Emergency stenting of the internal carotid artery in combination with anterior circulation thrombectomy in acute ischemic stroke

Daniel Behme

Department of Diagnostic and Interventional Neuroradiology
University Medical Center Göttingen
Disclosures

Speaking honorarium from Penumbra
Content

- Acute ischemic stroke with an underlying tandem occlusion – definition and epidemiology

- Treatment strategies with stenting of the ICA
  - Does it always have to be a stent?
  - What about complications?

- Evidence and guideline recommendations
  - Other studies/ case series

- Summary
Tandem occlusion - definition

Acute and simultaneous occlusion - high grade stenosis of the extracranial internal carotid artery in combination with a proximal occlusion of the anterior circulation (Carotid-T, M1 or M2)
Tandem occlusion - definition
Tandem occlusion - Epidemiology

MRCLEAN\(^1\): 75*/233 (32%) in the intervention cohort (of these 30 treated with an ICA stent) - *extracranial internal carotid artery occlusion

REVASCAT\(^2\): 19/102* (18,6%) with an underlying tandem occlusion (9 with stent treatment) - *intervention cohort

Göttingen Stroke Registry ~60/400 (15%) with a tandem occlusion (~ 50 with stent treatment)

…in a real world setting we do expect every 5-10th patient with a tandem occlusion!!!
Antegrade treatment
Antegrade treatment

Stenting of the extracranial internal carotid artery followed by anterior circulation thrombectomy with direct aspiration using large catheters like ACE/ACE64 (+- Stentretriever)

+ better overview, safer because you see what you are doing distally, usually no problems with distal embolization because the anterior circulation is already occluded

- Loss of time until you reach the intracranial clot (~ 15-30min)
Retrograde treatment
Retrograde treatment

Intracranial thrombectomy first, followed by ICA stenting

+ faster intracranial recanalization (look for A1 segments and Acom on CTA images!)

- higher risk of distal embolization, if you want to use a large aspiration catheter you might have to perform a PTA before passing the stenosis
- risk of dissection and loss of time due to the initial PTA
Antiplatelet therapy

What we do:

ASA 500mg iv + 5000IU Heparin iv pre stenting + 375mg Clopidogrel over a nasogastric tube* after ICH is ruled out by flat panel CT

Other possibilities (Aggrastat iv) or Eptifibatide (Integrillin iv) – then changing to ASA + Clopidogrel after ruling out an ICH
Does it always have to be a stent?

No evidence for stenting of the ICA in the setting of a tandem occlusion – (almost no good data at all)

There is no strict indication towards stenting, but literally all of the ICA occlusions/stenoses are symptomatic

What are the alternatives?
Balloon PTA without stenting
Balloon PTA without stenting

PTA first followed by passing the stenosis with the guide catheter/ long sheath and subsequent thrombectomy

+ fast and no need for a dual antiplatelet therapy

- higher risk of dissections and distal embolization, secondary occlusion of the ICA is rather likely
Complications

There is no sufficient data on complications in a real world setting (outside randomized trials)

Possible complications are:

Acute occlusion of the stent (<24h)
Dislocation of the stent (e.g. when passing it with a large catheter)
ICH (dual antiplatelet + iv rtPA)
Complications of mechanical thrombectomy for acute ischemic stroke—a retrospective single-center study of 176 consecutive cases

Daniel Behme • Ludger Gondecki • Sarah Fiethen • Annika Kowoll • Anastasios Mpotsaris • Werner Weber

Received: 19 December 2013 / Accepted: 6 March 2014
© Springer-Verlag Berlin Heidelberg 2014
Symptomatic ICH
Symptomatic ICH

…how high is the risk?

- Malik et al. 2011, *Stroke*: sICH 11% in 77 cases
- Stampfl et al. 2013, *AJNR*: sICH 17% in 24 cases
- Cohen et al. 2014, *JNIS*: sICH 0% in 24 cases
- Heck and Brown 2014, *JNIS*: sICH 22% in 23 cases
- Lockau et al. 2014, *Neuroradiology*: sICH 11% in 37 cases

… how high is the risk?

LINC, Leipzig, January 2016
Symptomatic ICH

A rate of 9% sICH was reported in the largest published cases series. A rate of 9% thereby was not significantly higher compared to MRCLEAN (7.7% Interventional treatment cohort). There was no obvious association with the chosen antiplatelet regime and no obvious association with application of iv rtPA.

