Acute Stroke Interventions: What I Learned During my Initial Cases

Horst Sievert,
Ilona Hofmann, Laura Vaskelyte, Sameer Gafoor, Stefan Bertog,
Predrag Matić, Markus Reinartz, Bojan Jovanovic,
Kolja Sievert, Iris Grunwald
CardioVascular Center Frankfurt - CVC,
Frankfurt, Germany
<table>
<thead>
<tr>
<th>Physician name</th>
<th>Company</th>
<th>Relationship</th>
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<tbody>
<tr>
<td>Horst Sievert</td>
<td>Abbott, Ablative Solutions, Acoredis, Atrium, Biosense Webster, Bioventrix, Boston Scientific, Carag, Cardiac Dimensions, CardioKinetix, Celonova, Cibriem, CGuard, Coherex, Comed B.V., Contego, CSI, CVRx, ev3, FlowCardia, Gardia, Gore, GTIMD Medical, Guided Delivery Systems, Hemoteq, InspireMD, Kona Medical, Lumen Biomedical, Lifetech, Medtronic, Occlutech, pfm Medical, Recor, SentreHeart, Svelte Medical Systems, Terumo, Trivascular, Valtech, Vascular Dynamics, Venus Medical, Veryan</td>
<td>Consulting fees, Travel expenses, Study honoraria, Stock options</td>
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<td>Cardiokinetix, Access Closure, Coherex, SMT</td>
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1994: My first acute stroke case

- 48 y/o man
- Collapsed in front of the hospital
- Unconscious
- Left sided hemiparesis

Discharged next day from the holding area without any deficit
On the next day I got a phone call from medical controlling:

- Please tell us
  - What did you do?
  - What is the diagnosis?
  - Why is the patient already discharged?
  - What should we bill now?
Lessons learned

• The intracranial circulation is relatively easily accessible by catheters and devices we use in coronary interventions

• Crossing the lesion with wires and catheters may be enough

• "Just do it" is not always a bad strategy
What do you know about Interventional Cardiologists ...

• .... can do everything!
• They can not only treat acute strokes by very impressive and advanced catheter techniques ...
• ... they can also cause acute strokes by very impressive and advanced catheter techniques!
Stroke during coronary intervention

- 64 yrs, male
- "uncomplicated" straightforward PCI of the right coronary artery
- No residual stenosis
- Unconscious after removal of the coronary guiding catheter
Unconscious!

Awake, but aphasic

Mechanical recanalization and local Urokinase
3 hours later: symptom-free
Lessons learned

• In catheter procedure related stroke, emboli are usually small
• They cause occlusions of small intracranial branches, difficult to diagnose
  - at least for a stupid cardiologist
• Catheter recanalisation
  - is feasible
  - relatively safe
• To recanalize an occluded brain vessel **immediately** is the most effective procedure in cardiovascular medicine
Lesson not learned at that time:

- Acute stroke during catheter interventions is different from other embolic strokes
  - Periprocedural stroke is most often due to debris
  - Spontaneous stroke is due to clot
Dedicated devices
Break through: Stent Retrievers
My first stent retriever case
69 y/o male patient

- Right hemispheric stroke of unknown onset
- Afib, on coumadin
- NIHSS 18
- A young neurologist on call had heard about acute stroke interventions and asked me to do something
- 10 min later the patient was in the cath lab
Then the cath lab got a call:

• The young neurologist had discussed the case with his senior neurologist:
  - The patient already has a big stroke according to the CT scan
  - He would probably not benefit from any intervention
  - It is probably better to treat him medically
  - In any case, the senior physician wants to discuss the case before we proceed and maybe do some additional imaging
My thoughts:

- Patient has a major stroke (NIHSS 18) without any hope that it will improve spontaneously
- IV lysis contraindicated due to anticoagulation and big stroke on CT
- Let's just do it
5 min later
the sheath was in
69 y/o male patient

- Diagnostic FR 4 catheter

- Right ICA occluded
Aspirate
• Angiographic result was excellent ...
• ... but clinical outcome was bad
  - Only minor improvement after thrombectomy
  - Patient died 2 weeks later due to secondary complications
• This intervention had a huge impact
  - not for the patient
  - but for our stroke program

• Because now the neurologists started referring patients
  - They were not convinced by randomized trials but by daily experience
Lessons learned

- It is not that difficult to remove the clot
- When the neurologist tells you there is a big stroke on CT then he is right and it is too late
- As always in live:
  - Something new does not move on its own
  - you have to push it!
  - Sometimes "just do it" is not a bad strategy
Other Lessons learned

- Big strokes referred by the neurologists are different from the strokes we produce in the cath lab during our coronary or non coronary procedures
- Not debris but clots
- Big clots!
- Sitting in large intracranial branches
One of my most important recent cases

- 16 yrs old girl
- Hemiplegic and aphasic since 30 min
- Her mother brought her to the ER in her own car
- Door to needle time 22 min
- Clot retrieved
- "I can speak again!!!"
- Wow!
Lessons learned

• Typical patient suitable for acute stroke intervention:
  - Severe stroke
  - Large vessel occlusion (Middle cerebral artery > internal carotid artery > basilar artery)
    • Embolic!
      - Of course clot, not debris
      - Maybe combined with proximal carotid stenosis
  - Large perfusion-diffusion mismatch (penumbra)
  - Currently, most patients have received iv lytics
Lessons learned

• **Access**
  - Same as access for carotid stenting
    - But often more easy because acute stroke patients
      - are younger
      - have less frequent arteriosclerotic disease
  - Proximal protection with dedicated balloon occlusion catheters

• **Crossing the clot**
  - Soft 0.014" wire, crossing with a loop usually works best
  - Followed by a microcatheter
Lessons learned

• Clot retrieval
  - Most often larger stent retrievers (6mm) work better, even in small vessels (2mm)
  - Occasionally 2 or 3 attempts are necessary
  - Alternative: aspiration

• Periprocedural medications
  - No medication if on lytics
    • 5000 U heparin if not on lytics
  - Stop lytics at the time of clot removal
  - Aspirin, Plavix only if stent was implanted
Lessons learned

• Time is brain!
  - There are patients with good collaterals who may benefit up to 12 hours
  - But most patients benefit only if you remove the clot as fast as possible
  - Acute strokes are more urgent than acute MIs
  - Comments like "The patient is still in the time window" are dangerous
    • because the may slow down the team
  - You have to run!
Lessons learned

• How to run?
  - Bypass the ER
  - Patient goes directly to the CT
  - Cath lab alerted in parallel
  - History as well as lab test are done in the CT
  - Lytics to start in the CT

• Collaboration is crucial!
  - Neuro
  - Imaging
  - Interventionist
  - Stroke unit
Lessons learned

• There are many areas in the world which are underserved
  - because there are not enough interventional neuroradiologists
• Acute stroke interventions require a special expertise and training
  - but other specialists than INR (even cardiologist) can learn it
• Therefore, we have initiated a dedicated training program
  - ICCA Stroke
  - Training program in a stroke center including simulators and case observations
Thank you for your time!
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