Quelles stratégies pour le diagnostic, la prévention et le traitement des accidents emboliques cérébraux dans l'endocardite infectieuse ?

Bruno Hoen
Déclaration d’intérêts de 2012 à 2015

Je n'ai rien à déclarer
Relationship between the initiation of antimicrobial therapy and the incidence of stroke in IE

1437 consecutive patients with left-sided IE admitted directly to ICE centers
15.2% (219/1437) had a stroke

After 1 week of antimicrobial therapy, only 3.1% of the cohort experienced a stroke

Dickerman S, Am Heart J 2007;154:1086
Risk of Embolism in IE: A Prospective Multicenter Study

Prospective study – 384 consecutive patients with Duke-definite IE

Typical profile of IE with high risk of embolism:
- large (10 to 15 mm) and mobile vegetation
- on the mitral valve
- caused by *S. aureus* or group D streptococci

<table>
<thead>
<tr>
<th>Vegetation length &gt;10 mm</th>
<th>0.004</th>
<th>9</th>
<th>1.56–46.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe vegetation mobility</td>
<td>0.04</td>
<td>2.4</td>
<td>1.02–5.42</td>
</tr>
<tr>
<td><em>S bovis</em></td>
<td>0.19</td>
<td>1.9</td>
<td>0.73–4.74</td>
</tr>
<tr>
<td><em>S aureus</em></td>
<td>0.12</td>
<td>2</td>
<td>0.84–4.76</td>
</tr>
</tbody>
</table>

Thuny F. Circulation 2005;112:69
Factors associated with cerebral ischemic lesions (IMAGE study)

- **Multivariate analysis**
  - **Vegetation length**
    - OR 1.10 per mm
    - 95% CI 1.03–1.16
    - $P=0.003$
  - **IE due to *S. aureus***
    - OR 2.65
    - 95% CI 1.01–6.96
    - $P=0.05$

Above 4 mm, every 1-mm increase in vegetation size is associated with a 10%-increased risk of ischemic lesion.
Predicting the occurrence of embolic events: an analysis of 1456 episodes of IE

<table>
<thead>
<tr>
<th></th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>p ≤†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.0</td>
<td>1.0 – 1.0</td>
<td>NS</td>
</tr>
<tr>
<td>HIV infection</td>
<td>0.8</td>
<td>0.3 – 2.0</td>
<td>NS</td>
</tr>
<tr>
<td>Cancer</td>
<td>1.10</td>
<td>0.7 – 1.9</td>
<td>NS</td>
</tr>
<tr>
<td>Chronic liver disease</td>
<td>1.4</td>
<td>0.9 – 2.2</td>
<td>NS</td>
</tr>
<tr>
<td>Mitral vs aortic valve</td>
<td>1.0</td>
<td>0.7 – 1.3</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Prosthetic vs native valve</strong></td>
<td><strong>1.8</strong></td>
<td><strong>1.2 – 2.9</strong></td>
<td><strong>0.011</strong></td>
</tr>
<tr>
<td><strong>Righ-sided IE</strong></td>
<td><strong>3.9</strong></td>
<td><strong>2.0 – 7.7</strong></td>
<td><strong>&lt;0.00001</strong></td>
</tr>
<tr>
<td><strong>Size of vegetation ≥ 13 mm</strong></td>
<td><strong>1.9</strong></td>
<td><strong>1.3 – 2.6</strong></td>
<td><strong>&lt;0.00001</strong></td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
<td><strong>2.2</strong></td>
<td><strong>1.5 – 3.4</strong></td>
<td><strong>&lt;0.00001</strong></td>
</tr>
</tbody>
</table>

Rizzi et al. BMC Infect Dis 2014, 14:230
Predicting the occurrence of embolic events: an analysis of 1456 episodes of IE

30-day cumulative incidence of embolism

- **Low risk**: 11.8% [7.2-19.2]
  - Non *S. aureus* etiology
  - and vegetation <13 mm

- **Intermediate risk**: 24.5% [20.3-37.0]
  - *S. aureus* etiology
  - or vegetation ≥ 13 mm

- **High risk**: 37.7% [22.1-64.9]
  - *S. aureus* etiology
  - and vegetation ≥ 13 mm