Emergency Stenting of the Extracranial Internal Carotid Artery in Combination with Anterior Circulation Thrombectomy in Acute Ischemic Stroke: A Retrospective Multicenter Study

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>sICH</th>
<th>No sICH</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carotid-T (n/N) (%)</td>
<td>4/15 (27%)</td>
<td>47/155 (30%)</td>
<td>1.0</td>
</tr>
<tr>
<td>MCA (n/N) (%)</td>
<td>11/15 (73%)</td>
<td>88/155 (57%)</td>
<td>.3</td>
</tr>
<tr>
<td>Antiplatelet medication (n/N) (%)</td>
<td>5/57 (9%), 7/71 (11%)</td>
<td>52/57 (91%), 64/71 (89%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Eptifibatide, tirofiban</td>
<td>5/57 (9%), 3/42 (7%)</td>
<td>52/57 (91%), 39/42 (93%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Eptifibatide, aspirin + clopidogrel</td>
<td>7/71 (11%), 3/42 (7%)</td>
<td>66/71 (89%), 39/42 (93%)</td>
<td>.7</td>
</tr>
</tbody>
</table>

Table 3: Potential risk factors for sICH after stenting and MT
Evidence and guidelines

MRCLEAN and REVASCAT have shown a significant benefit of an interventional treatment in cases with underlying tandem occlusion.
Guidelines

(adjusted OR, 1.15; 95% CI, 0.78–2.64). Although thrombectomy for patients with cervical ICA occlusion is clearly indicated by these data, the optimal management of the underlying stenosis is not clear. There are several potential advantages and disadvantages for angioplasty and stenting at the time of thrombectomy. Although immediate revascularization may reduce the risk of recurrent stroke, urgent stenting generally requires antiplatelet prophylaxis, which has been associated with intracranial hemorrhage in this setting. Carotid stenting and intracranial thrombectomy for the treatment of acute stroke resulting from tandem occlusions with aggressive antiplatelet therapy may be associated with a high incidence of intracranial hemorrhage. In addition, there is some risk for thromboembolic stroke at the time of stenting. Further studies are indicated.
Other studies

Results of 170 cases in 4 German centers

<table>
<thead>
<tr>
<th></th>
<th>All (n=170)</th>
<th>Reckling. (n=57)</th>
<th>Göttingen (n=42)</th>
<th>Cologne (n=44)</th>
<th>Augsburg (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puncture-recan. , min (IQR)</td>
<td>88 (59-121)</td>
<td>75 (56-95)</td>
<td>81 (41-118)</td>
<td>111 (70-148)</td>
<td>119 (84-147)</td>
</tr>
<tr>
<td>Onset-recan. , min (IQR)</td>
<td>296 (236-367)</td>
<td>263 (217-317)</td>
<td>332 (259-401)</td>
<td>317 (252-420)</td>
<td>306 (227-365)</td>
</tr>
<tr>
<td>TICI≥2b</td>
<td>130/170 (77%)</td>
<td>48/57 (84%)</td>
<td>22/42 (53%)*</td>
<td>37/44 (82%)</td>
<td>24/27 (89%)</td>
</tr>
<tr>
<td>TICI2a</td>
<td>21/170 (12%)</td>
<td>3/57 (5%)</td>
<td>13/42 (31%)</td>
<td>4/44 (9%)</td>
<td>1/27 (4%)</td>
</tr>
</tbody>
</table>

*incl. cases from 07+08 with Penumbra system

~ 90min
~ 300min
77%
## Other studies

### Results of 170 cases in 4 German centers

<table>
<thead>
<tr>
<th></th>
<th>All  (n=170)</th>
<th>Reckling. (n=57)</th>
<th>Göttingen (n=42)</th>
<th>Cologne (n=44)</th>
<th>Augsburg (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIHSS discharge, median (IQR)</td>
<td>6 (3-12)</td>
<td>6 (3-11)</td>
<td>8 (4-15)</td>
<td>8 (3-15)</td>
<td>5 (2-10)</td>
</tr>
<tr>
<td>FU mRS≤2, n/N (%)</td>
<td>62/170 (36%)</td>
<td>22/57 (38.6%)</td>
<td>16/42 (38%)</td>
<td>15/44 (34%)</td>
<td>9/27 (33%)</td>
</tr>
<tr>
<td>In-hospital-mortality, n/N (%) (all cause)</td>
<td>32/170 (19%)</td>
<td>11/57 (19%)</td>
<td>5/42 (12%)</td>
<td>9/44 (20%)</td>
<td>7/27 (26%)</td>
</tr>
<tr>
<td>sICH, n/N (%)</td>
<td>15/170 (9%)</td>
<td>5/57 (9%)</td>
<td>3/42 (7%)</td>
<td>3/44 (7%)</td>
<td>4/27 (15%)</td>
</tr>
</tbody>
</table>

**Values:**
- 6
- 36%
- ~20%
- 9%
Tandem occlusions - summary

Acute stroke with an underlying tandem occlusion is a frequent event!

Stroke imaging with CTA of the extracranial vessels is very important and has to be evaluated carefully before treatment.

Angiographic and clinical results after the treatment of tandem occlusions are comparable to isolated intracranial anterior circulation occlusions.

The risk of sICH is very likely not higher compared to mechanical thrombectomy without extracranial stenting.
Thanks for your attention!
Emergency stenting of the internal carotid artery in combination with anterior circulation thrombectomy in acute ischemic stroke

Daniel Behme

Department of Diagnostic and Interventional Neuroradiology
University Medical Center Göttingen