Vascular Neurosurgery Update

The cerebrovascular program at the Oregon Neuroscience Institute

Erik Hauck, MD, PhD; Medical Director; Chairman
Disclosures

• None
Objectives

• Vascular Neurosurgery program - summary
• Breakthrough in ischemic stroke treatment
• Advances in the treatment of aneurysms
• The pathophysiology of hydrocephalus
• Endoscopic brain surgery - case presentation
Vascular Neurosurgery Summary

- Aneurysm
- Ischemic stroke
- AVM
- Carotid disease
3 - Year Summary: > 1500 procedures

- 200 Craniotomies
- > 800 Catheter procedures
- > 100 aneurysms
- > 30 AVMs
- > 100 Carotids
- > 100 CSF shunting proc.
# The vascular neurosurgery mini team

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
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<tbody>
<tr>
<td>Neurosurgery MD</td>
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<td>Clinic nurse</td>
<td>Rosemary Parnell</td>
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<td>Clinic organizer</td>
<td>Carrie &amp; Debi</td>
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<td>Michele Daniels</td>
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Available 24/7 starting 8/1/13
541 – 222 – 2880
The cerebrovascular neighborhood

- Private Neurosurgery
- Radiology
- Rehabilitation
- Neurology
- PT/OT
- Neurohospitalist
- Primary Care
- PH & OHVI & McW & OMG
- 24/7 Hospitalist
- 24/7 Intensivist
- ED
- Cardiology
- CT surgery
- Vascular Surgery
- Cerebrovascular Neurosurgery
- Cardiology
Neuro-biplane Room, Smart ORs
Breakthrough in treatment for ischemic stroke
Projected incidence of ischemic stroke in the US
2400 Years of Non-Interventional Tx

400BC Observation of ‘apoplexy’ (Hippocrates)
1500s Beginnings of Neuroanatomy (Vesal)
1600s Beginnings of Neuropathology (Wepfer)
1800s Correlation of clinical & pathological
1954 Eastcott et al., 1st CEA
1970s ASA, CT/PET
1980s MRI
1990s Clinical trials - iv tPA
Current standard of care – IV tpa for ischemic stroke (since 1996)

0 – 3 hours, if no contra-indication

3 – 4.5 hrs, if no contra-indication and pt is not
   > 80 yrs old,
   on coumadin (even with normal INR),
   hx of previous CVA and DM,
   NIHSS > 25

2013 AHA guidelines for the treatment of ischemic stroke
• 1994  Urokinase
• 1996  Prourokinase
• 1997  Alteplase
• 1997  Mechanical lysis
• 1999  Reteplase
• 2000  Abciximab
• 2001-2  IIB IIIA Inhibitor + reteplase + Clot Retrieval
• 2003-4  Hep+Reteplase/urokinase+IIB/IIIA Inhibitor (IA and IV) + Clot Retrieval
• 2004-5  Merci for failed Thrombolitics
• 2005-6  Wingspan or Neuroform Stent for failed Merci
• 2007-9  i.a. injections, Merci, Penumbra, plasty, stents
Penumbra
MERCI retriever
Symptomatic intracranial stenosis
“Stent for Stroke”


2012

Stent retrievers

Aka

“Stent on a stick”
FDA approved March 2012

Solitaire
• Solitaire flow restoration device versus the Merci Retriever in patients with acute ischaemic stroke (SWIFT): a randomised, parallel-group, non-inferiority trial

• The Solitaire Flow Restoration Device achieved substantially better angiographic, safety, and clinical outcomes than did the Merci Retrieval System. The Solitaire device might be a future treatment of choice for endovascular recanalisation in acute ischaemic stroke.
<table>
<thead>
<tr>
<th></th>
<th>MERCI</th>
<th>Solitaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>55</td>
<td>58</td>
</tr>
<tr>
<td>TIMI 2/3</td>
<td>24%</td>
<td>61%</td>
</tr>
<tr>
<td>Good outcome</td>
<td>33%</td>
<td>58%</td>
</tr>
<tr>
<td>Mortality</td>
<td>38%</td>
<td>17%</td>
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Case Presentation

• 58 yo F, found by sister on the floor at 8.00 am
• Right sided complete paralysis, aphasia
• To local ED
• No TPA (wake up stroke)
• Intubated
• Transport to Sacred Heart
• NIHSS ~ 20
CT perfusion

MTT (sec)