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Rizzi et al. BMC Infect Dis 2014, 14:230
130 patients admitted to Bichat Claude Bernard Hospital, Paris (June 2005-Sept 2008) with systematic cerebral MRI (including MRA)

Neurological Complications
n=106
82%

16/16 (100%) symptomatic pts
90/114 (79%) asymptomatic pts
Cerebral embolism, whether symptomatic or not, is associated with a poorer outcome of IE

- Rate of CV embolism
  - 24% (375/1571 patients)

- 5-year survival
  - w/ CV embolism 46%
  - w/o CV embolism 57% (P<.01)

- 10-year survival
  - w/ CV embolism 42%
  - w/o CV embolism 35% (P<.01)

Misfield, J Thorac Cardiovasc Surg 2014;147:1837-46
How to mitigate the risk of embolism?

- 30-year-old man, known bicuspid aortic valve
  - Admitted to hospital because of high-grade fever
  - New mitral regurgitation murmur
  - Blood cultures: *Haemophilus paraphrophilus*
  - TEE: large (20 mm), oscillating vegetation on the MV, no other complication
  - Afebrile within 48 h of AbRx

- 34 year-old female, no known valve disease
  - Admitted to hospital because of high-grade fever
  - No cardiac murmur
  - Blood cultures: *S. aureus*
  - TEE by day 2 of AbRx: very large vegetation (34 mm) on the aortic valve, no abscess, no regurgitation
How to mitigate the risk of embolism?

1. Keep on with AbRx, and do nothing else
2. Keep on with AbRx, and pray
3. Keep on with AbRx, and push the patient right away to the OR for emergency valve surgery
4. Keep on with AbRx, and do something else
Interventions to reduce embolic risk in IE

- Pharmacologic interventions
  - Anticoagulants
  - Antiplatelet agents
    - Aspirin
    - Other agents
Antiplatelet agents and embolism in IE

**Experimental**

Nicolau et al 1995, AAC; 39:2748
ASA, impoved Rx... no prevention
Ticlopidine, impoved Rx... no prevention
ASA +ticlo, impoved Rx... no prevention
ASA, anti-S. aureus... no prevention
ASA, pleotropic anti-S. aureus (sigma, arg,sar)
ASA, ticlo, abciximab, dabigatran … prevention

Nicolau et al 1996, IJAA; 7:271
Nicolau et al 1999, IJAA; 11:159
Kupferwasser et al 1999, Circ; 99:2791
Kupferwasser et al 2003, JCI; 112:222
Veloso et al 2015, JID; 211:72

**Clinic**

Chan et al 2003, JACC; 42:775
ASA during IE, emboli idem, increased hemorrhage
Anavekar et al 2007, CID; 44:1180
ASA pre-IE, less emboli, no hemorrhage increase
Chan et al 2008, CID; 46:37
ASA pre-IE, emboli idem, increased hemorrhage
Pepin et al 2009, CMI; 15:193
ASA pre-IE, emboli idem, decreased mortality
Eisen et al 2009, J Infect; 58:332
ASA pre S.aureus IE, decreased surgery and complications, increased mortality
Anavekar et al 2011, MCP; 86:1068
ASA or statins, less emboli
Snygg-Martin et al 2011, SJID;43:899
AP pre-IE, emboli idem, mortality?

Eisen et al 2015, JID; 2015; corresp.
meta-analysis, less emboli, …more death
Interventions to reduce embolic risk in IE

- Pharmacologic interventions
  - Anticoagulants
  - Antiplatelet agents
    - Aspirin
    - Other agents
  - Thrombolytic agents
    - r-TPA
Successful treatment of IE with r-TPA

Methods
- 7 infants/young children with septic shock/MOF and catheter-related IE failing antimicrobial Rx and catheter removal.
- BC+ in 6 infants (Candida, staphylococci, enterococci)
- r-TPA given intravenously until vegetation vanishing.

