Proximal Protection During CAS: Why is it the Superior Concept?

Giancarlo Biamino
Disclosure

• Speaker name:
• I have the following potential conflicts of interest to report:
  □ Consulting
  □ Employment in industry
  □ Stockholder of a healthcare company
  □ Owner of a healthcare company
  □ Other(s)
  □ I do not have any potential conflict of interest
The most important clinical aspects of carotid artery stenting!

- The only goal for the treatment of carotid artery stenoses is the prevention of stroke.

- This preventive intervention should never be associated with a complication risk, in symptomatic and asymptomatic lesions, exceeding the stroke risk of the natural course of carotid atherosclerosis.
The Mandatory Goal for CArotid Stenting: **safety first!**

MANE ~ 1 (to 3%)
Cerebral Protection Strategies

Distal Flow Blockage

Distal Filters

Proximal Protection with Flow Reversal

Proximal Protection with Flow Blockage

NO PROTECTION NO CAS
Distal Protection Filter (DPF)

- Angioguard XP (Cordis)
- Emboshield (Abbott)
- Accunet (Guidant)
- FilterWire (Boston)
- Spider (ev3/Covidien)
- Embolic Filter (Gore)
- Fibernet (Medtronic)
Distal Filter Protection

- **Advantages**:
  - Maintenance of cerebral perfusion during CAS
  - Intuitive device for interventionalists

- **Major Disadvantages**:
  - Passage of lesion without protection
  - Opening of the system in a adequate landing zone in the ICA
  - Uncontrollable vessel wall apposition
• Blockage of retrograde blood flow from the ECA
• Blockage of antegrade blood flow through the CCA
• “BACK Pressure”
Rationale for Proximal Protection

TO AVOID

1. Need of a landing zone
2. Crossing the lesion prior to establish protection
3. Traumatization of the distal ICA
4. Difficult gw navigation in tortuuous anatomies or passing tight lesions
5. Sub-optimal system stability and poor gw support
6. Emboli passing through by distal Filter protection
7. Embolization through ECA collaterals
Montevergine Registry on PEC protected CAS

- From July 2004 to March 2009, 1300 patients underwent CAS using PEC.

- All patients had a >80%, if asymptomatic, and >60%, if symptomatic, diameter stenosis of the internal carotid artery, measured according to the NASCET criteria.

- The only exclusion criteria were the presence of critical stenosis of the ipsilateral common carotid artery and/or the occlusion of the ipsilateral external carotid artery.

- Patients received a detailed clinical assessment one hour, twenty-four hours, and 30 days.

Stabile et al. JACC 2010
Cumulative results at 30 days (MACCE = 1.3 %)  
No AMI !
proximal protection with the MO.ma device during carotid stenting

Principal Investigators:
Gary Ansel - Columbus (OH)
L. Nelson Hopkins – Buffalo (NY)
Results 1. Endpoint

30d Results (ITT & Full Population)

30d Results by Symptoms and Age (ITT)
## Clinica Montevergine-VME-VMC Registry

<table>
<thead>
<tr>
<th>Death and Stroke</th>
<th>Frequency (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP</td>
<td>0.0% (0)</td>
</tr>
<tr>
<td>PP</td>
<td>2.02% (4)</td>
</tr>
<tr>
<td>30 Day</td>
<td>0.5% (1)</td>
</tr>
<tr>
<td>Total</td>
<td>2.52% (5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Pts #</th>
<th>198</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>82 ± 2,2</td>
<td></td>
</tr>
<tr>
<td>Creatinine clearance &gt;30 &lt; 60 ml-min (%) (n)</td>
<td>68,8 (82)</td>
<td></td>
</tr>
<tr>
<td>Presence of significant CAD (%) (n)</td>
<td>58,8 (70)</td>
<td></td>
</tr>
<tr>
<td>Symptomatic Patients (%) (n)</td>
<td>35,9 (42)</td>
<td></td>
</tr>
</tbody>
</table>
# patients
2002: 42  
2002-2003: 157  
2001-2005: 416  
2001-2005: 84  
2004-2006: 60  
2004-2009: 1300  
2007-2009: 225 (ITT)  
2005-2009: 198  
2008-2010: 127

% symptom.
2002: 26.2%  
2002-2003: 19.7%  
2001-2005: 63.5%  
2001-2005: 62.0%  
2004-2006: 23.3%  
2004-2009: 27.8%  
2007-2009: 15.1%  
2005-2009: 39.4%  
2008-2010: 12.6%

Elderlies
2002: na  
2002-2003: 4.5% >80y  
2001-2005: na  
2001-2005: na  
2004-2006: na  
2004-2009: 9.3% >80y  
2007-2009: 56.1% >75y  
2005-2009: 100% >80y  
2008-2010: na

