

Approches thérapeutiques et timing de la chirurgie dans les endocardites infectieuses graves

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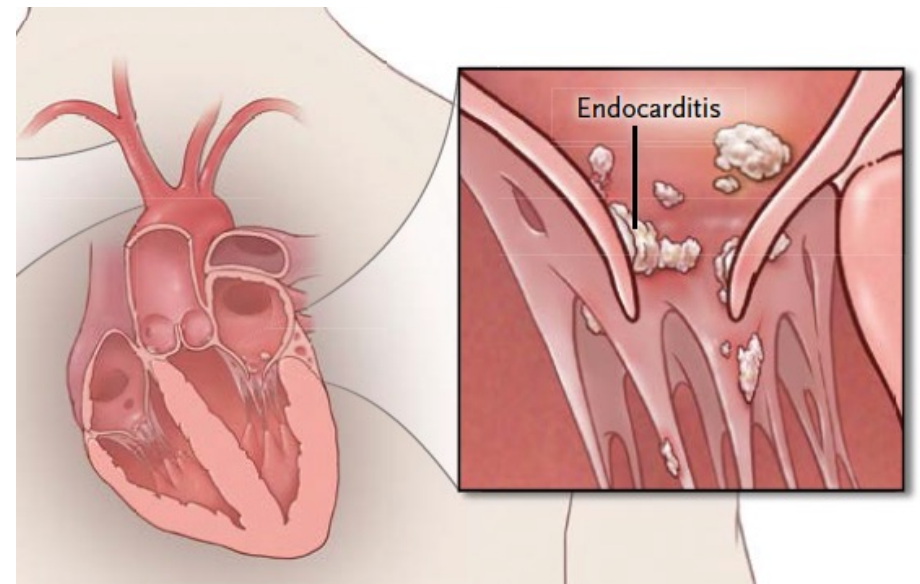
Liens d'intérêt

- aucun

- **Endocardites en 2022: définitions, épidémiologie**
- Particularités du malade de réanimation
- Antibiothérapie initiale
- Chirurgie précoce
- Complications neurologiques
- Perspectives

Infective Endocarditis

Bruno Hoen, M.D., Ph.D., and Xavier Duval, M.D., Ph.D.



- Infection resulting from the **colonization of damaged valvular endothelium by circulating bacteria** with specific adherence properties.
- **Valvular endothelial damage** may result from various mechanisms :
 - « **jet lesions** » due to turbulent blood flow
 - provoked by **electrodes or catheters**
 - or by **repeated intravenous injections** of solid particles in (IV-drug users)
 - Or by **chronic inflammation**, as in chronic rheumatic heart disease and degenerative valvular lesions

Infective Endocarditis

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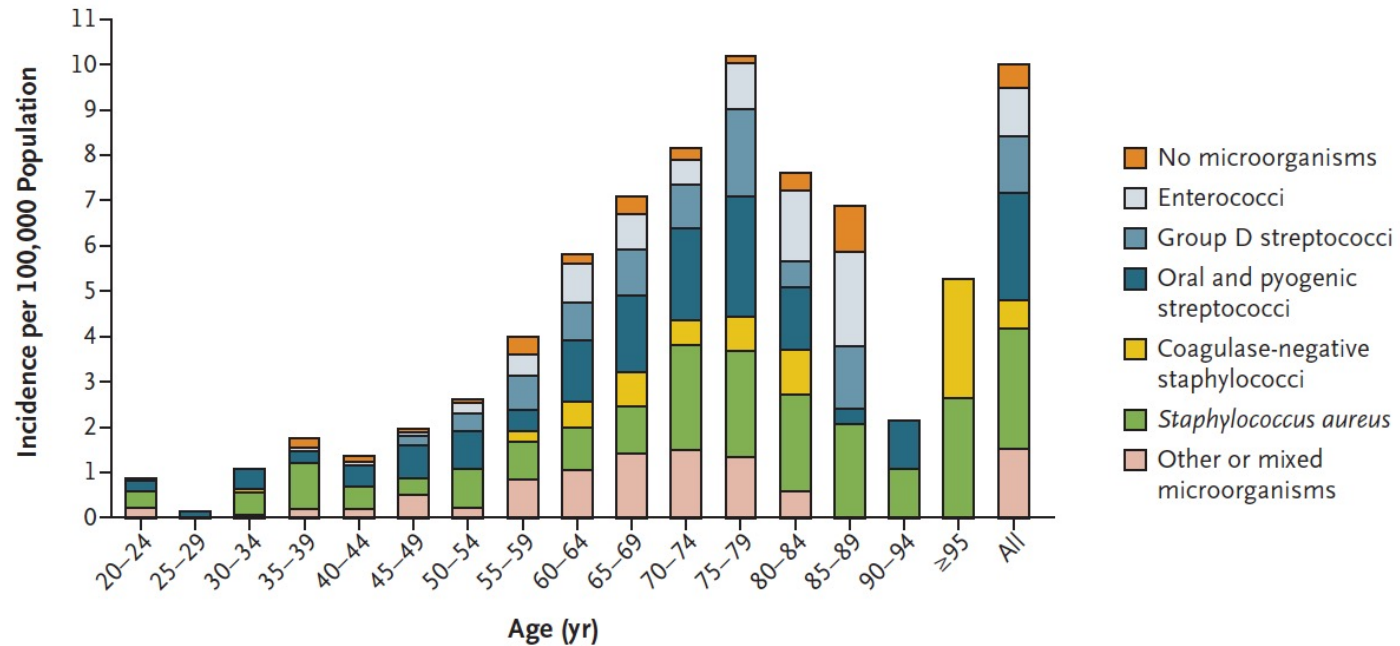


Figure 1. Incidence of Definite Infective Endocarditis, According to Age and Microorganism.

Streptococci + staphylococci

= 80% of cases

Proportions varying according to :

- patient age
- coexisting conditions.
- valve (native vs. prosthetic)
- source of infection

Management Considerations in Infective Endocarditis

A Review

Andrew Wang, MD; Jeffrey G. Gaca, MD; Vivian H. Chu, MD, MHS

Risk Factors for Acquisition of Infective Endocarditis

Age older than 60 years

Male sex

Structural heart disease

Valvular disease (eg, rheumatic heart disease, mitral valve prolapse, degenerative)

Congenital heart disease (eg, ventricular septal defect, bicuspid aortic valve)

Prosthetic valve

Prior infective endocarditis

Intravenous drug use

Chronic hemodialysis

Intravascular catheter

Indwelling cardiovascular device

Skin infection

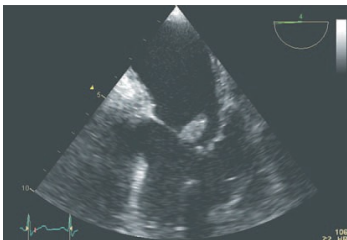
Oral hygiene or dental pathology

Table 1. Clinical Signs and Complications of Infective Endocarditis

Sign	Patients, %
Fever	86-96
New murmur	48
Worsening of old murmur	20
Hematuria	26
Vascular embolic event	17
Splenomegaly	11
Splinter hemorrhages	8
Osler nodes	3
Janeway lesions	5
Roth spots	2
Complication	
Stroke	17-20
Nonstroke embolization	23-33
Heart failure	14-33
Intracardiac abscess	14-20
New conduction abnormality	8

