

Embolitic Risk in Infective Endocarditis

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2015 Guidelines for the Management of Infective Endocarditis

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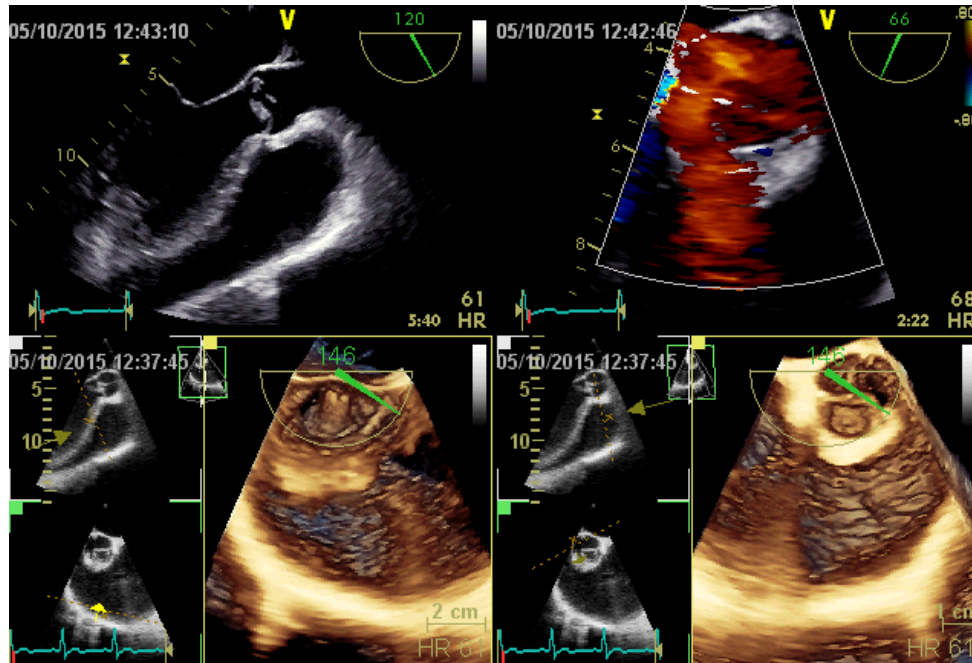
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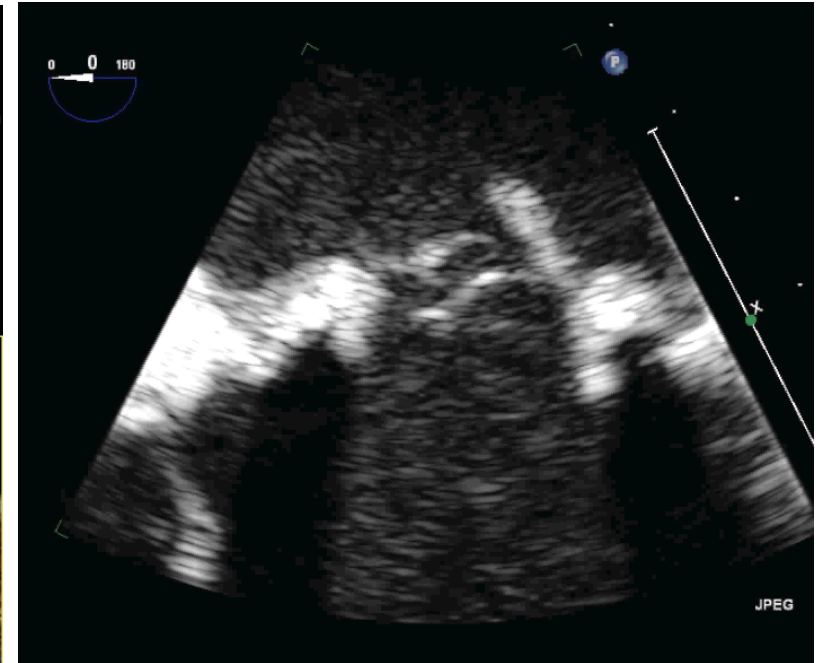
Imaging Diagnosis

Clinical Context

Native valve IE



Prosthetic valve IE



When to operate?

Embolic risk in IE

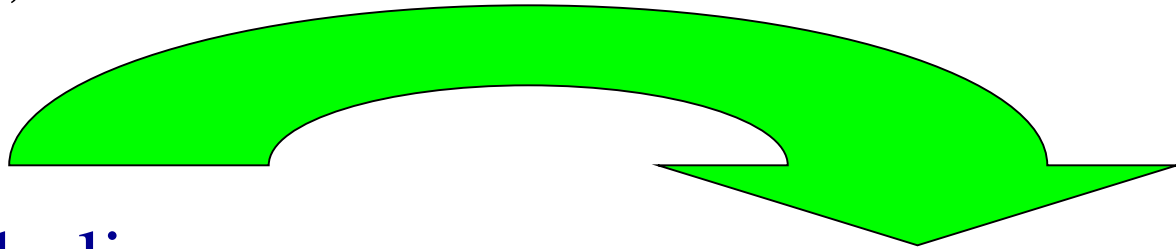
1. What is the risk of embolism in IE?
2. Can we predict the risk of embolism?
3. Can we prevent embolic events?
4. What to do in neurological complication?

Embolic risk in IE

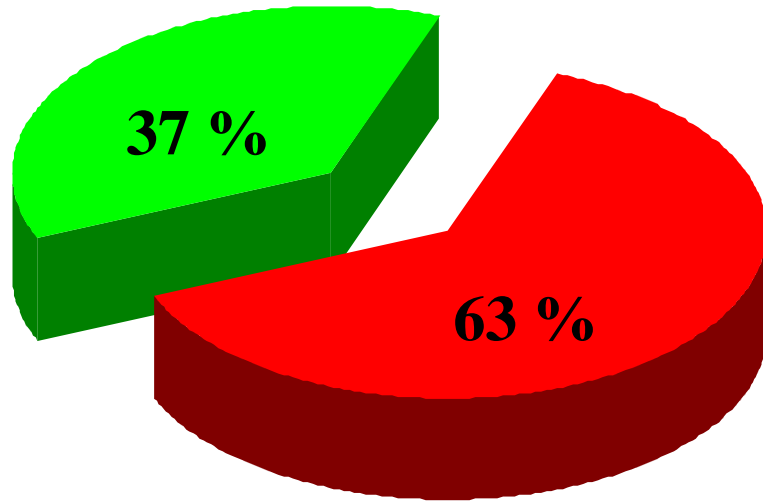
1. **What is the risk of embolism in IE?**
2. Can we predict the risk of embolism?
3. Can we prevent embolic events?
4. What to do in neurological complication?

TEE and embolic risk

178 patients, definite IE

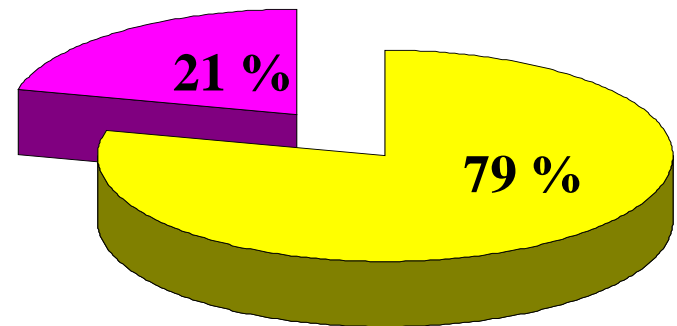


With embolism



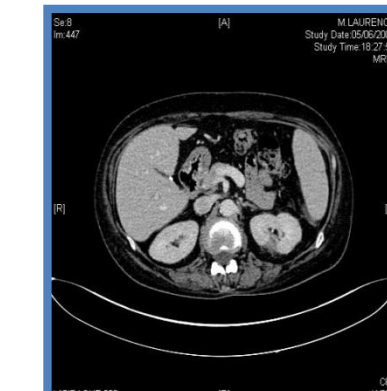
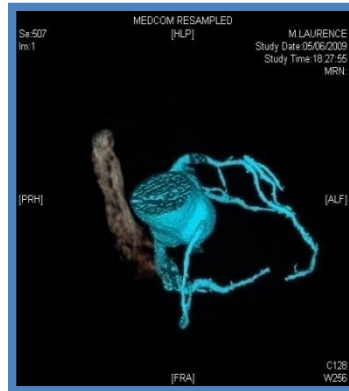
Without embolism