Results
- Patients afebrile and BC negative after 3 days.
- Vegetations no longer visualized after 4 days.
- Weaning from cardiorespiratory support after 6 days.
- No bleeding and full recovery in all patients.
Intravenous thrombolysis is unsafe in stroke due to infective endocarditis

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age/sex</th>
<th>Presentation</th>
<th>Baseline NIHSS</th>
<th>Time to tPA</th>
<th>Time to IE diagnosis</th>
<th>IE risk factors</th>
<th>Complications</th>
<th>Follow-up NIHSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1⁵</td>
<td>56/M</td>
<td>Right hemiparesis, dysphasia, HH</td>
<td>15</td>
<td>2 h, 36 min</td>
<td>48 h</td>
<td>None</td>
<td>None reported</td>
<td>4</td>
</tr>
<tr>
<td>2⁶</td>
<td>46/M</td>
<td>Left hemiparesis</td>
<td>15</td>
<td>1 h, 50 min</td>
<td>&lt;6 h</td>
<td>IVDU</td>
<td>Death</td>
<td>NR</td>
</tr>
<tr>
<td>3⁷</td>
<td>65/F</td>
<td>Right hemiplegia, dysphasia, HH</td>
<td>21</td>
<td>2 h, 0 min</td>
<td>24 h</td>
<td>Immunosuppression</td>
<td>Multifocal parenchymal and subarachnoid haemorrhage</td>
<td>NR</td>
</tr>
<tr>
<td>4⁸</td>
<td>61/M</td>
<td>Right hemiparesis, dysphasia</td>
<td>21</td>
<td>1 h, 30 min</td>
<td>24 h</td>
<td>None</td>
<td>Multifocal parenchymal and subarachnoid haemorrhage</td>
<td>NR</td>
</tr>
<tr>
<td>5⁹</td>
<td>70/M</td>
<td>Right hemiparesis, dysphasia</td>
<td>13</td>
<td>2 h, 30 min</td>
<td>&lt;6 h</td>
<td>Occult malignancy</td>
<td>None reported</td>
<td>5</td>
</tr>
<tr>
<td>6⁰</td>
<td>68/M</td>
<td>Right hemiparesis, dysphasia</td>
<td>12</td>
<td>2 h, 15 min</td>
<td>24 h</td>
<td>None</td>
<td>Multifocal parenchymal and subarachnoid haemorrhage</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>27/F</td>
<td>Right hemiparesis, dysphasia</td>
<td>15</td>
<td>2 h, 20 min</td>
<td>&lt;6 h</td>
<td>Poor dentition</td>
<td>Early neurological deterioration not due to ICH</td>
<td>1</td>
</tr>
</tbody>
</table>

Interventions to reduce embolic risk in IE

- Pharmacologic interventions
  - Anticoagulants
  - Antiplatelet agents
    - Aspirin
    - Other agents
  - Thrombolytic agents
    - r-TPA
- Surgical intervention
## Indications for surgery in IE

**Recommendations by the ESC, 2009**

**Habib G. Eur Heart J 2009;30:2369**

### Recommendations: Indications for surgery

<table>
<thead>
<tr>
<th>A - HEART FAILURE</th>
<th>Timing</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic or mitral IE with severe acute regurgitation or valve obstruction causing refractory pulmonary oedema or cardiogenic shock</td>
<td>Emergency</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Aortic or mitral IE with fistula into a cardiac chamber or pericardium causing refractory pulmonary oedema or shock</td>
<td>Emergency</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Aortic or mitral IE with severe acute regurgitation or valve obstruction and persisting heart failure or echocardiographic signs of poor haemodynamic tolerance (early mitral closure or pulmonary hypertension)</td>
<td>Urgent</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>Aortic or mitral IE with severe regurgitation and no HF</td>
<td>Elective</td>
<td>IIa</td>
<td>B</td>
</tr>
</tbody>
</table>

### B - UNCONTROLLED INFECTION

| Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation) | Urgent | I | B |
| Persisting fever and positive blood cultures > 7–10 days | Urgent | I | B |
| Infection caused by fungi or multiresistant organisms | Urgent/elective | I | B |

### C - PREVENTION OF EMBOLISM

| Aortic or mitral IE with large vegetations (> 10 mm) following one or more embolic episodes despite appropriate antibiotic therapy | Urgent | I | B |
| Aortic or mitral IE with large vegetations (> 10 mm) and other predictors of complicated course (heart failure, persistent infection, abscess) | Urgent | I | C |
| Isolated very large vegetations (> 15 mm)* | Urgent | IIb | C |