Definition of infective endocarditis according to the modified DUKE criteria

Definite IE	Major criteria	Minor criteria
<p>Pathological criteria</p> <ul style="list-style-type: none"> • Microorganisms demonstrated by culture or on histological examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or • Pathological lesions; vegetation or intracardiac abscess confirmed by histological examination showing active endocarditis <p>Clinical criteria</p> <ul style="list-style-type: none"> • 2 major criteria; or • 1 major criterion and 3 minor criteria; or • 5 minor criteria 	<p>1. Blood cultures positive for IE</p> <p>a. Typical microorganisms consistent with IE from 2 separate blood cultures:</p> <ul style="list-style-type: none"> • <i>Viridans streptococci</i>, <i>Streptococcus gallolyticus</i> (<i>Streptococcus bovis</i>), <i>HACEK group</i>, <i>Staphylococcus aureus</i>; or • Community-acquired enterococci, in the absence of a primary focus; or <p>b. Microorganisms consistent with IE from persistently positive blood cultures:</p> <ul style="list-style-type: none"> • ≥ 2 positive blood cultures of blood samples drawn >12 h apart; or • All of 3 or a majority of ≥ 4 separate cultures of blood (with first and last samples drawn ≥ 1 h apart); or <p>c. Single positive blood culture for <i>Coxiella burnetii</i> or phase I IgG antibody titre $>1:800$</p> <p>2. Imaging positive for IE</p> <p>a. Echocardiogram positive for IE:</p> <ul style="list-style-type: none"> • Vegetation; • Abscess, pseudoaneurysm, intracardiac fistula; • Valvular perforation or aneurysm; • New partial dehiscence of prosthetic valve. <p>b. Abnormal activity around the site of prosthetic valve implantation detected by ^{18}F-FDG PET/CT (only if the prosthesis was implanted for >3 months) or radiolabelled leukocytes SPECT/CT.</p> <p>c. Definite paravalvular lesions by cardiac CT.</p>	<p>1. Predisposition such as predisposing heart condition, or injection drug use.</p> <p>2. Fever defined as temperature $>38^\circ\text{C}$.</p> <p>3. Vascular phenomena (including those detected by imaging only): major arterial emboli, septic pulmonary infarcts, infectious (mycotic) aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway's lesions.</p> <p>4. Immunological phenomena: glomerulonephritis, Osler's nodes, Roth's spots, and rheumatoid factor.</p> <p>5. Microbiological evidence: positive blood culture but does not meet a major criterion as noted above or serological evidence of active infection with organism consistent with IE.</p>



Clinical presentation, aetiology and outcome of infective endocarditis. Results of the ESC-EORP EURO-ENDO (European infective endocarditis) registry: a prospective cohort study

Gilbert Habib^{1,2*}, Paola Anna Erba^{3,4}, Bernard Lung⁵, Erwan Donal⁶, Bernard Cosyns⁷, Cécile Laroche⁸, Bogdan A. Popescu⁹, Bernard Prendergast¹⁰, Pilar Tornos¹¹, Anita Sadeghpour¹², Leopold Oliver¹³, Jolanta-Justina Vaskelyte¹⁴, Rouguiatou Sow¹⁵, Olivier Axler¹⁶, Aldo P. Maggioni¹⁷, and Patrizio Lancellotti^{18,19,20}, on behalf of the EURO-ENDO Investigators[†]

Prospective cohort, 3116 adult patients, 156 hospitals, 40 countries.

January 2016 - March 2018

Diagnosis of IE based on ESC 2015 diagnostic criteria

Infective endocarditis types:

native valve endocarditis: 1764 (56.6%) patients

prosthetic valve endocarditis: 939 (30.1%) patients

device-related: 308 (9.9%) patients

Infective endocarditis was **community-acquired** in 2046 (65.66%) patients.

Microorganisms involved:

Staphylococci: 1085 (44.1%) patients

Oral streptococci: 304 (12.3%) patients

Enterococci: 390 (15.8%) patients

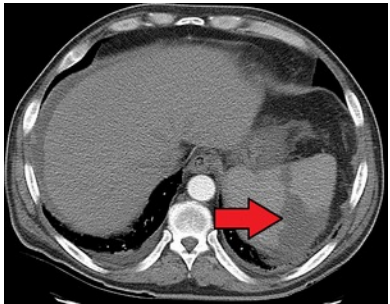
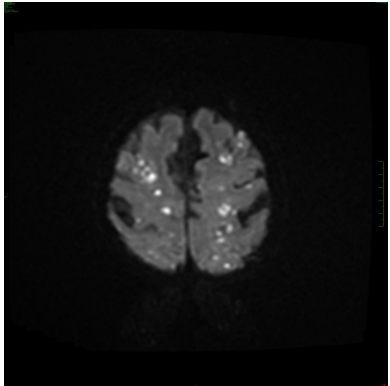
Streptococcus gallolyticus: 162 (6.6%) patients



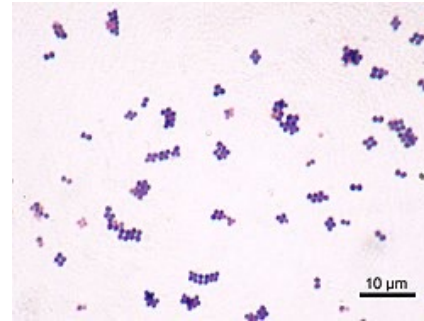
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Complications of infective endocarditis

Embolic events



Sepsis

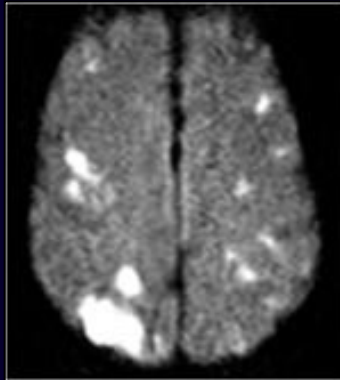


Heart failure Cardiogenic shock



Endocardites en Réanimation

- 198 EI gauches (définies)
- ETO 157/198 (79%)
- Critères de DUKE
 - 2 critères majeurs : 174/198 (89%)
 - 1 critère majeur + 3 mineurs : 14/198 (11%)



Neurologic complications and outcomes of infective endocarditis in critically ill patients: The ENDOcardite en REAnimation prospective multicenter study*

198 patients with definite left-sided infective endocarditis (IE)

Age : 62 (52-72) years

Community-acquired IE: 78%

Native valve IE: 83%

GCS: 14 (9-15)

SOFA: 8 (5-11)

Mechanical ventilation: 79%

Shock: 59%

S. aureus: 46 %

Neurologic complications: 55%

Cardiac surgery: 52%

Incidence, risk factors and prediction of post-operative acute kidney injury following cardiac surgery for active infective endocarditis: an observational study