silent embolism

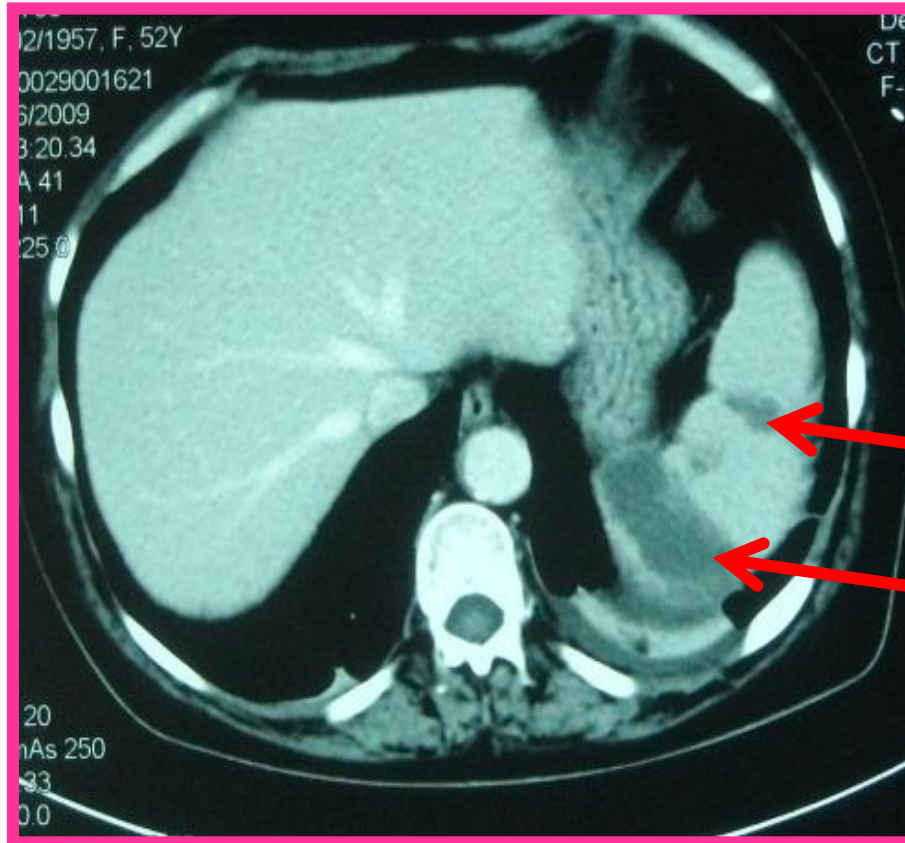


clinical embolism

« Endocarditis » CT-scan

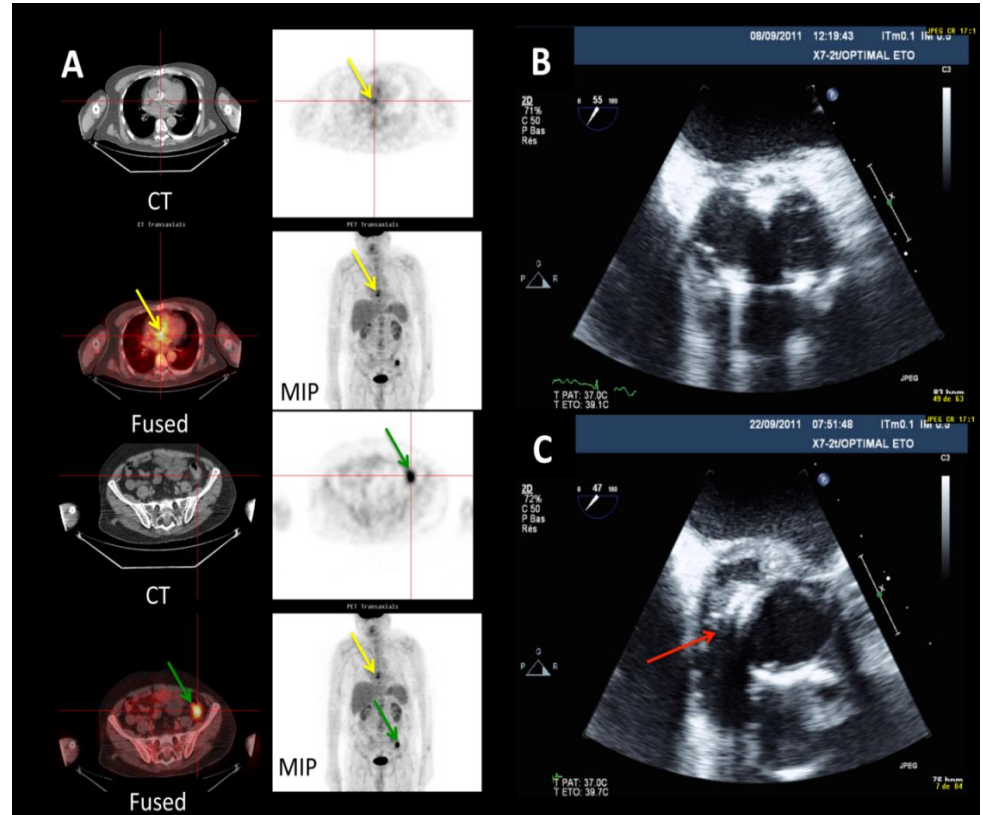


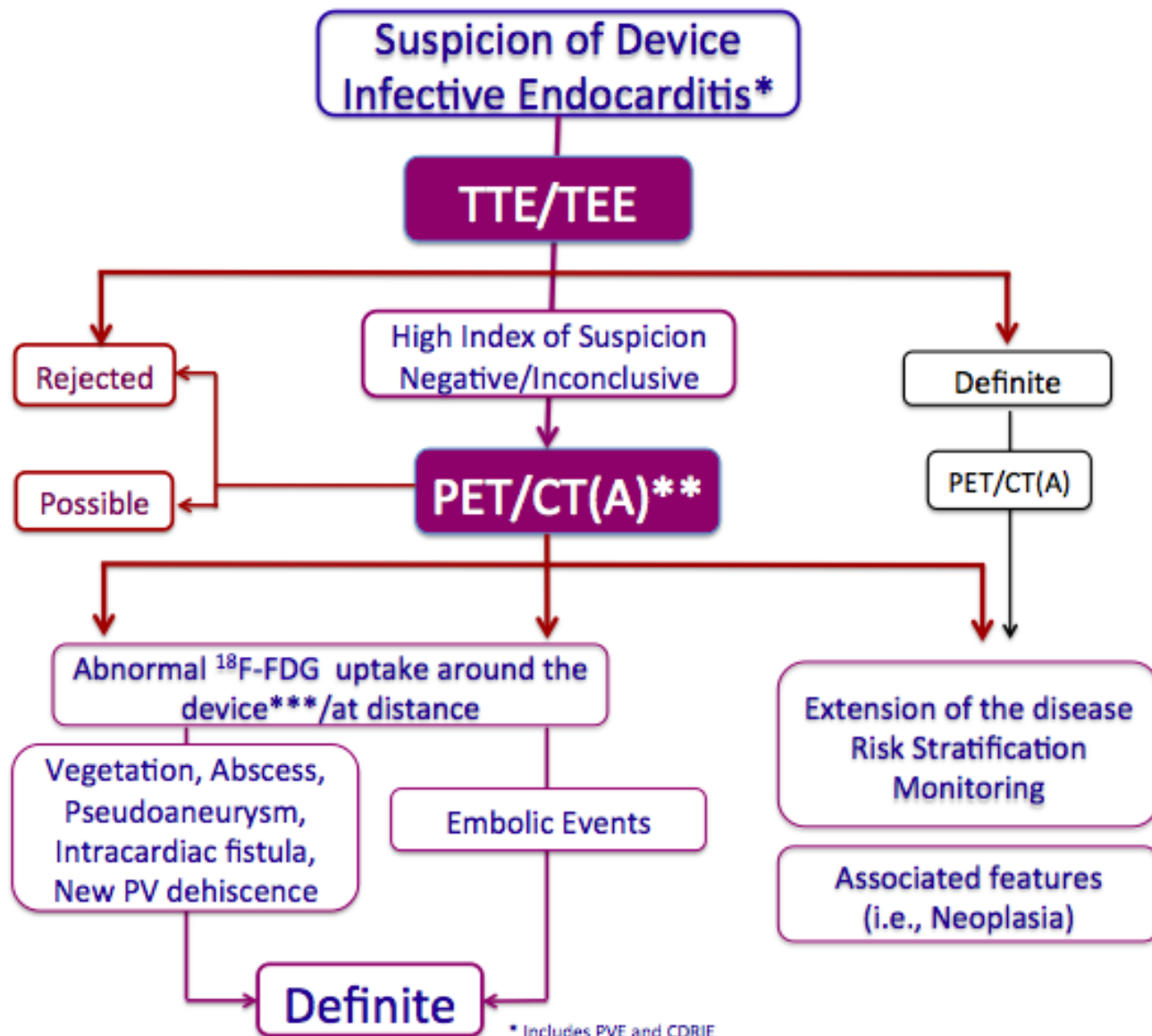
CT-scan imaging



18FDG-PET-CT in endocarditis

1. Early diagnosis of perivalvular lesions
2. Detection of secondary lesions



