003 treated with surgery and jawbone resection.


Echo-Doppler revealed:
- Right common carotid occlusion
- Severe Left common carotid stenosis
- Less severe left internal carotid stenosis
Right common carotid occlusion
2/Left CC access: 5 F right Judkins catheter
3 / Selective left CC injection
Placement of 6F 90 cm braided introducer over the extra stiff guidewire.
8/Direct Stenting: Placement of a stent
3D Rotational Angiography after stenting
Stent boost after Post-stenting Dilatation
Bovine Arch: 2 directions
Type 2 arch: 2 directions in 2 different planes
CCA Access
Aortic Arch Types (Myla 1996)

Type I
- Simple Curve
- Catheters HN1
- Telescopic Access
- Guide Cath or Sheath

Type II
- Reverse Curve
- Catheters SM 2
- Serial Stiffening
- Guide Cath or Sheath

Type III
- Reverse Curve
- Catheters SM 2
- JCL XB 4.0 & Saad
- Guide catheter

From S.MYLA TCT 2009
In 3 shapes (2 for the left & 1 for the right carotid)
Anatomy

1. the anatomy is the main limiting factor to perform CAS

2. The anatomic limitations reside mainly at 2 levels
   - The access to the common carotid
   - The angulations and the nature of the carotid lesion
TORTUOSITY: LEFT CAROTID ARTERY STENOSIS

BEFORE ANGIOPLASTY
Angulations+ severe eccentric stenosis
Saad catheter for pre-dilatation without protection
Anatomic Factors : Protection & Devices

- **Anatomic Factors for Protection**
  - Filters : Landing Zone & Safe Retrieval
  - Flow reversal: External Carotid & exchange Possible

- **Anatomic Factors For Stenting**
  - Navigability across the curves
  - Lesion coverage : Length, Bifurcation, Tortuosity
  - Conformability
  - Crossing (Balloons, Retrieval Device)
## Caractéristiques des systèmes de protection

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>Vessel Size (mm)</th>
<th>Crossing Profile (Inches/French)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FiberNet</td>
<td>3.5 mm – 7.0 mm</td>
<td>2.4 – 2.9 F</td>
</tr>
<tr>
<td>Angioguard XP</td>
<td>4.5 – 7.5 mm</td>
<td>3.2 - 3.9 F</td>
</tr>
<tr>
<td>FilterWire EZ</td>
<td>3.5 – 5.5 mm</td>
<td>3.2 F</td>
</tr>
<tr>
<td>Emboshield Pro</td>
<td>2.5 – 7.0 mm</td>
<td>2.8 – 3.2 F</td>
</tr>
<tr>
<td>RX AccuNet</td>
<td>3.25 – 5.0 mm</td>
<td>3.5 – 3.7 F</td>
</tr>
<tr>
<td>SpiderFX</td>
<td>3.0 – 7.0 mm</td>
<td>3.2 F</td>
</tr>
<tr>
<td>GuardWire</td>
<td>3.0 – 5.5 mm</td>
<td>2.8 F</td>
</tr>
<tr>
<td>Emboshield Nav 6</td>
<td>2.5 – 7.0 mm</td>
<td>3.2F</td>
</tr>
</tbody>
</table>
Sélection du système de protection

**Asymptomatique**

**Filtre de protection**
- **Artère Distale**
  - ≤5mm : Easy Boston, Spider Rx EV3
  - >5mm: Emboshield, Angioguard
- **Franchissement**
  - Simple: Easy Boston
  - Difficile: Emboshield Abbott
  - Très Difficile: Spider RX
  - Echec: Chirurgie ou ▶

**Symptomatique**

**Inversion du Flux**

**Filtre de protection type**
- Fibernet Invatec
## Sélection du stent

<table>
<thead>
<tr>
<th>Type</th>
<th>Stents à cellules <strong>ouvertes</strong></th>
<th>Mixte</th>
<th>Stents à cellules <strong>fermées</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom Comp</td>
<td>Precise Cordis</td>
<td>Acculink Abbott</td>
<td>Protege EV 3</td>
</tr>
<tr>
<td>Sympto.</td>
<td>+</td>
<td>-</td>
<td>±</td>
</tr>
<tr>
<td>Asymp.</td>
<td>+++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Bifurc.</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Ulcérée</td>
<td>++</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Calcifiée</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Courte</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Longue</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Irr/Coni.</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Resténos</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Radique</td>
<td>++</td>
<td>-</td>
<td>++</td>
</tr>
</tbody>
</table>
IN CONCLUSION

- Some anatomic limitations have found today new solutions
  - Trans-radial CAS
  - New guiding catheter
  - Trans-cervical approach with percutaneous closing
  - Improvement of device characteristics

- Other anatomic limitations still exist and require new solutions, and new developments
Thank YOU

SAVE THE DATE 2011
APRIL, 28-30*, ROMA

* Dates to be confirmed.
## Catheter selection

<table>
<thead>
<tr>
<th>Catheters</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simmons (Sidewinder)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>II</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>III</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>IV</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td><strong>Hinck/Berenstein</strong></td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td><strong>Headhunter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>II</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td><strong>Bentson</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JB1</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>JB2</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>JB3</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td><strong>Mani</strong></td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td><strong>Vitek</strong></td>
<td>++</td>
<td>+++</td>
</tr>
</tbody>
</table>
## Catheter selection & width of the aorta

<table>
<thead>
<tr>
<th>Catheters Shape</th>
<th>Aorta Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small</td>
</tr>
<tr>
<td>Simmons</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>+++</td>
</tr>
<tr>
<td>II</td>
<td>+</td>
</tr>
<tr>
<td>III</td>
<td>++</td>
</tr>
<tr>
<td>IV</td>
<td>++</td>
</tr>
<tr>
<td>Hinck</td>
<td>+</td>
</tr>
<tr>
<td>Headhunter</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>++</td>
</tr>
<tr>
<td>II</td>
<td>++</td>
</tr>
<tr>
<td>Bentson</td>
<td></td>
</tr>
<tr>
<td>JB1</td>
<td>+</td>
</tr>
<tr>
<td>JB2</td>
<td></td>
</tr>
<tr>
<td>JB3</td>
<td></td>
</tr>
<tr>
<td>Vitek</td>
<td>+</td>
</tr>
</tbody>
</table>
Figure 1. Prevalence of aortic atheroma according to age (6)
CCA Access
Aortic Arch Types (Myla 1996)

Type I
- Simple Curve
- Catheters HN1
- Telescopic Access
- Guide Cath or Sheath

Type II
- Reverse Curve
- Catheters SM 2
- Serial Stiffening
- Guide Cath or Sheath

Type III
- Reverse Curve
- Catheters SM 2
- SAL
- JCL XB 4.0 & Saad
- IAL
- Guide catheter

From S.MYLA TCT 2009