Table 3 Factors associated with impairment in renal function after surgery

	RR	95% CI	P-value	OR	95% CI	P-value
Multiple surgery	1.83	1.54, 2.18	<0.001	4.16	2.98, 5.80	<0.001
Vancomycin administration	1.57	1.37, 1.81	<0.001	2.63	2.07, 3.34	<0.001
Aminoglycoside administration	1.23	1.07, 1.41	0.004	1.44	1.13, 1.83	0.004
Vancomycin:aminoglycoside interaction	1.54	1.34, 1.76	<0.001	2.62	2.08, 3.31	<0.001
Contrast agent	1.33	1.18, 1.51	<0.001	1.70	1.37, 2.12	<0.001
Transfusion	1.62	1.27, 2.07	<0.001	2.38	1.55, 3.63	<0.001
Pre-operative hemoglobin (<10 g/dl)	1.39	1.15, 1.67	0.001	1.89	1.34, 2.66	<0.001
Age (>65 y)	0.57	0.47, 0.70	<0.001	0.41	0.30, 0.57	<0.001

The variable importance measure for the risk factors associated with post-operative renal function impairment was performed after adjusting for all other covariates. RR, relative risk, OR, odds ratio.

Pronostic des EI en réanimation

Auteur	n	Mortalité (%)
Mourvillier B, <i>et al.</i> (2004) ¹	228	45 (hôpital)
Sonneville R, <i>et al.</i> (2011) ²	225	57 (3 mois)
Leroy O, <i>et al.</i> (2017) ³	248	41,5 (Hôpital)
Joffre J, <i>et al.</i> (2019) ⁴	4405	32 (Hôpital)

¹ICM 2004, ²CCM 2011, ³Crit Care 2017, ⁴ Crit Care 2019

**Infective endocarditis
in the intensive care unit:
clinical spectrum and prognostic factors
in 228 consecutive patients**

El sur valves native (n=146)	OR	95% CI	p
Choc septique	4.81	2.05-11.31	0.0003
Complications neurologiques	3.00	1.27-7.04	0.01
Immunod�pression	2.88	1.14-7.26	0.03
Chirurgie cardiaque	0.475	0.22-1.00	0.05

Mortalit  hospitali re : 38%

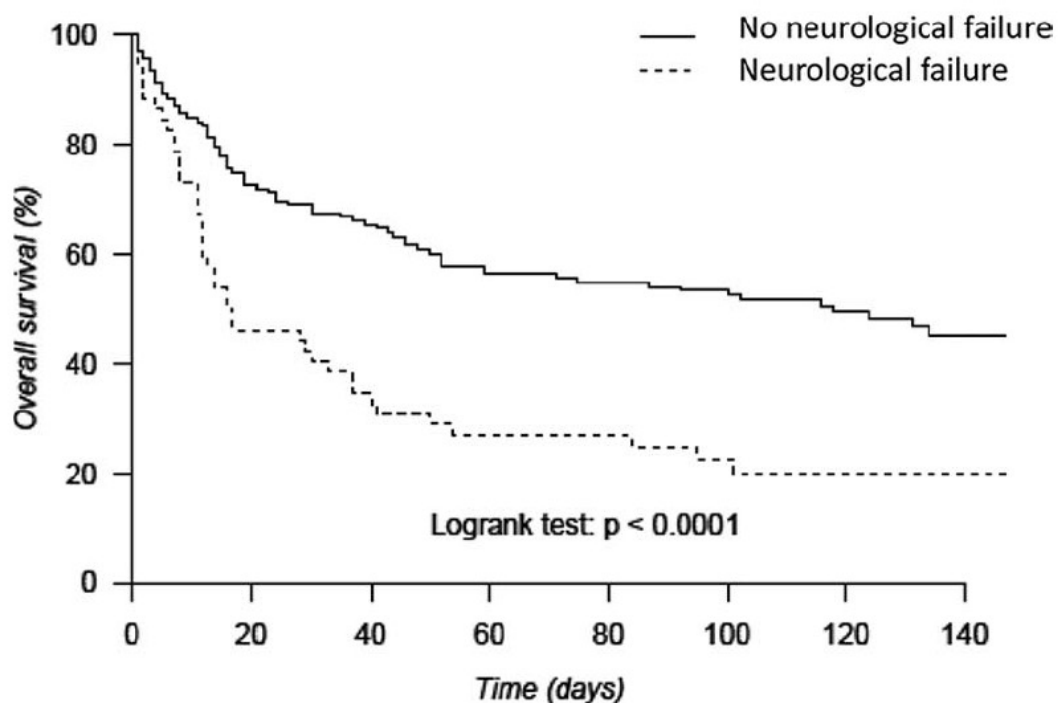
El sur valves proth�tique (n=82)	OR	95% CI	p
Choc septique	4.07	1.77-9.41	0.001
Complications neurologiques	3.10	1.38-8.55	0.008
Immunod�pression	3.46	1.14-7.26	0.003

Mortalit  hospitali re : 56%

Neurologic complications and outcomes of infective endocarditis in critically ill patients: The ENDOcardite en REAnimation prospective multicenter study*

198 left-sided IE patients

Factors associated with 3-month mortality



Variable	Multivariate analysis OR [CI 95%]
Neurological failure (neurological SOFA >2)	7.41 [2.89-18.96]
Charlson comorbidity index (>2)	3.16 [1.47-6.76]
<i>S. aureus</i>	3.26 [1.53-6.94]

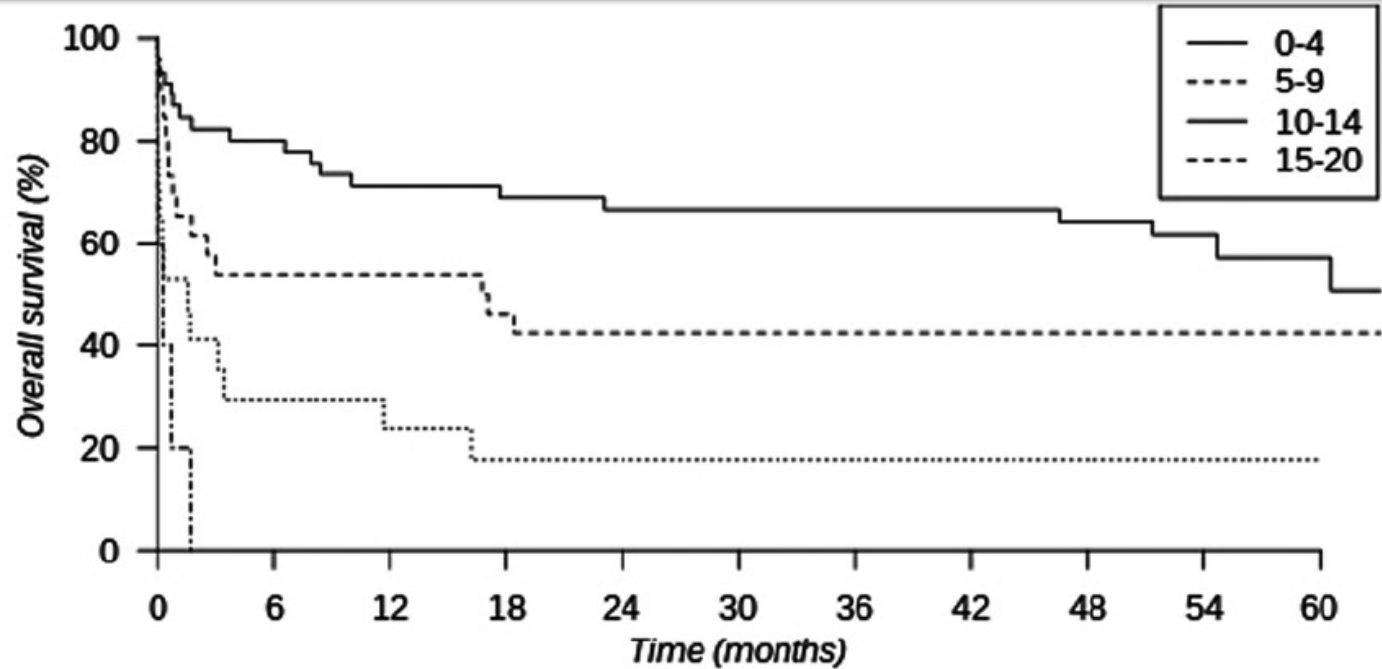
Long-term outcomes and cardiac surgery in critically ill patients with infective endocarditis