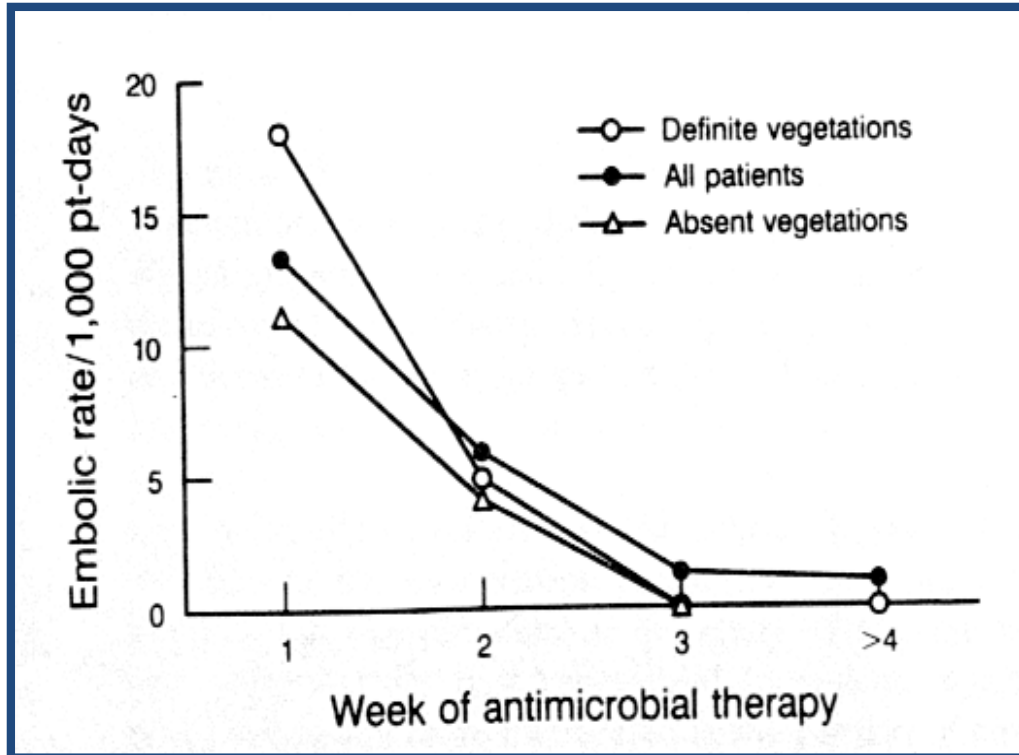


* Includes PVE and CDRIE

** Radiolabelled Leukocytes SPECT/CT can be used as an alternative

*** only after >3 months of implantation for PV and >6 weeks for other devices (i.e., pacemaker)

Embotic risk under therapy



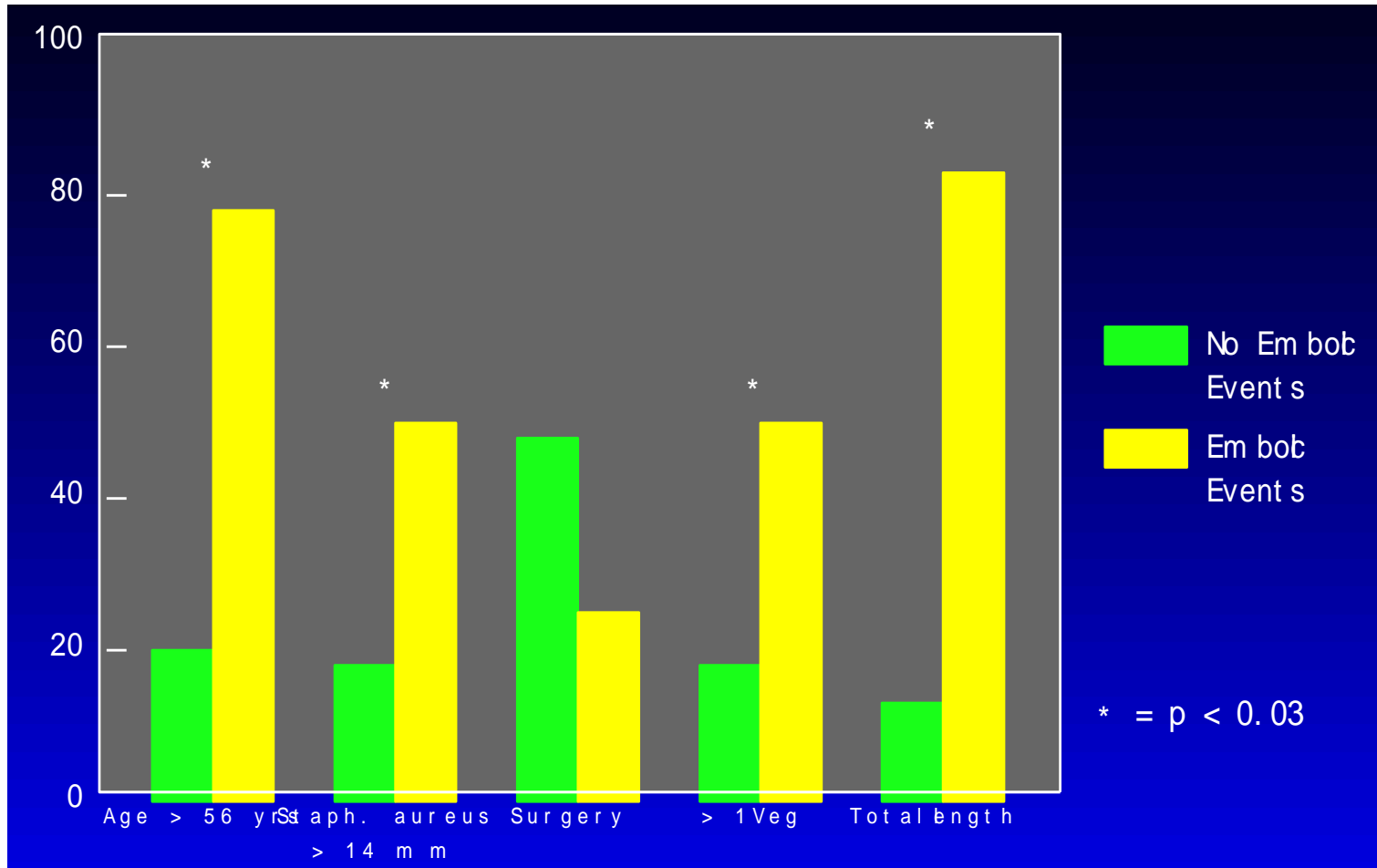
- 207 IE