### Primary EP
<table>
<thead>
<tr>
<th>Year</th>
<th>3m MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MACCE</th>
<th>30d MANE</th>
<th>DW-MRI lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>4.70%</td>
<td>5.70%</td>
<td>4.56%</td>
<td>2.40%</td>
<td>2.40%</td>
<td>2.70%</td>
<td>2.52%</td>
<td>29.9%</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>30d Death</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.48%</td>
<td>1.20%</td>
<td>0.00%</td>
<td>0.61%</td>
<td>0.90%</td>
<td>0.51%</td>
</tr>
<tr>
<td>2008</td>
<td>30d Maj. Stroke</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.24%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.46%</td>
<td>0.90%</td>
<td>1.01%</td>
</tr>
<tr>
<td>2010</td>
<td>30d Min. Stroke</td>
<td>4.70%</td>
<td>4.50%</td>
<td>3.84%</td>
<td>1.20%</td>
<td>1.67%</td>
<td>0.46%</td>
<td>1.40%</td>
<td>1.01%</td>
</tr>
<tr>
<td>2005</td>
<td>30d MI</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>na</td>
<td>0.00%</td>
<td>na</td>
</tr>
<tr>
<td>2008</td>
<td>30d MANE</td>
<td>4.70% (3m)</td>
<td>5.70%</td>
<td>4.56%</td>
<td>2.40%</td>
<td>1.67%</td>
<td>1.38%</td>
<td>2.70%</td>
<td>2.52%</td>
</tr>
</tbody>
</table>

### Pr. EP Results
<table>
<thead>
<tr>
<th>Author</th>
<th>3m MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>30d MANE</th>
<th>DW-MRI lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biamino</td>
<td>4.70%</td>
<td>5.70%</td>
<td>4.56%</td>
<td>2.40%</td>
<td>2.40%</td>
<td>2.70%</td>
<td>2.52%</td>
<td>29.9%</td>
<td></td>
</tr>
<tr>
<td>Reimers</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.48%</td>
<td>1.20%</td>
<td>0.00%</td>
<td>0.61%</td>
<td>0.90%</td>
<td>0.51%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Coppi</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.24%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.46%</td>
<td>0.90%</td>
<td>1.01%</td>
<td>2.40%</td>
</tr>
<tr>
<td>Cremonesi</td>
<td>4.70%</td>
<td>4.50%</td>
<td>3.84%</td>
<td>1.20%</td>
<td>1.67%</td>
<td>0.46%</td>
<td>1.40%</td>
<td>1.01%</td>
<td>2.40%</td>
</tr>
<tr>
<td>Stabile</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>na</td>
<td>0.00%</td>
<td>na</td>
<td>0.00%</td>
</tr>
<tr>
<td>Stabile</td>
<td>4.70% (3m)</td>
<td>5.70%</td>
<td>4.56%</td>
<td>2.40%</td>
<td>1.67%</td>
<td>1.38%</td>
<td>2.70%</td>
<td>2.52%</td>
<td>2.40%</td>
</tr>
</tbody>
</table>

### Additional Data
- Soft plaque
- Stenotic ECA
- 1300 MO.MA Trial
- High Surg Risk
- US FDA Trial
- High Surg Risk
- Octogenarians
- DW-MRI

### Publication Years
- 2002
- 2005
- 2008
- 2010
Patient History  case 1

Patient demographics:

Gender: Male
Age: 81 yrs
Risk factors: Hyperlipidaemia
Hypertension
Smoking history
A Meta-Analysis of Proximal Occlusion Device Outcomes in Carotid Artery Stenting

Robert M. Bersin, MD, MPH, Eugenio Stabile, MD, Gary M. Ansel, MD, Daniel G. Clair, MD, Alberto Cremonesi, MD, L. Nelson Hopkins, MD, Dimitrios Nikas, MD, PhD, Bernhard Reimers, MD, Horst Sievert, MD, and Paolo Rubino, MD

Background: The clinical risk predictors for adverse events in carotid stenting using distal embolic protection devices are well established and include patient age and symptomatic status. The risk predictors for adverse events with proximal occlusion devices are not as well established. This study is a meta-analysis of available data on proximal occlusion devices to determine the risk predictors of adverse events in carotid stenting. Methods: Study-specific results on 2,397 patients from six independent databases of two different proximal occlusion devices were meta-analyzed by an independent statistical analysis organization for predictors of major adverse clinical events including stroke, myocardial infarction, and death using random effects models. The primary endpoint was the composite of total stroke, myocardial infarction, and death.

demographic variables including patient gender, symptomatic status, and contralateral carotid occlusion were not found to be independent risk predictors. Conclusions: A meta-analysis of CAS procedures performed with proximal occlusion devices demonstrated a very low incidence of adverse events at 30 days. The only independent risk predictors were age and diabetes. Patient gender, symptomatic status, and other baseline characteristics were not found to be risk predictors for CAS using proximal occlusion devices.