FACTORS ASSOCIATED WITH LONG-TERM MORTALITY IN 198 PATIENTS ADMITTED TO THE ICU WITH LEFT-SIDED INFECTIVE ENDOCARDITIS

Variable	HR	95%CI	<i>p</i> -value
Prosthetic valve endocarditis	2.01	1.09-3.69	0.02
Vegetation > 15 mm	1.64	1.03-2.63	0.03
SOFA			
0-4	1 (reference)		0.003
5-9	1.43	0.79-2.59	
10-14	2.01	1.05-3.85	
>15	3.53	1.75-7.11	
Surgery			0.005
24 hours	0.33	0.16-0.67	
1-7days	0.61	0.29-1.26	
> 7 days	0.42	0.21-0.83	

Long-term outcomes and cardiac surgery in critically ill patients with infective endocarditis

FACTORS ASSOCIATED WITH POST OPERATIVE OUTCOMES
N=103 patients with definite IE requiring surgery



	Number at risk										
	0	6	12	18	24	30	36	42	48	54	60
—	46	36	31	30	29	29	29	29	28	14	10
- - -	26	14	14	12	11	11	11	11	11	8	6
.....	17	5	4	3	3	3	3	3	3	3	1
- . - . -	5	0	0	0	0	0	0	0	0	0	0



2015 ESC Guidelines for the management of infective endocarditis

The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC)

When to refer a patient with IE to an 'Endocarditis Team' in a reference centre

1. Patients with complicated IE (i.e. endocarditis with HF, abscess, or embolic or neurological complication or CHD), should be referred early and managed in a reference centre with immediate surgical facilities.
2. Patients with non-complicated IE can be initially managed in a non-reference centre, but with regular communication with the reference centre, consultations with the multidisciplinary 'Endocarditis Team', and, when needed, with external visit to the reference centre.

Characteristics of the reference centre

1. Immediate access to diagnostic procedures should be possible, including TTE, TOE, multislice CT, MRI, and nuclear imaging.
2. Immediate access to cardiac surgery should be possible during the early stage of the disease, particularly in case of complicated IE (HF, abscess, large vegetation, neurological, and embolic complications).
3. Several specialists should be present on site (the 'Endocarditis Team'), including at least cardiac surgeons, cardiologists, anaesthesiologists, ID specialists, microbiologists and, when available, specialists in valve diseases, CHD, pacemaker extraction, echocardiography and other cardiac imaging techniques, neurologists, and facilities for neurosurgery and interventional neuroradiology .

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Infective Endocarditis

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Identifying the causative microorganism is central to diagnosis and appropriate treatment +++

2 or 3 **blood cultures** should be drawn before ATB Rx is initiated

=> **Quick start of antibiotic therapy**



2015 ESC Guidelines for the management of infective endocarditis

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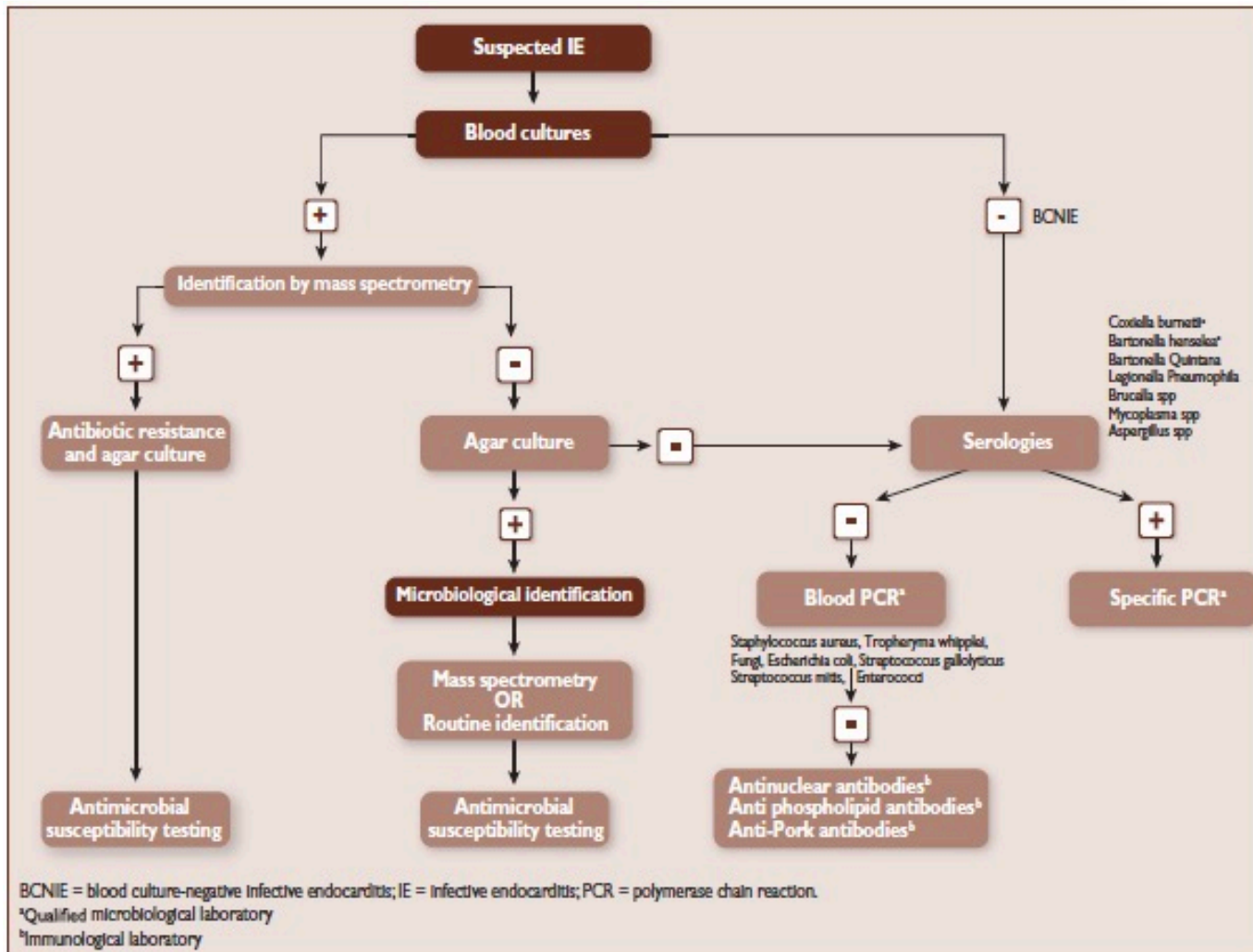