- 13 % embolic events

- ✦ 13/1000 pt/d during the 1st week
- ✦ 1.2/1000 pt/d after the 2nd week

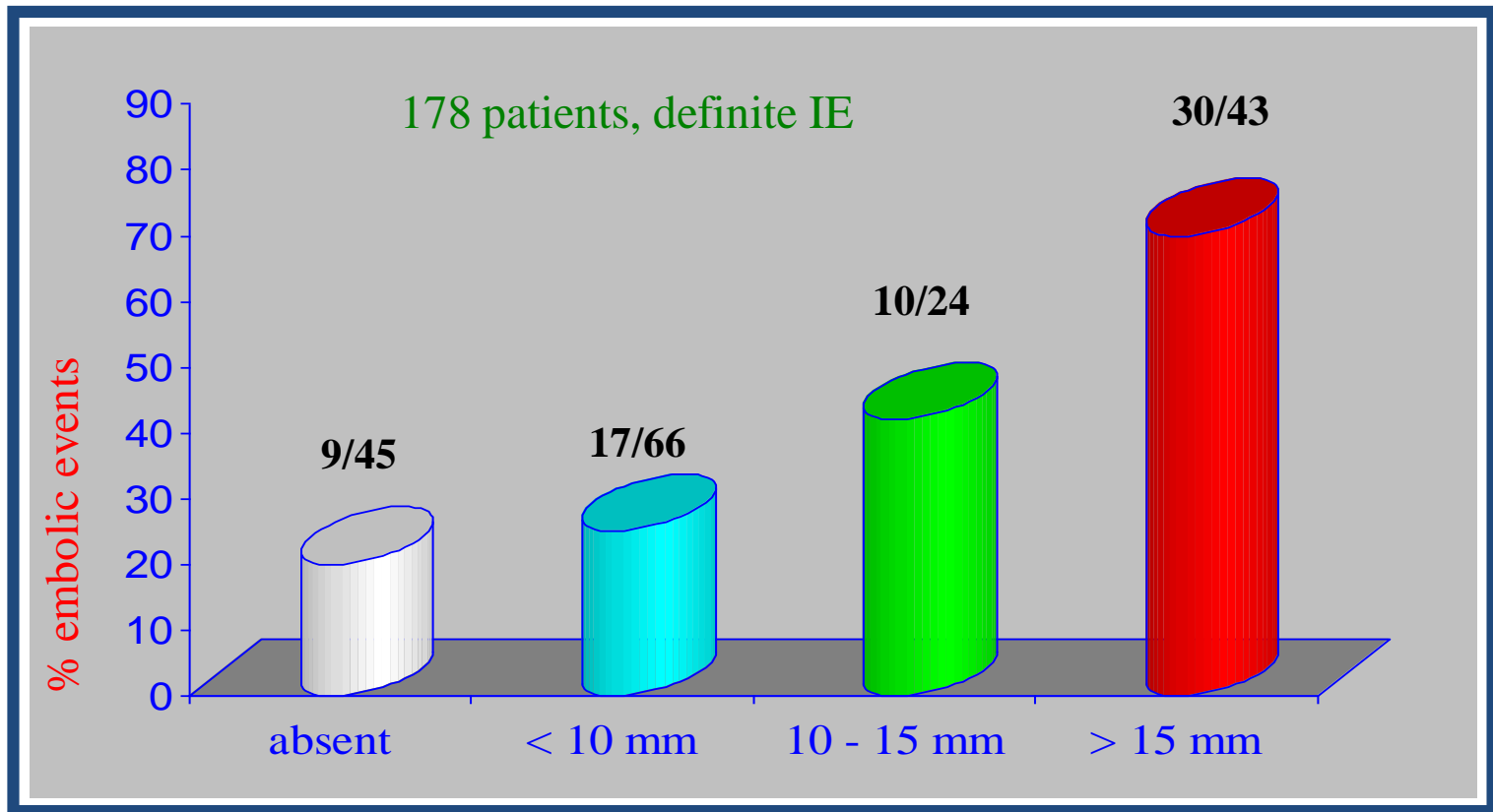
Embolic risk in IE

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TEE and embolic risk

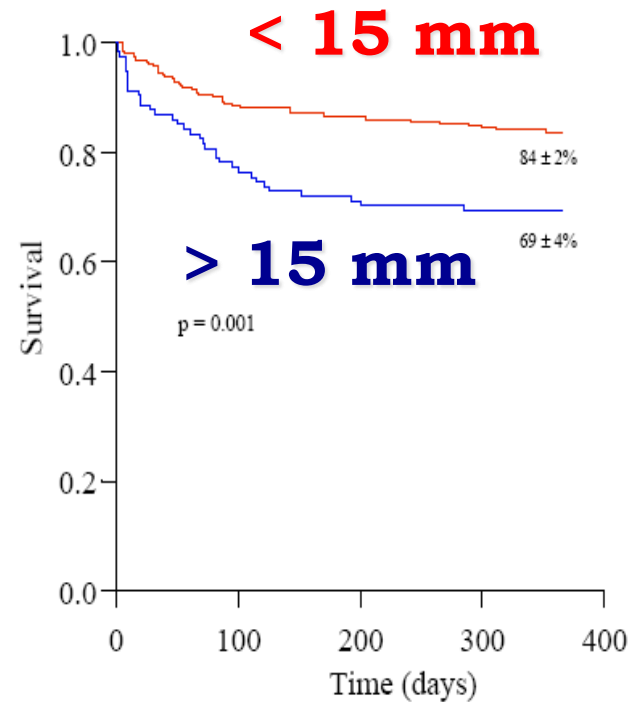
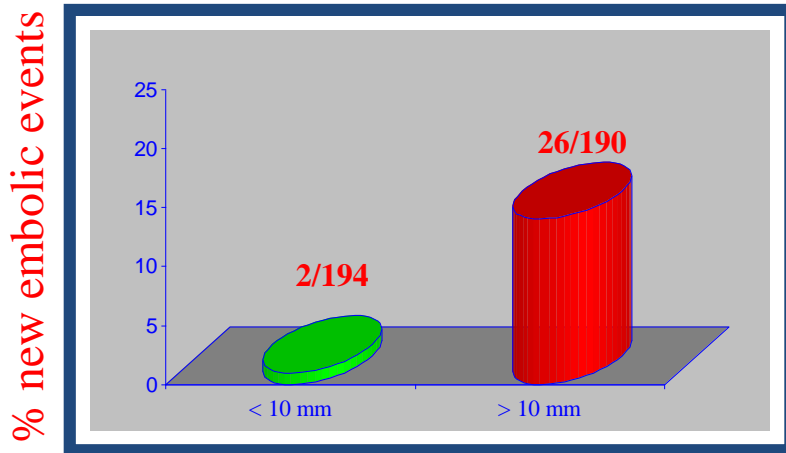