*C: consensus of experts’ opinion*
Definitions

Based on emergency level (patient-based)

<table>
<thead>
<tr>
<th>Indications for surgery</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic or mitral IE with severe acute regurgitation or obstruction causing</td>
<td>Emergency</td>
</tr>
<tr>
<td>refractory pulmonary edema or cardiogenic shock</td>
<td>within hours</td>
</tr>
<tr>
<td>Aortic or mitral IE with fistula into a cardiac chamber or pericardium</td>
<td>Emergency</td>
</tr>
<tr>
<td>causing refractory pulmonary oedema or shock</td>
<td>within days</td>
</tr>
<tr>
<td>Aortic or mitral IE with severe acute regurgitation or obstruction and</td>
<td>Urgent</td>
</tr>
<tr>
<td>persisting heart failure or signs of poor hemodynamic tolerance (early mitral closure</td>
<td>within weeks</td>
</tr>
<tr>
<td>or pulmonary hypertension)</td>
<td></td>
</tr>
<tr>
<td>Aortic or mitral IE with severe regurgitation and heart failure easily</td>
<td>Elective</td>
</tr>
<tr>
<td>controlled with medical treatment</td>
<td></td>
</tr>
</tbody>
</table>

Based on timing (for descriptive epidemiology)

- Early: during antibiotic course
- Very early: within 1st week of treatment
Early Surgery versus Conventional Treatment for Infective Endocarditis

Duk-Hyun Kang, M.D., Ph.D., Yong-Jin Kim, M.D., Ph.D., Sung-Han Kim, M.D., Ph.D., Byung Joo Sun, M.D., Dae-Hee Kim M.D., Ph.D., Sung-Cheol Yun, Ph.D., Jong-Min Song, M.D., Ph.D., Suk Jung Choo, M.D., Ph.D., Cheol-Hyun Chung, M.D., Ph.D., Jae-Kwan Song, M.D., Ph.D., Jae-Won Lee, M.D., Ph.D., and Dae-Won Sohn, M.D., Ph.D.


ABSTRACT

BACKGROUND
The timing and indications for surgical intervention to prevent systemic embolism in infective endocarditis remain controversial. We conducted a trial to compare clinical outcomes of early surgery and conventional treatment in patients with infective endocarditis.
**Early Surgery versus Conventional Treatment for Infective Endocarditis**

- All patients suspected of IE underwent **blood cultures and echocardiography** within 24 hrs after hospitalization.

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Age: 15-80 years</td>
<td>- Pts with urgent indication of surgery</td>
</tr>
<tr>
<td>- Definite left-sided native valve IE according to Duke criteria</td>
<td>moderate to severe CHF, heart block, annular or aortic abscess, penetrating</td>
</tr>
<tr>
<td>- Severe mitral or aortic valve disease</td>
<td>lesions, fungal endocarditis</td>
</tr>
<tr>
<td>- Vegetation length &gt; 10mm</td>
<td>- Pts not candidates for early surgery</td>
</tr>
<tr>
<td></td>
<td>age &gt; 80 yrs, coexisting major embolic stroke or poor medical status</td>
</tr>
<tr>
<td></td>
<td>- Prosthetic valve IE</td>
</tr>
<tr>
<td></td>
<td>- Right-sided vegetations</td>
</tr>
<tr>
<td></td>
<td>- Small vegetations ≤ 10mm</td>
</tr>
</tbody>
</table>

Early Surgery versus Conventional Treatment for Infective Endocarditis

- **Randomization arms**
  - early surgery (ES): surgery within 48 hours
  - conventional treatment (CT): according to current guidelines

- **Primary endpoint (composite):**
  - In-hospital death or clinical embolic events within 6 weeks after randomization

- **Clinical embolic event:**
  - acute onset of clinical symptoms or signs of embolism and the occurrence of new lesions, confirmed by imaging studies.