Table 12 Investigation of rare causes of blood culture negative infective endocarditis

Pathogen	Diagnostic procedures
<i>Brucella spp.</i>	Blood cultures, serology, culture, immunohistology, and PCR of surgical material.
<i>Coxiella burnetii</i>	Serology (IgG phase I >1:800), tissue culture, immunohistology, and PCR of surgical material.
<i>Bartonella spp.</i>	Blood cultures, serology, culture, immunohistology, and PCR of surgical material.
<i>Tropheryma whipplei</i>	Histology and PCR of surgical material.
<i>Mycoplasma spp.</i>	Serology, culture, immunohistology, and PCR of surgical material.
<i>Legionella spp.</i>	Blood cultures, serology, culture, immunohistology, and PCR of surgical material.
<i>Fungi</i>	Blood cultures, serology, PCR of surgical material.

Ig = immunoglobulin; PCR = polymerase chain reaction.

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Prospective cohort, 3116 adult patients, 156 hospitals, 40 countries.

January 2016 - March 2018

Diagnosis of IE based on ESC 2015 diagnostic criteria

Positive blood cultures

	NVE	PVE	CDRIE
S. aureus (%)	33	23	46,5
CNS (%)	9	18,5	19
Strepto viridans (%)	15	10	3
Enterococcus (%)	13	22	13
S. Gallolyticus (%)	8	6	4
GNB (%)	4	2,5	6

Proposed antibiotic regimens for initial empirical treatment of infective endocarditis in acute severely ill patients

Antibiotic	Dosage and route	Class ^b	Level ^c	Comments
Community-acquired native valves or late prosthetic valves (≥ 12 months post surgery) endocarditis				
Ampicillin with (Flu)cloxacillin or oxacillin with Gentamicin ^d	12 g/day i.v. in 4–6 doses 12 g/day i.v. in 4–6 doses 3 mg/kg/day i.v. or i.m. in 1 dose	IIa	C	Patients with BCNIE should be treated in consultation with an ID specialist.
Vancomycin ^d with Gentamicin ^d	30–60 mg/kg/day i.v. in 2–3 doses 3 mg/kg/day i.v. or i.m. in 1 dose			
Early PVE (<12 months post surgery) or nosocomial and non-nosocomial healthcare associated endocarditis				
Vancomycin ^d with Gentamicin ^d with Rifampin	30 mg/kg/day i.v. in 2 doses 3 mg/kg/day i.v. or i.m. in 1 dose 900–1200 mg i.v. or orally in 2 or 3 divided doses	IIb	C	Rifampin is only recommended for PVE and it should be started 3–5 days later than vancomycin and gentamicin has been suggested by some experts. In healthcare associated native valve endocarditis, some experts recommend in settings with a prevalence of MRSA infections >5% the combination of cloxacillin plus vancomycin until they have the final <i>S. aureus</i> identification

Proposed antibiotic regimens for initial empirical treatment of infective endocarditis in acute severely ill patients

Antibiotic	Dosage and route	Class ^b	Level ^c	Comments
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Selon forme clinique 😊

- Aiguë: péni M ou céfazoline + gentamicine
- Subaiguë: amoxicilline + gentamicine
- Liée aux soins: péni M + vancomycine + gentamicine ou daptomycine + gentamicine

Early PVE (<12 months post surgery) or nosocomial and non-nosocomial healthcare associated endocarditis

Vancomycin ^d with Gentamicin ^d with Rifampin	30 mg/kg/day i.v. in 2 doses 3 mg/kg/day i.v. or i.m. in 1 dose 900–1200 mg i.v. or orally in 2 or 3 divided doses	IIb	C	Rifampin is only recommended for PVE and it should be started 3–5 days later than vancomycin and gentamicin has been suggested by some experts. In healthcare associated native valve endocarditis, some experts recommend in settings with a prevalence of MRSA infections >5% the combination of cloxacillin plus vancomycin until they have the final <i>S. aureus</i> identification
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Aminosides: recommandations actuelles

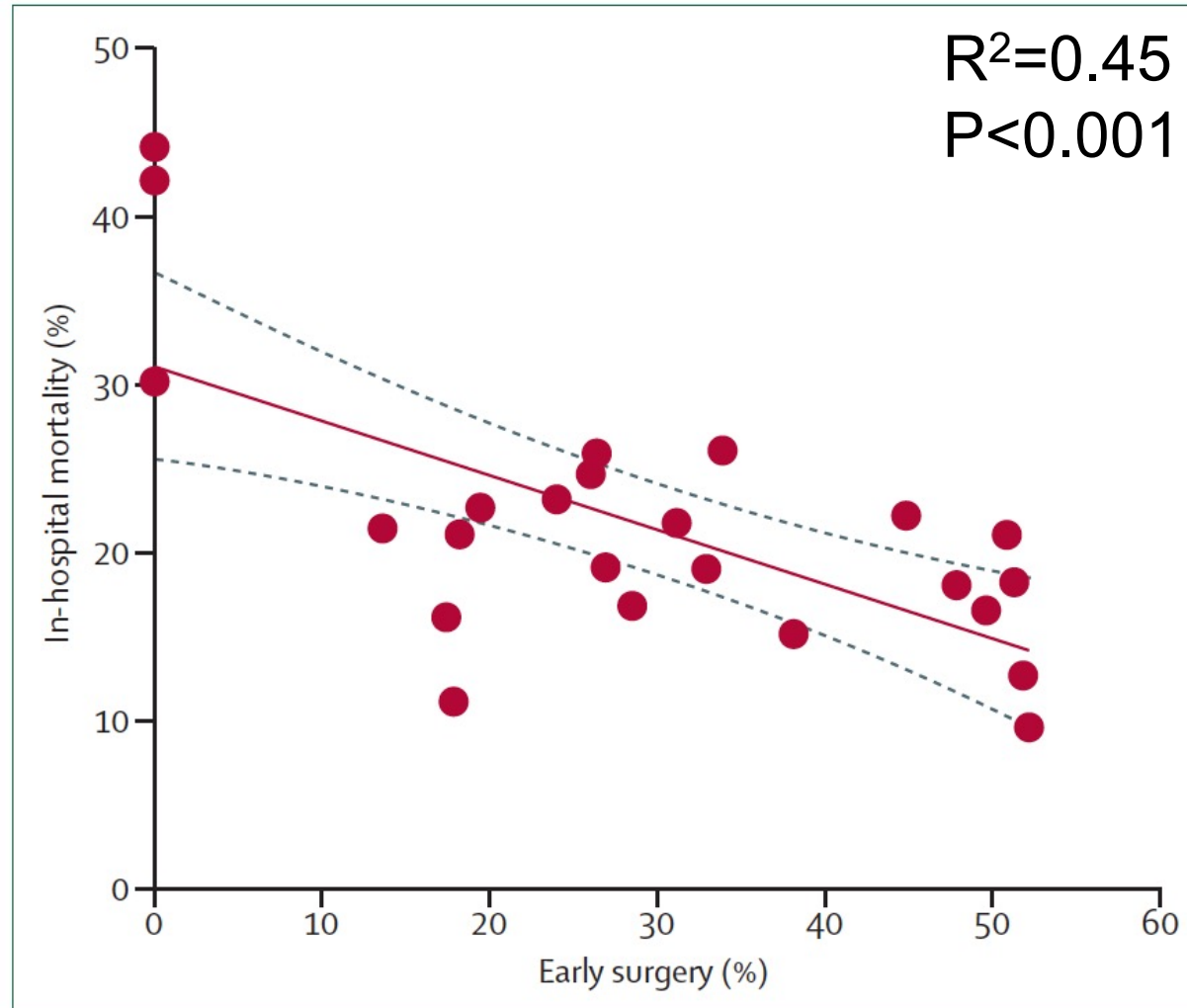
	IE sur valve native	IE sur prothèse
SAMS	Non	2 semaines
SAMR	Non (mais...)	2 semaines
Streptocoques avec CMI <0,125 mg/L	Non	Non
Streptocoques avec CMI à 0,25-2 mg/L	2 semaines	2 semaines
Entérocoques	2-6 semaines (2!)	2-6 semaines (2!)
Bartonella sp	2 semaines	2 semaines