TEE and embolic risk

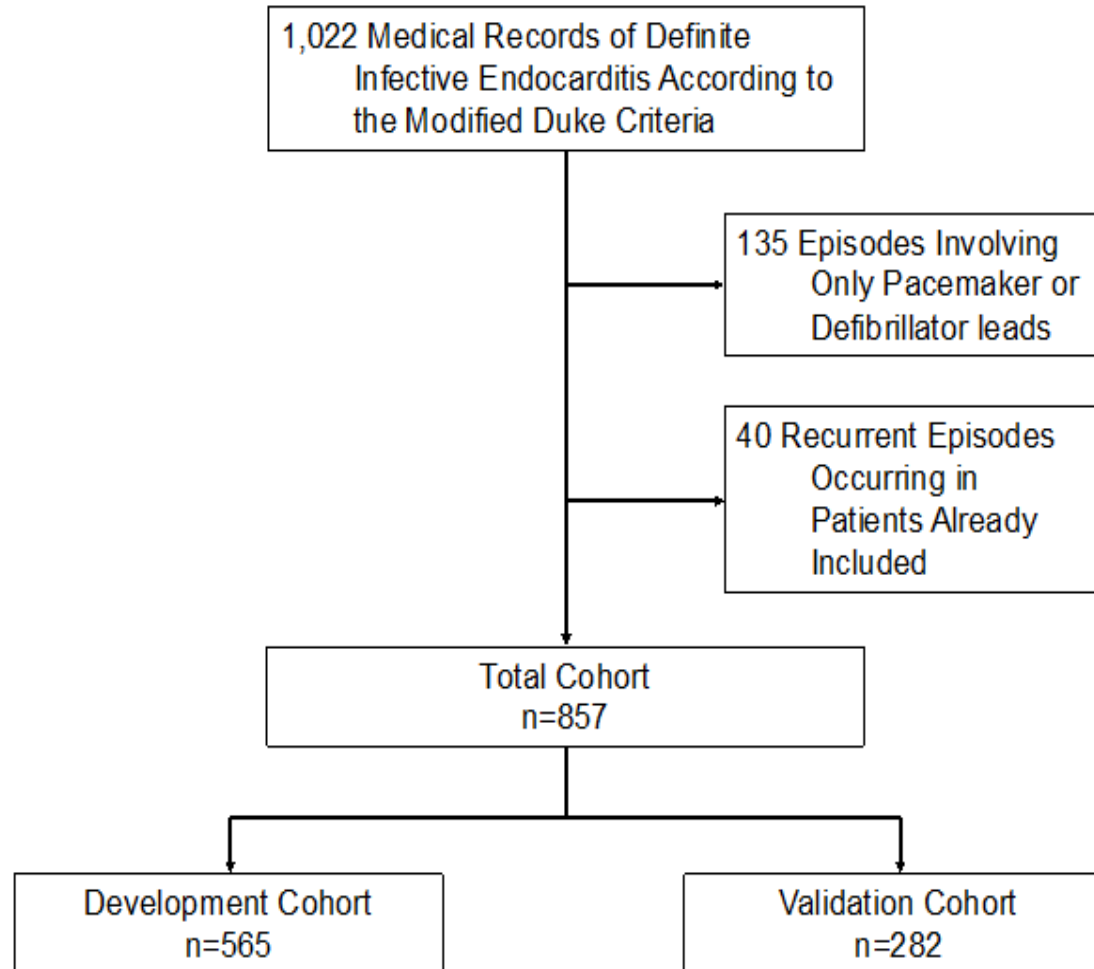


Embotic risk under therapy

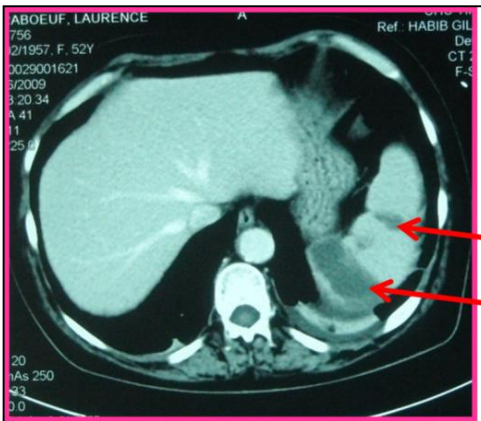
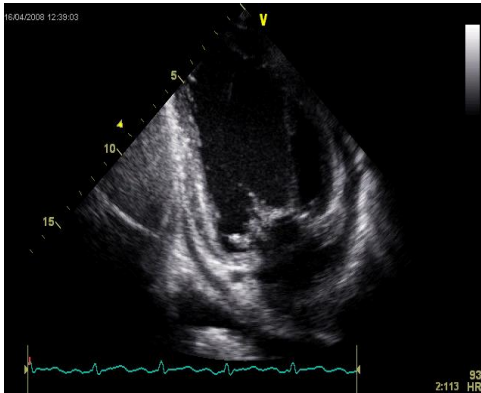
- 384 IE , multicentre European study
- 131 (34%) EE, 28 (7.3%) EE under therapy
- 20 (71.4%) during the first 15 days



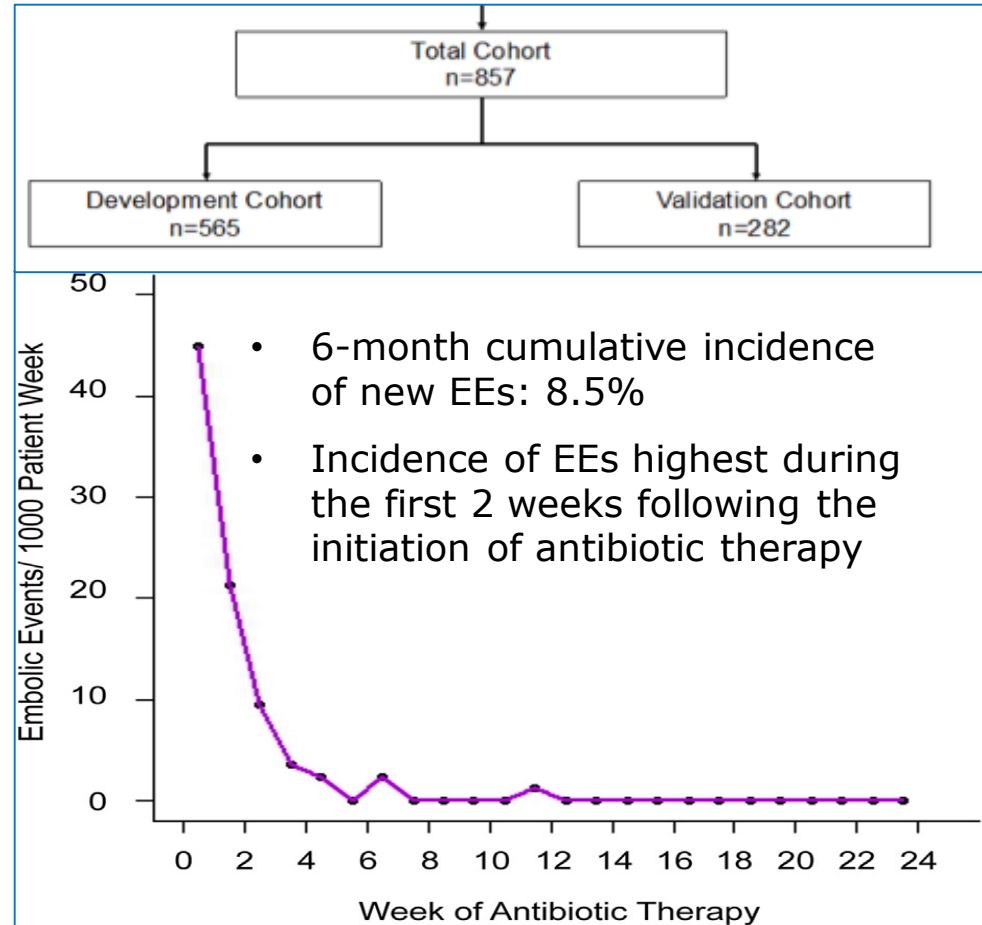
The embolic risk in IE



The embolic risk in IE



- 44.9 EEs per 1000 patient-weeks the first week
- 21.3 EEs per 1000 patient-weeks the second week



Can we predict the embolic risk ?

- Confirmation that EE are related to the vegetation size

Variable	Univariate Analysis p Value	Multivariate Analysis	
		Hazard Ratio (95% Confidence Interval)	p Value
Age	0.15	1.01 (0.99–1.03)	0.18
Diabetes	0.05	1.30 (0.61–2.80)	0.50
Previous embolism	0.04	1.40 (0.74–2.65)	0.30
Atrial fibrillation	0.07	1.66 (0.81–3.41)	0.17
Vegetation length (mm) (stratified)*	0.001		
>0 to ≤10		1.26 (0.24–6.69)	0.79
>10		4.46 (1.06–18.88)	0.04
<i>Staphylococcus aureus</i>	0.07	1.78 (0.85–3.76)	0.13

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Can we calculate the embolic risk ?

The embolic risk calculator

Risk Calculator for 6-Month Embolic Risk for Infective Endocarditis

Collect the following clinical, echocardiographic, and microbiological variables at admission of patient with infective endocarditis.

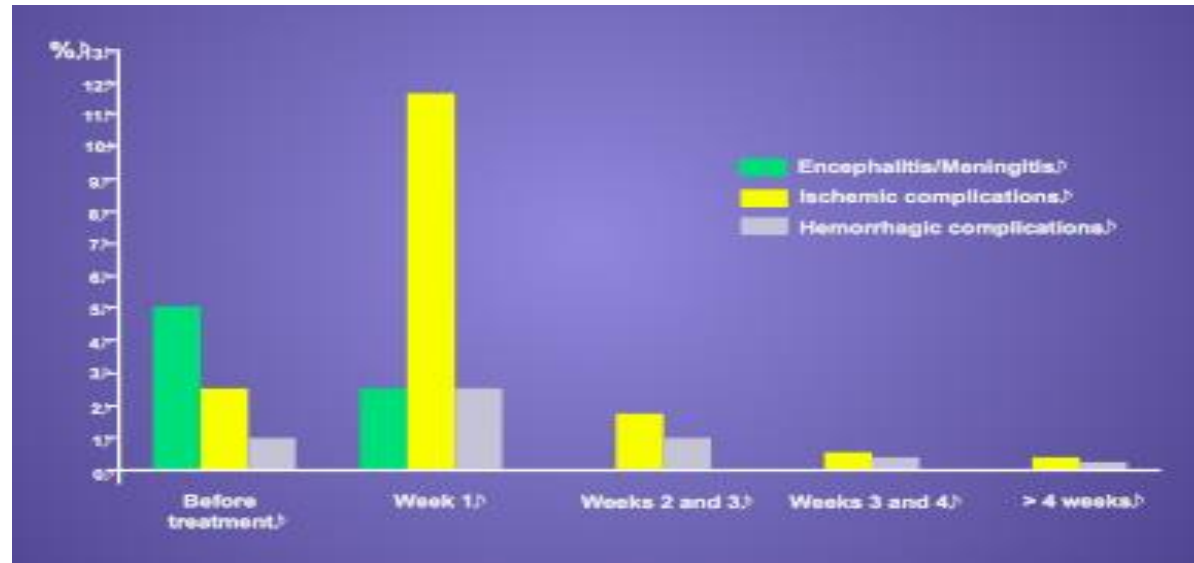
Then, the predicted embolic risk is automatically calculated at different times.