- **Cutaneous manifestations or metastatic abscesses were NOT regarded as embolic events**

Early Surgery versus Conventional Treatment for Infective Endocarditis

134 Patients received a diagnosis of endocarditis

44 Were excluded
   26 Underwent urgent surgery
   18 Did not have severe valve disease or vegetation
   >10 mm and underwent medical treatment

90 Were assessed for eligibility

14 Were excluded
   5 Had major stroke
   5 Were in poor medical condition
   4 Declined to participate

76 Underwent randomization

37 Were assigned to early-surgery group
39 Were assigned to conventional-treatment group

# Early Surgery versus Conventional Treatment for Infective Endocarditis

Primary endpoint (death or major embolic event within 6 weeks)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Conventional Treatment (N = 39)</th>
<th>Early Surgery (N = 37)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-hospital death or embolic event at 6 wk</td>
<td>9 (23)</td>
<td>1 (3)</td>
<td>0.01</td>
</tr>
<tr>
<td>In-hospital death</td>
<td>1 (3)</td>
<td>1 (3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Embolic event at 6 wk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any</td>
<td>8 (21)</td>
<td>0</td>
<td>0.005</td>
</tr>
</tbody>
</table>
Cumulative probability of death

Cumulative probability of composite endpoint (death or embolic event or recurrence of IE or CHF)
The limitations of the study by Kang et al

- Single-center study – Recruitment took 5 years
- Patients were young (mean age 46 years)
- Only patients with left-sided native valve IE were enrolled
- More than 60% of the cases were due to streptococci
- All-cause, 6-month mortality was 3% in ES and 5% in CT
- 77% of the patients randomized to the CT arm underwent early valve surgery
- Benefit resulted only from the decreased rate of embolic events
  - no impact on short-term mortality

Results of this trial cannot be generalized to support EVS
The timing of surgery influences mortality and morbidity in adults with severe complicated IE: a propensity analysis

<table>
<thead>
<tr>
<th></th>
<th>≤1st week surgery group (n = 95)</th>
<th>&gt;1st week surgery group (n = 196)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-month mortality</td>
<td>14 (15)</td>
<td>23 (12)</td>
<td>0.47</td>
</tr>
<tr>
<td>Relapses and postoperative valvular dysfunction</td>
<td>15 (16)</td>
<td>7 (4)</td>
<td>0.0005</td>
</tr>
<tr>
<td>Relapses</td>
<td>8 (8)</td>
<td>4 (2)</td>
<td>0.02</td>
</tr>
<tr>
<td>Postoperative valvular dysfunction</td>
<td>7 (7)</td>
<td>3 (2)</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Thuny F, Eur Heart J, 2009
Indication of EVS for prevention of embolism in an individual patient

Day 0: initiation of Ab Rx for IE
No indication for emergency surgery
No prior symptomatic stroke

High risk of embolism?

Yes
Other potential indication for surgery?

Yes
Consider urgent surgery

No
Valve repair possible?
- Operative risk (Euroscore)
- Cerebral MRI
  - Ischemic lesions?
  - Large hemorrhagic lesions?

Yes
Low
Yes
Consider very early/urgent surgery

No
Conventional Rx & follow-up

No
Other potential indication for surgery?

Yes
Vegetation
- Size
- Mobility
- Location
Microorganism

No urgent surgery

Yes
Consider very early/urgent surgery

No
Conventional Rx & follow-up
Influence of the Timing of Cardiac Surgery on the Outcome of Patients With IE and Stroke

Duke definite IE – 4794

Stroke – 857

Ischemic Stroke – 556

Ischemic Stroke with Known Date of Stroke – 492

Cardiac Surgery – 237
Medical Management – 253
Missing – 2

Known Date of Surgery – 235

Cardiac Surgery after Stroke – 198

Early surgery: ≤ 7 days after stroke
Late surgery: > 7 days after stroke

Barsic B. et al, Clin Infect Dis 2012
Influence of the Timing of Cardiac Surgery on the Outcome of Patients With IE and Stroke

One-year probability of death:
- 27.1% in EVS  \( P = .328 \)
- 19.2% in LVS  \( aHR = 1.14; 95\% CI = 0.80–1.65 \)