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Indications for cardiac surgery

Main indications	Clinical signs
Heart failure	<ul style="list-style-type: none">• Acute regurgitation with refractory heart failure• Cardiogenic shock
Uncontrolled infection	<ul style="list-style-type: none">• Locally uncontrolled infection (abscess, fistula...)• Persistent positive blood cultures
Prevention of embolism	<ul style="list-style-type: none">• Large vegetations > 15 mm• Large vegetations > 10mm, after 1 or more embolic events despite appropriate AB therapy (first 2 weeks of therapy +++)

Timing de la chirurgie

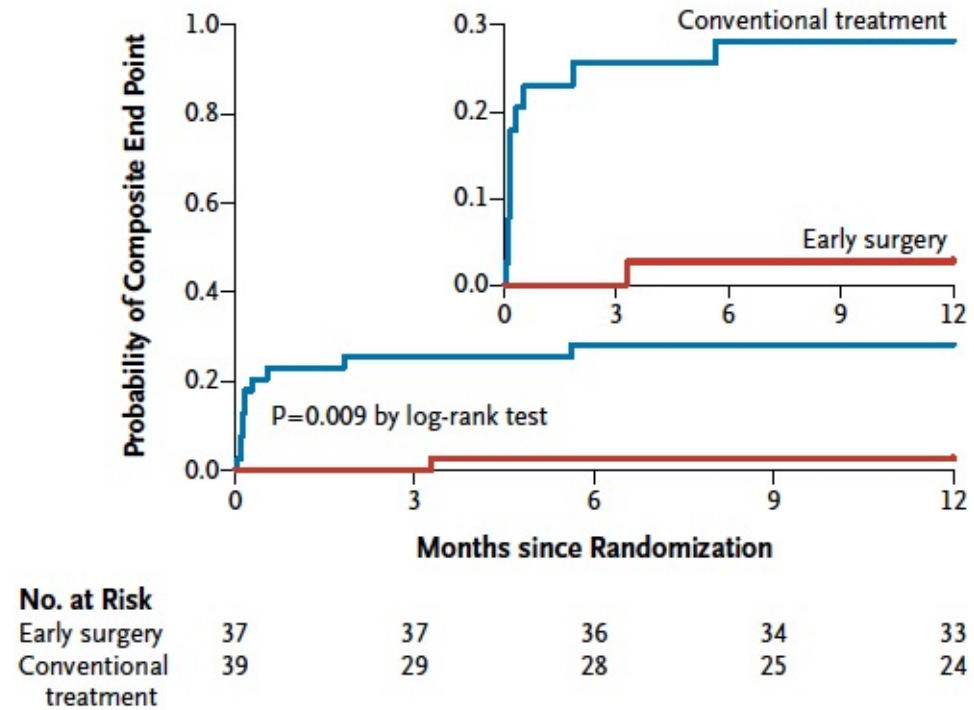


Early Surgery versus Conventional Treatment for Infective Endocarditis

Definite IE patients with severe valve disease and large vegetations
 Early surgery (within 48 hours) vs conventional treatment

Table 3. Clinical End Points.

Outcome	Conventional Treatment (N=39)	Early Surgery (N=37)	P Value
Primary end point — no. (%)			
In-hospital death or embolic event at 6 wk	9 (23)	1 (3)	0.01
In-hospital death	1 (3)	1 (3)	1.00
Embolic event at 6 wk			
Any	8 (21)	0	0.005
Cerebral	5 (13)	0	
Coronary	1 (3)	0	
Popliteal	1 (3)	0	
Splenic	1 (3)	0	
Secondary end points at 6 mo — no. (%)			
Any	11 (28)	1 (3)	0.003
Death	2 (5)	1 (3)	1.00
Embolic event	8 (21)	0	0.005
Recurrence of infective endocarditis	1 (3)	0	1.00



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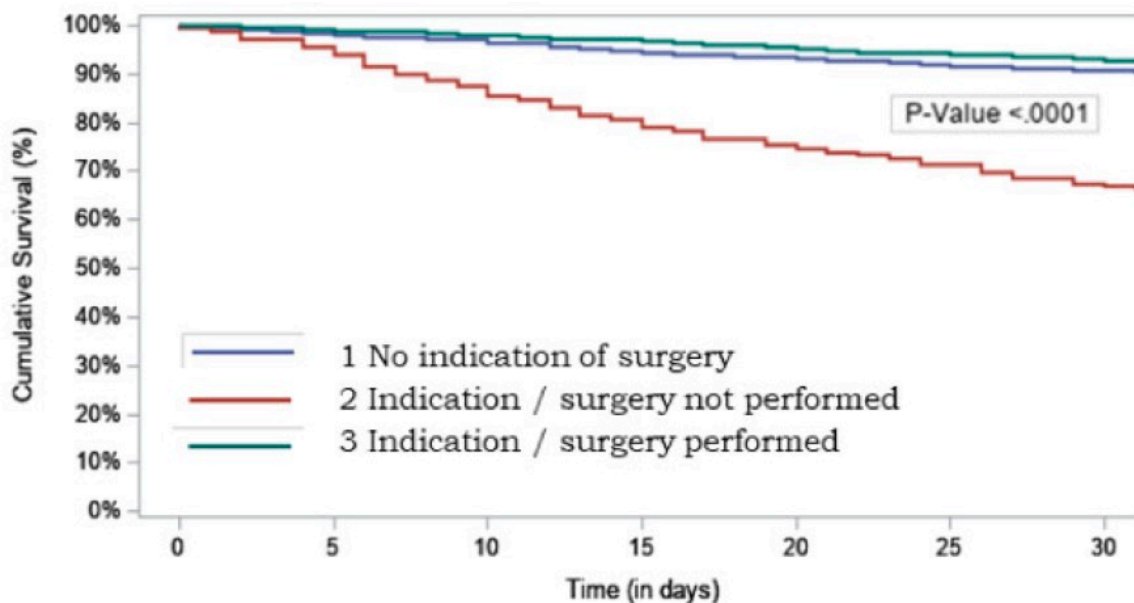
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Table 4 Multivariable Cox regression analysis for all causes of death at discharge (1-month period)