PREDICTED EMBOLIC RISK CALCULATION	
Time (Days)	Predicted Embolic Risk
1	4%
2	6%
3	9%
4	12%
5	13%
6	14%
7	14%
10	16%
11	17%
12	18%
13	21%
14	22%
18	22%
19	23%
23	24%
28	25%
35	25%
47	26%
48	26%
180	27%

Can we predict the risk of stroke?

- 1345 consecutive episodes of left-sided IE from 8 centers in Spain
- 340 neurological events.
- Factors associated with neurological events
 - Vegetation size ≥ 3 cm HR 1.91
 - Staphylococcus aureus HR 2.47
 - Mitral valve involvement HR 1.29
 - Anticoagulant therapy HR 1.31

- The majority of ischemic strokes occurred during the first week of ATB therapy
- Very large (> 3 cm) vegetations are associated with high EE (20%) even after the first week



Embolic risk under therapy

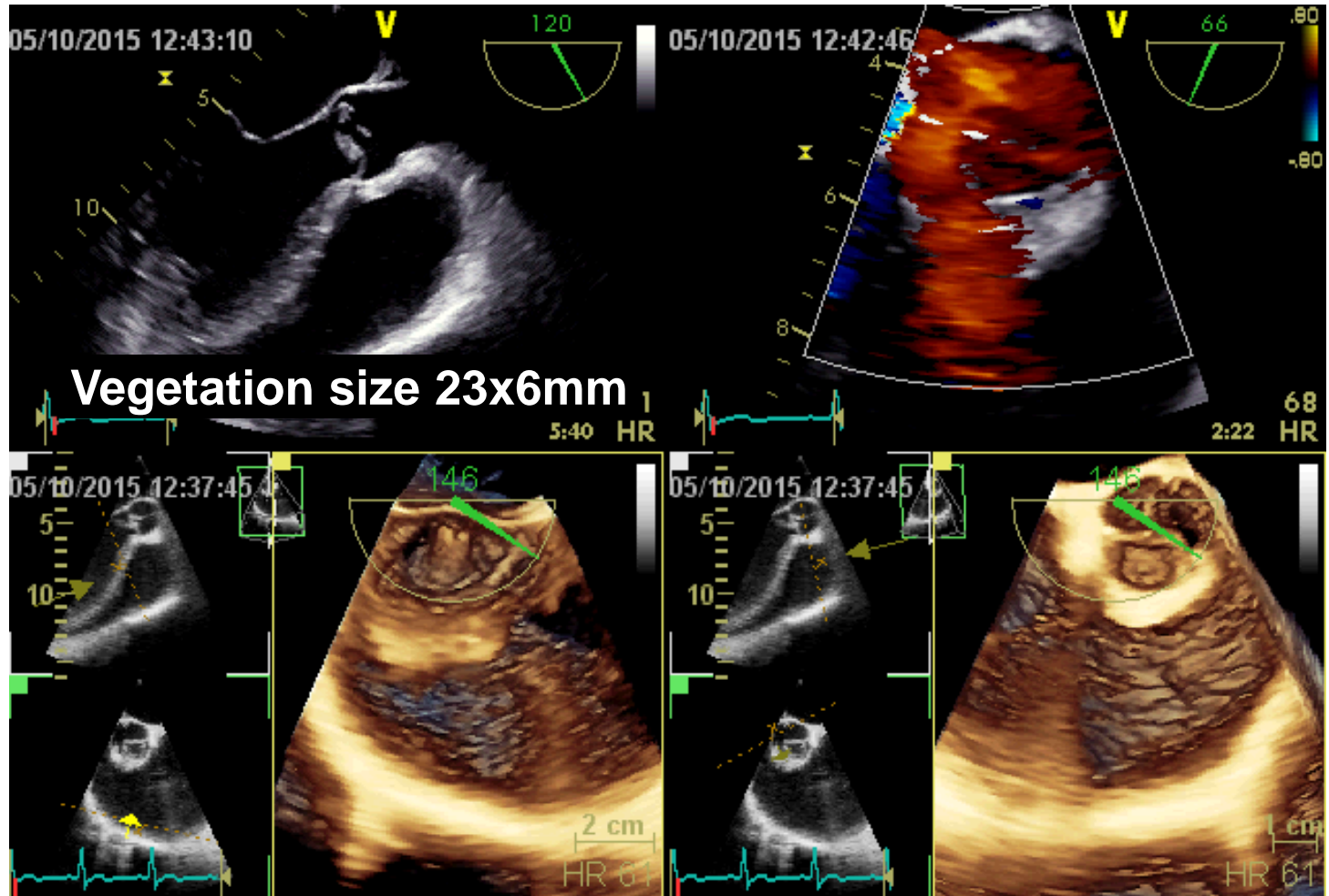
The risk of new embolism

1. Dramatically decreases after initiation of ATB
2. Is still high during the first 2 weeks of ATB
3. Is related to the size and mobility of the vegetation
4. Is also related to other than echocardiographic factors
5. Can be reduced by very early surgery ?

Embolic risk in IE

1. What is the risk of embolism in IE?
2. Can we predict the risk of embolism?
- 3. Can we prevent embolic events?**
4. What to do in neurological complication?

When to operate to prevent EE?



ORIGINAL ARTICLE

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.

Study Patients

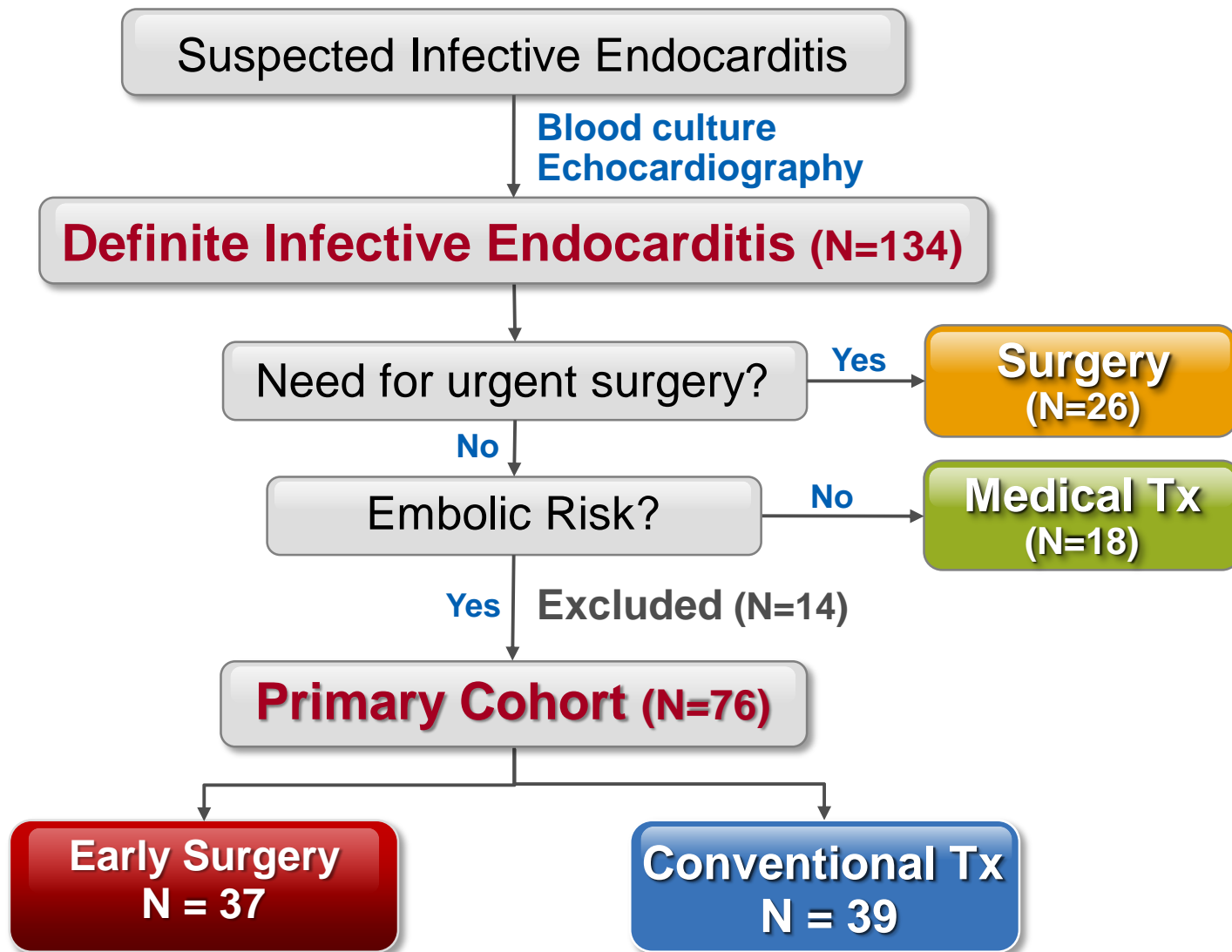
- All patients suspected of IE underwent **blood cultures and echocardiography** within 24 hrs after hospitalization