TTP (sec)
“Green means Go”
Angiogram
Pre / post angio
CT post op day #3
Outcome

• Patient had an excellent recovery
• NIHSS 4
• Patient is discharged home on day 5
Therapy trial

The Randomized, Concurrent Controlled Trial to Assess the Penumbra System’s Safety and Effectiveness in the Treatment of Acute Stroke trial

Launches August 1st with 24/7 state of the art neuro-interventional coverage at Sacred Heart
Aneurysms and subarachnoid hemorrhage
Size

Small & Giant
Location

Brisman JL, Song JK, Newell DW. Cerebral aneurysms. NEJM 2006; 355:928-939
# Risk of Rupture (ISUIA)

*5 year cumulative risk*

<table>
<thead>
<tr>
<th>Size</th>
<th>Anterior Circulation</th>
<th>Posterior Circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6</td>
<td>0 – 1.5%</td>
<td>2.5 – 3.4%</td>
</tr>
<tr>
<td>7 – 12</td>
<td>2.6%</td>
<td>14.5%</td>
</tr>
<tr>
<td>13 - 24</td>
<td>14.5%</td>
<td>18.4%</td>
</tr>
<tr>
<td>25+</td>
<td>40%</td>
<td>50%</td>
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Treatment Option

- Surgery (clip)
- Endovascular (coil)
Dandy’s sketch of the first Aneurysm Clip 1937
Change in my practice

- Year  
  - 2010  
  - 2011  
  - 2012
- Clip  
  - 46%  
  - 12%  
  - 11%
- Coil  
  - 54%  
  - 88%  
  - 89%
Current percentage of aneurysms treated endovascularly here in Eugene now is 89%.
Flow diversion – world wide break through in aneurysm treatment


53 Patients, nearly 100% cure over 12 months.

Reviewer comment (Hauck et al.):

… the pipeline embolization device promises to become the endovascular equivalent of a surgical clip…
Pipeline Embolization Device

- Braided mash cylinder
- 48 microfilaments
- Platinum and cobalt chromium strands
- Mounted on a flexible microwire
Flow diversion in Oregon

- Eugene is the first center in Oregon to successfully perform the procedure
- Currently only Riverbend and OHSU are fully certified to perform the procedure independently
Pipeline/coil

87 yo F, acute left III nerve palsy
Right cavernous aneurysm

76 yo F with right hemispheric TIA
Right cavernous aneurysm

pipeline x 2

pre-op  post-op  6 months
Our cathlab

- 2 Million $ GE biplane
- 2 Million $ equipment
- world class cathlab team
  - priceless

👍👍👍
Multiple aneurysms 48 F, ruptured a-com
Direct coiling

Still a good option – simple and straightforward

Hydrocephalus
## Symptoms

<table>
<thead>
<tr>
<th>Children</th>
<th>Adults</th>
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<tr>
<td>Rapid increase in head circumference or an unusually large head size</td>
<td>Vomiting</td>
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<tr>
<td>Vomiting</td>
<td>Nausea</td>
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<tr>
<td>Sleepiness</td>
<td>Papilledema (swelling of the optic disk that's part of the optic nerve)</td>
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<tr>
<td>Irritability</td>
<td>Blurred vision</td>
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<tr>
<td>Downward deviation of the eyes (also called “sunsetting”)</td>
<td>Diplopia (double vision)</td>
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<tr>
<td>Seizures</td>
<td>Sunsetting of the eyes</td>
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<tr>
<td>In older children and adults</td>
<td>Problems with balance</td>
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<tr>
<td>Headache</td>
<td>Poor coordination</td>
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<tr>
<td></td>
<td>Gait disturbance</td>
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<td>Urinary incontinence</td>
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Anatomy of the ventricles
Pathophysiology

• CSF production > absorption
  (communicating HCP)

• CSF flow obstruction
  (non-communicating HCP)
Hydrocephalus, case presentation

• 30 year-old lady
• Progressing symptoms for a few weeks
  • No hx of prior injury
• Sees flashing lights, scary when driving
  • Numbness in arms and legs
  • Balance problems
• Tightness in her neck
• Pressure behind eyes
MRI
Technique - ETV
Technique - ETV
Technique - ETV

- Optic recess
- Infundibular recess
- Floor of third ventricle
- Pons
- Basilar a.
- Mammillary bodies
Check out the movie
Outcome

• Discharge home post op day #1
• Back to work, no restrictions the following week
• Cure
• No shunt
THANKS!!!