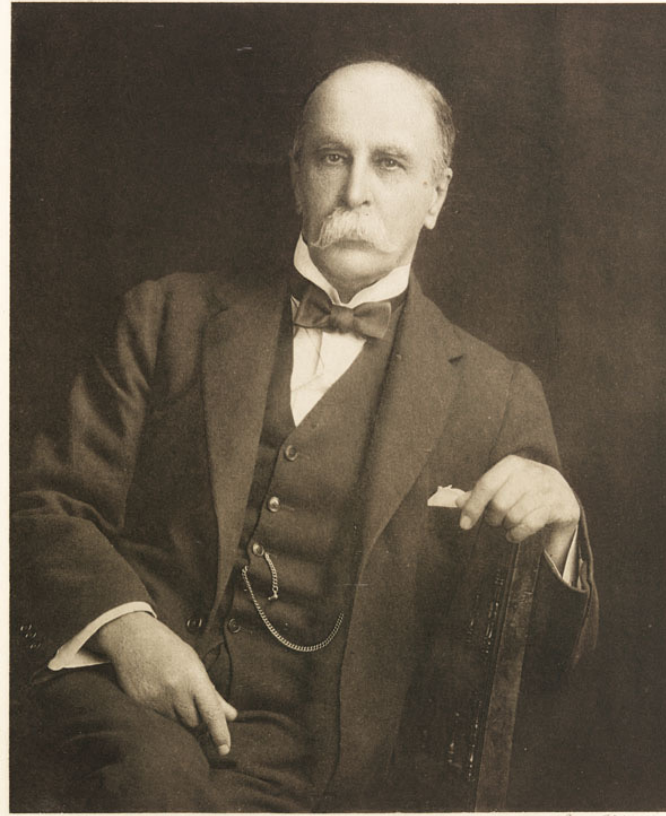
	Hazard ratio	95% CI	P-value*
Charlson index	1.07	[1.04–1.11]	<0.0001
Creatinine >2 mg/dL	1.58	[1.19–2.11]	<0.0017
Congestive heart failure	2.09	[1.58–2.77]	<0.0001
Vegetation length > 10 mm	2.12	[1.64–2.73]	<0.0001
Cerebral complication	2.21	[1.61–3.04]	<0.0001
Abscess	1.50	[1.07–2.10]	0.0186
Indication—surgery not performed	2.84	[2.00–4.03]	<0.001
Indication—surgery performed	0.63	[0.43–0.92]	0.0169

Goodness of fit test: $P = 0.18$. Concordance = 0.77—Global Schoenfeld residual test $P = 0.12$.

* P -value corresponds to the results of Wald test. For indication—surgery performed or not, the reference is no indication.



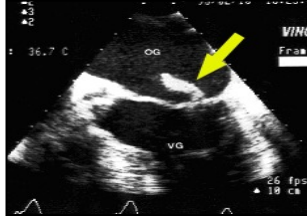
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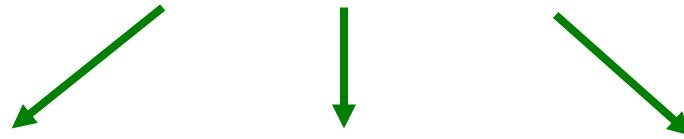
« A considerable number of cases of malignant endocarditis come under observation, perhaps, in hospital-practice, for the first time, with symptoms of cerebral, or even cerebro-spinal, trouble. »