Inclusion Criteria

- Age: 15-80 years
- Definite **left-sided native valve IE** according to Duke criteria
- Severe mitral or aortic valve disease
- **Vegetation length > 10mm**

Exclusion Criteria

- **Pts with urgent indication of surgery** moderate to severe CHF, heart block, annular or aortic abscess, penetrating lesions, fungal endocarditis
- **Pts not candidates for early surgery** age > 80 yrs, coexisting major embolic stroke or poor medical status
- Prosthetic valve IE
- Right-sided vegetations
- Small vegetations $\leq 10\text{mm}$



Primary end point:

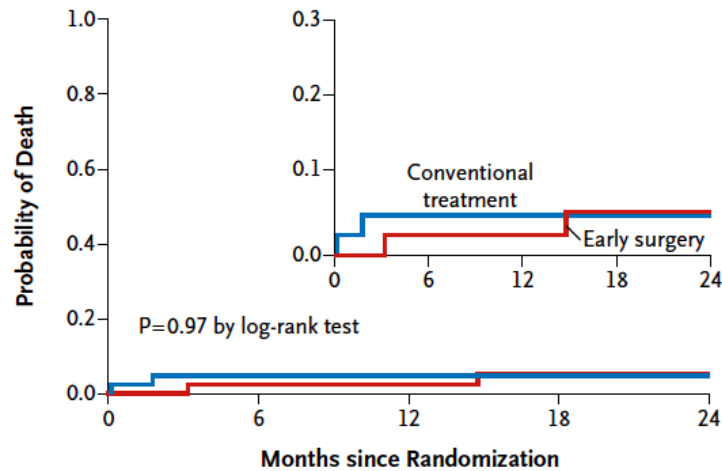
In-hospital death and clinical embolic events at 6 weeks

Embololic risk under therapy

Randomization of pts. with severe valve disease, and large vegetations to early surgery (37 patients) or conventional treatment (39)

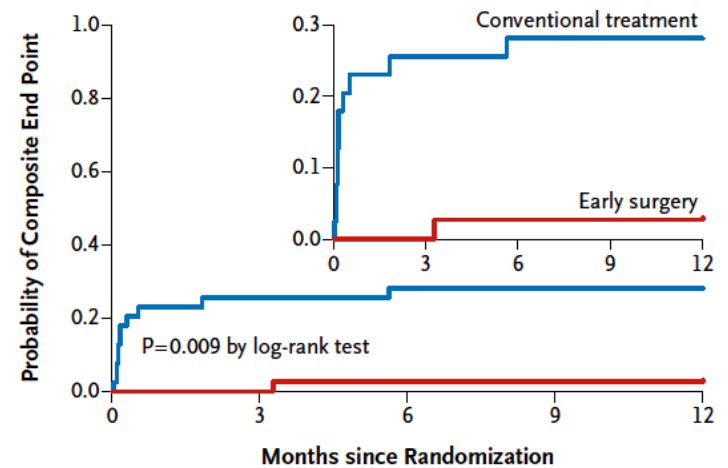
Primary EP: in hospital death, EE, recurrence of IE, repeat hospitalization due to the development of CHF

A



No. at Risk	0	6	12	18	24
Early surgery	37	36	33	28	21
Conventional treatment	39	37	31	27	23

B



No. at Risk	0	3	6	9	12
Early surgery	37	37	36	34	33
Conventional treatment	39	29	28	25	24

Indications and timing of surgery

Indications for surgery	Timing	Class	Level
1. Heart Failure			
Aortic or mitral NVE or PVE with severe acute regurgitation, obstruction or fistula causing refractory pulmonary oedema or cardiogenic shock.	Emergency	I	B
Aortic or mitral NVE or PVE with severe regurgitation or obstruction causing symptoms of HF or echocardiographic signs of poor haemodynamic tolerance.	Urgent	I	B
2. Uncontrolled infection			
Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation).	Urgent	I	B
Infection caused by fungi or multiresistant organisms.	Urgent/elective	I	C
Persisting positive blood cultures despite appropriate antibiotic therapy and adequate control of septic metastatic foci.	Urgent	IIa	B
PVE caused by staphylococci or non-HACEK Gram negative bacteria.	Urgent/elective	IIa	C
3. Prevention of embolism			
Aortic or mitral NVE or PVE with persistent vegetations >10 mm after one or more embolic episode despite appropriate antibiotic therapy.	Urgent	I	B
Aortic or mitral NVE with vegetations >10 mm, associated with severe valve stenosis or regurgitation, and low operative risk.	Urgent	IIa	B
Aortic or mitral NVE or PVE with isolated very large vegetations (>30 mm).	Urgent	IIa	B
Aortic or mitral NVE or PVE with isolated large vegetations (>15 mm) and no other indication for surgery.	Urgent	IIb	C

Indications and timing of surgery in left-sided valve IE: **Prevention of embolism**

Indications for surgery	Timing	Class	Level
3. Prevention of embolism			
Aortic or mitral NVE or PVE with persistent vegetations >10 mm after ≥1 embolic episodes despite appropriate antibiotic therapy.	Urgent	I	B
Aortic or mitral NVE with vegetations >10 mm , associated with severe valve stenosis or regurgitation, and low operative risk .	Urgent	IIa	B
Aortic or mitral NVE or PVE with isolated very large vegetations (>30 mm).	Urgent	IIa	B
Aortic or mitral NVE or PVE with isolated large vegetations (>15 mm) and no other indication for surgery.	Urgent	IIb	C

* Surgery may be preferred if procedure preserving the native valve is feasible

Early Surgery for IE

Prevention of Embolism

2014 AHA/ACC guidelines

Class IIa indication

- Recurrent emboli and persistent vegetation despite antibiotic Tx

Class IIb indication

- Mobile large vegetations in excess of 10 mm

2015 ESC guidelines

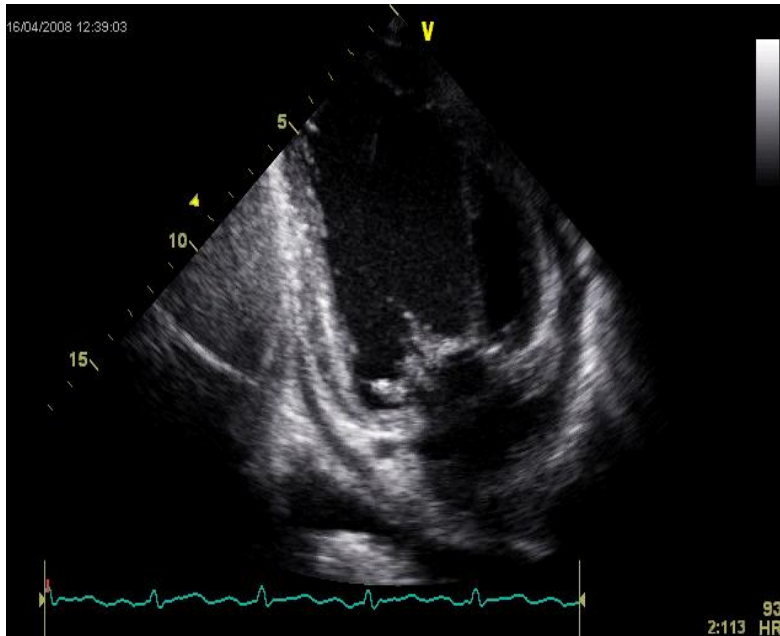
Class I indication

- Large vegetations (> 10mm) following **one** or more embolism despite antibiotic Tx

Class IIb indication

- Isolated very large vegetations in excess of 15 mm

When to operate to prevent EE?



Native valve IE

- Large vegetation
- High embolic risk
- High probability of valve repair



Surgical therapy

Indications and timing of surgery in left-sided valve IE: **Prevention of embolism**

Indications for surgery	Timing	Class	Level
3. Prevention of embolism			
Aortic or mitral NVE or PVE with persistent vegetations >10 mm after ≥1 embolic episodes despite appropriate antibiotic therapy.	Urgent	I	B
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Aortic or mitral NVE or PVE with isolated very large vegetations (>30 mm).	Urgent	IIa	B
Aortic or mitral NVE or PVE with isolated large vegetations (>15 mm) and no other indication for surgery.	Urgent	IIb	C

Do not delay surgery !!!!