Key words: cerebrovascular disease; cerebrovascular accident; myocardial infarction

The incidence of stroke was 1.71%
Metanalysis on PPS CAS

$P$ value = 0.034

Bersin and Stabile. Cath Cardiovasc Int 2013
Evolution of Carotid Stenting

2003 2005 2007 2009

30 days Stroke

SECURITY ARCHER II ARCHER III SAPPHIRE CREATE I CREATE II MAVERIC BEACH CABERNET EMPIRE EPIC PROTECT ARMOUR POD Meta ERCAS DPS ERCAS PPS

DPF PPS

0.6%
Detection of Microembolic Signals

„Multi - Gate - Technique“
### Effect of Two Different Neuroprotection Systems on Microembolization During Carotid Artery Stenting

**Andrej Schmidt, MD, Klaus-Werner Diederich, MD, Susanne Scheinert, MD, Sven Bräunlich, MD, Tatjana Olenburger, Giancarlo Biamino, MD, Gerhard Schuler, MD, Dierk Scheinert, MD**

*Leipzig, Germany*

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Single Center comparative - non random. MO.MA vs Filters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>MO.MA</strong></td>
</tr>
<tr>
<td>Nr of Patients</td>
<td>21</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>7 (33%)</td>
</tr>
<tr>
<td>Degree of Stenosis</td>
<td>$86\pm9%$</td>
</tr>
<tr>
<td>Evidence of Macroscopic Debris</td>
<td>18 (89%)</td>
</tr>
<tr>
<td>Stroke &amp; Deaths procedural</td>
<td>0</td>
</tr>
<tr>
<td>Total MES Counts</td>
<td>$57\pm41$</td>
</tr>
</tbody>
</table>

**p < 0.0001**
DESERVE STUDY

Diffusion Weighted-MRI based evaluation of the effectiveness of endovascular clamping during Carotid Artery Stenting with the Mo.Ma device

- Prospective, multicenter, single arm, European Study.
- Principal Investigator: Prof Giancarlo Biamino.

- **127 subjects** included between February 2008 and October 2010.

- **6 sites** (Italy, Germany, Poland):
  - Dr. A. Cremonesi, Cotignola (Italy).
  - Prof. D. Dudek, Krakow (Poland).
  - Dr. B. Reimers, Mirano (Italy).
  - Prof. P. Rubino, Mercogliano (Italy).
  - Prof. D. Scheinert, Leipzig (Germany).
  - Prof. H. Sievert, Frankfurt (Germany).

## Results 1° Endpoint

<table>
<thead>
<tr>
<th>TARGET SIDE</th>
<th>%</th>
<th>(N =127)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pts with new “lesions”</td>
<td>26%</td>
<td>(33)</td>
</tr>
<tr>
<td>Single “lesion”</td>
<td>46%</td>
<td>(15)</td>
</tr>
<tr>
<td>CONTRALATERAL SIDE</td>
<td>0.9%</td>
<td>(1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OVERALL</th>
<th>%</th>
<th>(N =127)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pts with new “lesions”</td>
<td>29.9%</td>
<td>(38)</td>
</tr>
<tr>
<td>Single “lesion”</td>
<td>43%</td>
<td>(16)</td>
</tr>
</tbody>
</table>

In the same range as supraortotic diagnostic procedures
The Mo.Ma.
PROXIMAL PROTECTION DEVICE:

1. EASY TO USE
2. SAFE (Arch I-III)
3. EFFECTIVE
4. AT THE MOMENT THE PROTECTION SYSTEM OF CHOISE
“Low-risk” CAS patient?
NOT EXISTING!!

- Male, 67 years old
- Recurrent TIAs
- RICA focal stenosis

Courtesy of A. Cremonesi
GAPS IN CLINICAL EVIDENCE FOR CAS IN 2019

• NO data considering the ability of the interventionalist to produce a complication-free result.
Multivariate analysis of Outcome Predictors after CSA using PPS

General Linear Model of predictors for 30 days events after endovascular occlusion protected carotid artery stenting. (Black dot p = ns ; red dot = p< 0.05).

X axis legend: 1 = Stent Design; 2 = Experience level; 3 = Octogenarians; 4 = Surgical High Risk for CEA; 5 = Gender; 6 = Smoke History; 7 = Hypertension; 8 = Diabetes; 9 = LDL > 100 mg/dl; 10 = Symptomatic; 11 = Ipsilateral ECA Stenosis > 70%.

Stabile et al. JACC 2010
THE END
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