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### Indications for Surgery

<table>
<thead>
<tr>
<th>Indications for Surgery</th>
<th>1–7 d (n = 58)</th>
<th>&gt;7 d (n = 140)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other systemic embolization (excluding stroke)</td>
<td>26 (44.8)</td>
<td>57 (40.7)</td>
<td>.637</td>
</tr>
<tr>
<td>Intracardiac abscess</td>
<td>14 (24.1)</td>
<td>46 (32.9)</td>
<td>.240</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>20 (34.5)</td>
<td>69 (49.3)</td>
<td>.061</td>
</tr>
<tr>
<td>Persistent positive blood cultures</td>
<td>8 (13.8)</td>
<td>10 (7.1)</td>
<td>.174</td>
</tr>
<tr>
<td>Mycotic aneurism</td>
<td>1 (1.7)</td>
<td>0 (0.0)</td>
<td>.293</td>
</tr>
<tr>
<td>Valve perforation</td>
<td>11 (19.0)</td>
<td>22 (15.7)</td>
<td>.676</td>
</tr>
<tr>
<td>Intracardiac fistula formation</td>
<td>1 (1.7)</td>
<td>3 (2.2)</td>
<td>1.000</td>
</tr>
<tr>
<td>Hospital mortality</td>
<td>13 (22.4)</td>
<td>17 (12.1)</td>
<td>.082</td>
</tr>
</tbody>
</table>

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### In-Hospital Mortality Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted OR</th>
<th>95% CI</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early surgery</td>
<td>2.308</td>
<td>0.942–5.652</td>
<td>.065</td>
</tr>
<tr>
<td>Intracardiac abscess</td>
<td>4.529</td>
<td>1.921–11.152</td>
<td>.001</td>
</tr>
<tr>
<td>Healthcare-associated infection</td>
<td>4.574</td>
<td>1.919–11.093</td>
<td>.001</td>
</tr>
</tbody>
</table>

---

### One-Year Mortality Cox Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted HR</th>
<th>95% HR Confidence Limits</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early surgery</td>
<td>1.138</td>
<td>0.802–1.650</td>
<td>.481</td>
</tr>
<tr>
<td>Intracardiac abscess</td>
<td>0.990</td>
<td>0.688–1.455</td>
<td>.957</td>
</tr>
<tr>
<td>Healthcare-associated infection</td>
<td>1.533</td>
<td>0.995–2.481</td>
<td>.066</td>
</tr>
</tbody>
</table>
Neurologic complications and outcomes of infective endocarditis in critically ill patients

• 198 patients with left-sided IE, admitted to ICU
  – 108 (55%) had at least one neurologic complication
    • Ischemic stroke (n=79)  Hemorrhagic stroke (n=53)
    • Meningitis (n=41)  Intra-cerebral abscess (n=14)
    • Mycotic aneurysm (n=10)

• Factors associated with 3-month mortality (multivariate)
  – Neurologic failure (GCS <10): OR 7.41 [2.89 –18.96],
  – *S. aureus* IE : OR 3.26 [1.53– 6.94],
  – severe comorbidities before admission (Charlson >2): OR 3.16 [1.47– 6.77]
Neurologic complications and outcomes of infective endocarditis in critically ill patients

- Outcome of IE is poorer when neurologic complications were associated with neurologic failure (GCS < 10 on admission to ICU)

Sonneville, Crit Care Med 2011;39:1474
Timing of valve surgery in patients with IE and ischemic stroke

Patient with IE and ischemic stroke
No indication for emergency surgery

Residual risk of embolism?

Yes

Low operative risk (Euroscore) and GCS > 10 and no cerebral hemorrhage

Yes
Consider valve surgery

No
Postpone valve surgery

No

Vegetation
- Size
- Mobility
- Location
Prior length of Ab Rx

No surgery
Conventional follow-up
Take home messages

- In 2015, there are no evidence-based data to support the performance of EVS in IE on a systematic basis, for whatever reason
  - (SA)PVIE
  - Fungal endocarditis
  - High embolic risk

- Very early valve surgery (within 48 hours of diagnosis)
  - is the only option for patients with untractable hemodynamic condition
  - may decrease the incidence of embolism in some high-risk situations
  - BUT is associated with higher risk of relapse and/or prosthetic dehiscence
  - therefore CANNOT be recommended on a systematic basis

- The indication of EVS for prevention of embolism MUST be discussed in any IE patient on the 1st day of treatment

- Patient management should involve a multidisciplinary team with expertise in cardiology, cardiac surgery, and infectious diseases
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