Early Surgery for IE

Prevention of Embolism

2014 AHA/ACC guidelines

Early Surgery

- during the initial hospitalization before completion of a full course of antibiotics

2015 ESC guidelines

Urgent Surgery

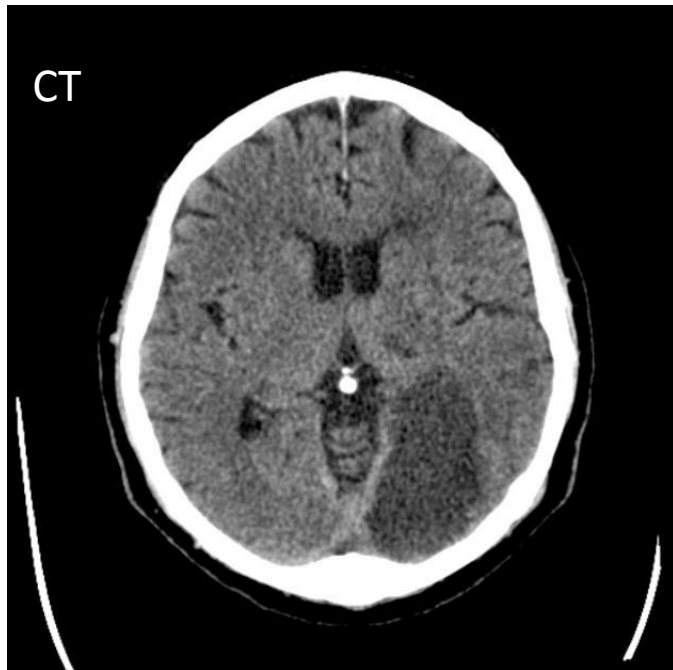
- Within a few days, <7 days

Embolic risk in IE

1. What is the risk of embolism in IE?
2. Can we predict the risk of embolism?
3. Can we prevent embolic events?
4. **What to do in neurological complication?**

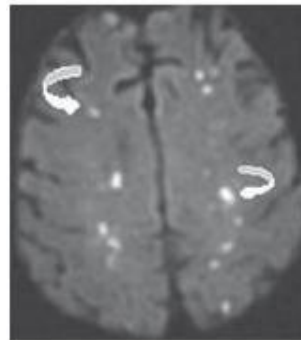
Therapeutic strategy for patients with IE and neurological complications

- Symptomatic in 15–30% vs. Silent in 35–60% of IE
- Consequence of embolism from vegetations



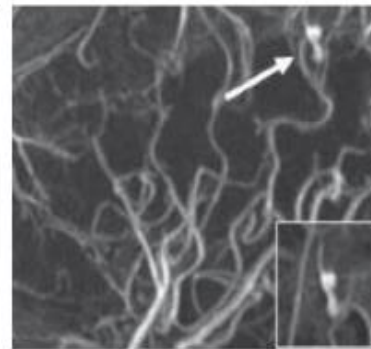
Cerebral MRI

Diffusion



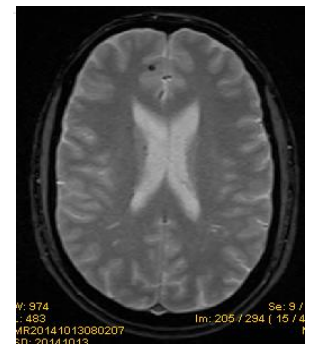
Ischemic Emboli

MR angiography



Infectious aneurysms

T2*

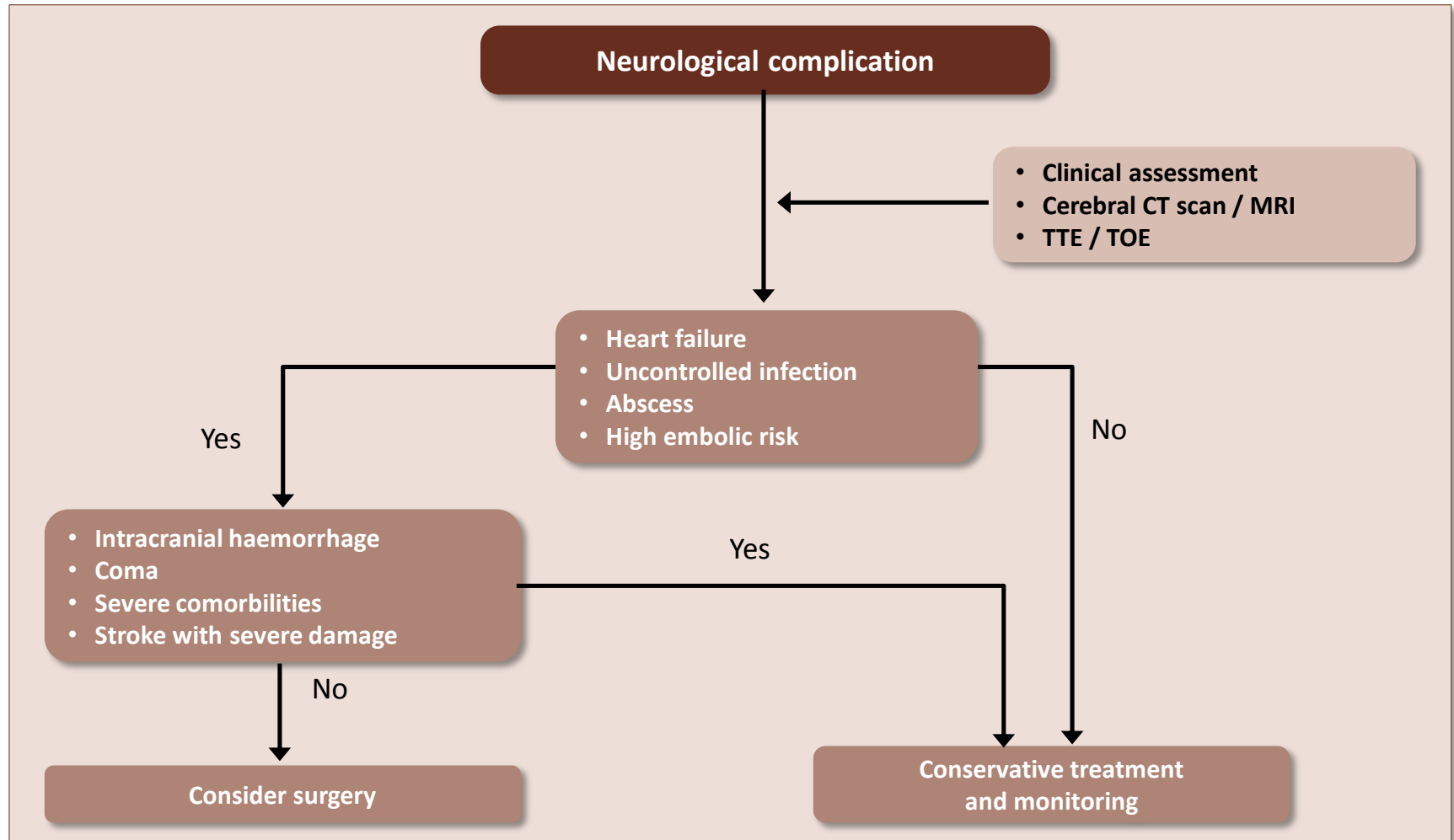


Microbleeds

No Minor criteria

Minor criteria

Therapeutic strategy for patients with IE and neurological complications



Management of neurological complications of IE

Recommendations	Class	Level
After a silent embolism or transient ischaemic attack , cardiac surgery, if indicated, is recommended without delay.	I	B
Neurosurgery or endovascular therapy is indicated for very large, enlarging or ruptured intracranial infectious aneurysms .	I	C
Following intracranial haemorrhage, surgery should generally be postponed for ≥ 1 month.	IIa	B
After a stroke , surgery indicated for HF, uncontrolled infection, abscess, or persistent high embolic risk should be considered without any delay as long as coma is absent and the presence of cerebral haemorrhage has been excluded by cranial CT or MRI.	IIa	B
Intracranial infectious aneurysms should be looked for in patients with IE and neurological symptoms . CT or MR angiography should be considered for diagnosis. If non-invasive techniques are negative and the suspicion of intracranial aneurysm remains, conventional angiography should be considered.	IIa	B

Conclusion: the risk of embolism

1. Is very high in IE (1/3 patients overall)
2. Dramatically decreases after initiation of ATB
3. Is still high during the first 2 weeks of ATB
4. Is related to the size and mobility of the vegetation
5. Needs an early (surgical) decision by a multidisciplinary team