What I learned from an unruptured complex cerebral aneurysm treatment that I will never forget

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NO

Conflicts of Interest to Disclose
What I learned from an unruptured complex cerebral aneurysm treatment that I will never forget.
Recurrent aneurysm
Outline

- Incidence of recurrent aneurysms
- Main intra-operative concerns
  - Our strategy
- Illustrative case
- Results
- Conclusions
January 2013 – December 2015
193 Aneurysms treated by surgery → 11 recurrent
January 2013 – December 2015
→ 11 recurrent aneurysms
Literature data

- Recurrent aneurysms 3.6-40%

- Treatment
  - To treat or not to treat?
  - When to treat?
  - Which Treatment? (clip vs coil)
  - Surgical treatment → coils removal?
Outline

. Incidence of recurrent aneurysms

. Main intra-operative concerns

. Our strategy

. Illustrative case

. Results

. Conclusions
Main intra-operative concerns

- Dissection
  → Scar!

- Small /irregular neck
  - clip blades
  - parent arteries

- Dome/neck stiffness
Main concerns

- Dissection → Scar!

- Irregular neck
  - clip blades
  - parent arteries

- Dome/neck stiffness
Main concerns

- Dissection
- Scar!
- Small / irregular neck
- Clip blades
- Parent arteries
- Dome / neck stiffness
Outline

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Aneurysm exposure

Flowmetry

ICG-VA (optional)

Clipping

Flowmetry

Flow drop >25%

Clipping

Flowmetry

Flow drop <25%

Clip repositioning

Flowmetry

Flow drop >25%

Flow drop <25%

ICG-VA (squeezing)

Complete exclusion

Remnant

Sac opening/puncturing

Neurophysiological Monitoring
Our strategy - Flowmetry

- Ultrasonic microflow probe
- Flow quantitative measurement
- Flow<25% → Stroke
Our strategy – ICG-Videoangiography

. Endovenous administration → on demand
. Microscopic Software needed
Our strategy – Neurophysiological monitoring

. MEPs  SSEPs monitoring
. Cortical vs Scalp electrodes
## Limitations of ICG + Flowmetry strategy

<table>
<thead>
<tr>
<th>SURGICAL GOALS</th>
<th>INTRA-OPERATIVE TOOLS</th>
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<tbody>
<tr>
<td><strong>ANEURYSM EXCLUSION</strong></td>
<td>ICG-VA</td>
</tr>
<tr>
<td></td>
<td>++</td>
</tr>
<tr>
<td><strong>PARENT/ BRANCH ARTERIES</strong></td>
<td>+</td>
</tr>
<tr>
<td><strong>FLOW MONITORING</strong></td>
<td>+</td>
</tr>
<tr>
<td><strong>PERFORATING ARTERIES</strong></td>
<td></td>
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<tr>
<td><strong>FLOW MONITORING</strong></td>
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### Table Legend

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
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<tr>
<td>++</td>
<td>Very helpful</td>
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<tr>
<td>+</td>
<td>Helpful</td>
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<tr>
<td>-</td>
<td>Not applicable</td>
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Outline

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M/33Y SAH H&H:3
Right MCA bifurcation bleeding aneurysm

ICG-VA + flowmetry
No IOM
Outline

. Incidence of recurrent aneurysms

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. Conclusions
### Clinical results

<table>
<thead>
<tr>
<th></th>
<th>97/193</th>
<th>7/11</th>
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<tbody>
<tr>
<td><strong>Aneurysm Remnant</strong></td>
<td>2.0% (2 pts)</td>
<td>0%</td>
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<tr>
<td><strong>Stroke (clip-related)</strong></td>
<td>3.0% (3 pts)</td>
<td>0%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Branch artery</th>
<th>Perforating artery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck 1%</td>
<td>Dome 1%</td>
</tr>
<tr>
<td>Neck 1%</td>
<td>Branch artery 1%</td>
</tr>
<tr>
<td>Neck 0%</td>
<td>Dome 0%</td>
</tr>
<tr>
<td>Neck 0%</td>
<td>Branch artery 0%</td>
</tr>
<tr>
<td>Neck 0%</td>
<td>Perforating artery 0%</td>
</tr>
</tbody>
</table>
## Post-operative Results

### Intra-operative results

<table>
<thead>
<tr>
<th>Method</th>
<th>97 /193</th>
<th>(35 clip repositionings/32 pts)</th>
<th>9/11</th>
<th>(23 clip repositionings/9 pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICG</td>
<td>25%</td>
<td>19%</td>
<td>4.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Flowmetry</td>
<td>56%</td>
<td>(20 CR)</td>
<td>91%</td>
<td>(21 CR)</td>
</tr>
<tr>
<td>IOM</td>
<td>19%</td>
<td>(6 CR)</td>
<td>4.5%</td>
<td>(1 CR)</td>
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### Clip repositioning rate
F/46Y SAH H&H:3
Left MCA bifurcation bleeding aneurysm

ICG-VA + flowmetry
No IOM
Final considerations

What I learned from Recurrent cerebral aneurysm treatment that I will never forget

- **Recurrent aneurysm is an emerging entity in the surgical practice**
- **Different concerns must be intra-operatively faced**
- **Advanced technology can be intra-operative needed**
- **Surgical results are good**
- **Treatment decision should be multidisciplinary**
thanks...
F/51Y SAH H&H: 2
Right MCA bifurcation bleeding aneurysm
F/51Y SAH H&H:2
Right MCA bifurcation bleeding aneurysm
F/51Y SAH H&H:2
Right MCA bifurcation bleeding aneurysm