Pathophysiology of neurological complications

Left-sided endocarditis
First symptom : 80%



Cerebral embolism



Ischemic stroke

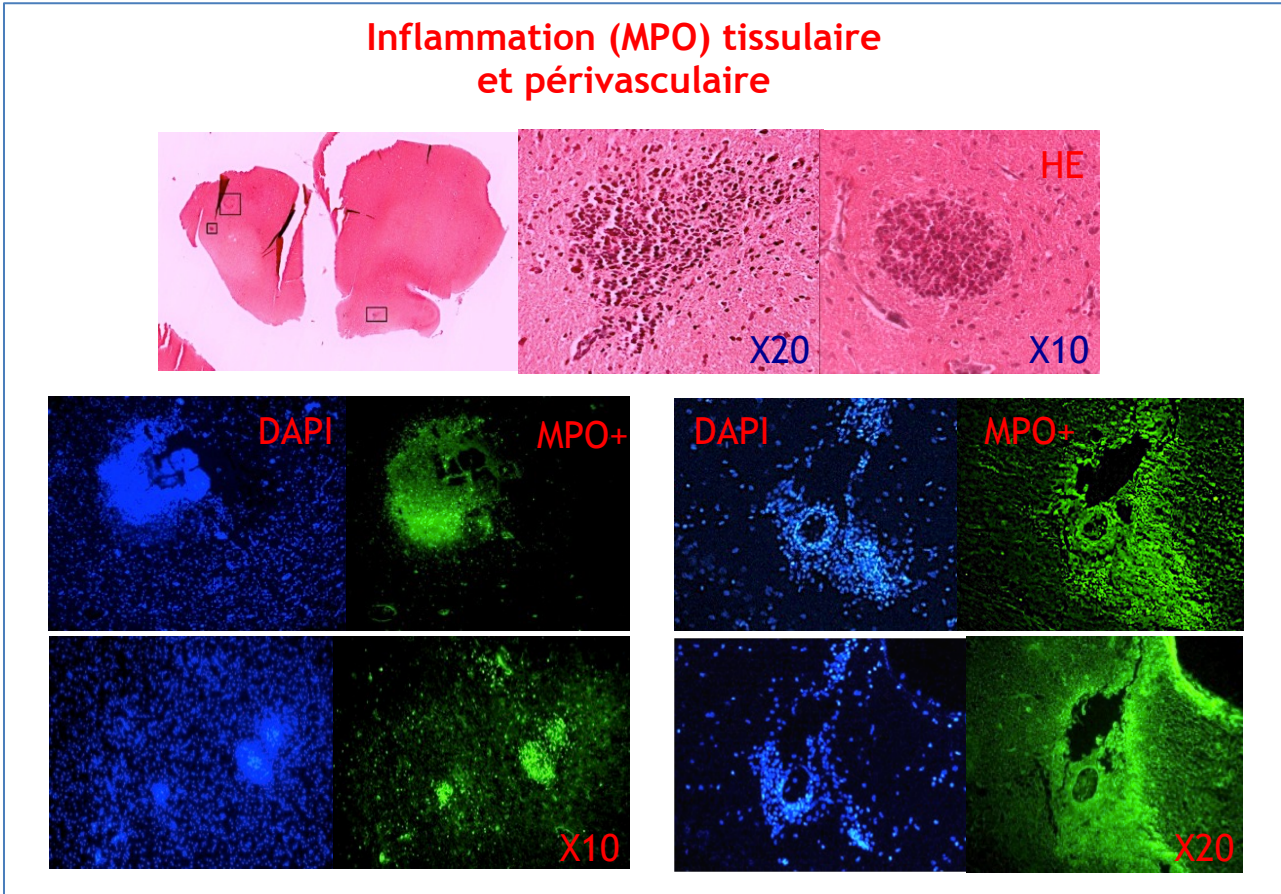
Mycotic
aneurysm

Meningitis
Brain abscess

Cerebral hemorrhage

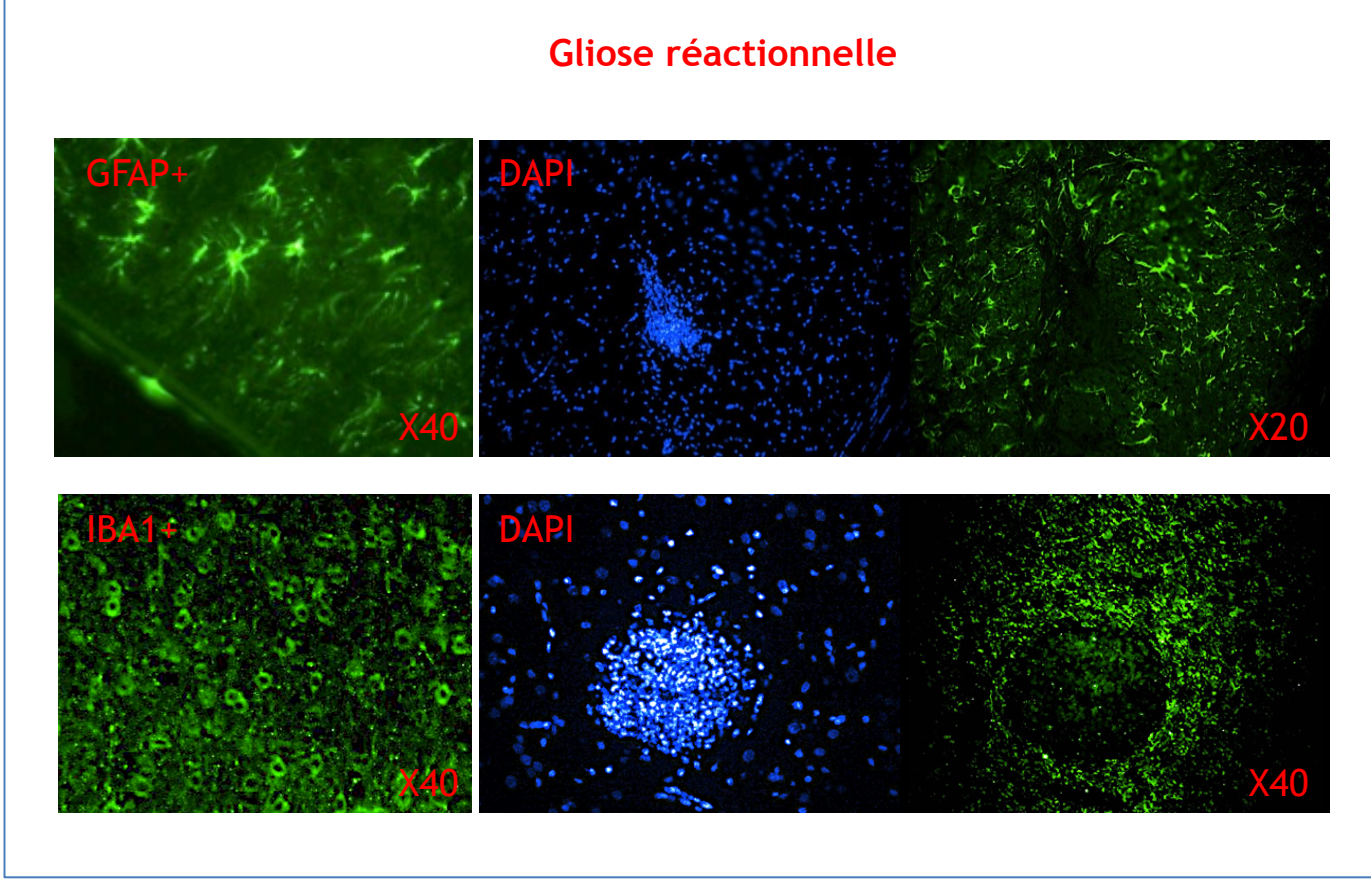
Neurologic Complications of Infective Endocarditis: A Joint Model for a Septic Thromboembolism and Inflammatory Small Vessel Disease

Marie Cantier, MD^{1,2}; Candice Sabben, MD^{1,3}; Homa Adle-Biassette, MD, PhD⁴; Liliane Louedec¹;
Sandrine Delbosc, PhD¹; Jean-Philippe Desilles, MD, PhD^{1,5}; Clément Journé^{1,6}; Devy Diallo, PhD¹;
Phalla Ou, MD, PhD^{1,6,7}; Isabelle Klein, MD, PhD⁸; Françoise Chau, MD⁹; Agnès Lefort, MD, PhD^{9,10};
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Neurological Complications of Infective Endocarditis

Risk Factors, Outcome, and Impact of Cardiac Surgery: A Multicenter Observational Study



1345 patients with IE, retrospective multicenter study
(25 years)

340 (25%) patients with neurological complications

- 192 (14%) : cerebral ischemic event
- 86 (6%) : meningitis
- 60 (4%) : cerebral hemorrhage
- 2 (1%) : brain abscess

Effect of Early Cerebral Magnetic Resonance Imaging on Clinical Decisions in Infective Endocarditis

A Prospective Study

Ann Intern Med. 2010;152:497-504.

Prospective single center study 2005-2008

130 patients

Systematic brain MRI at IE diagnosis

Neurologic symptoms 17%

Brain MRI lesions : 82%

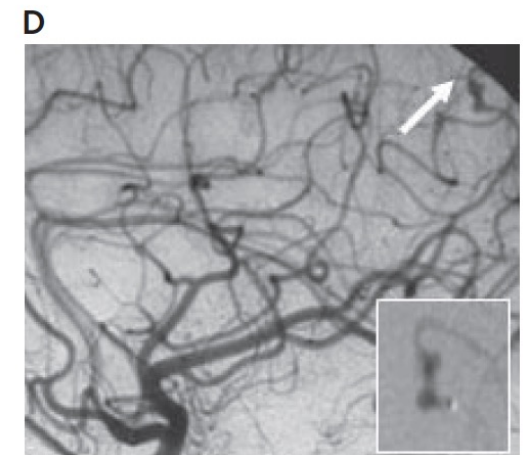
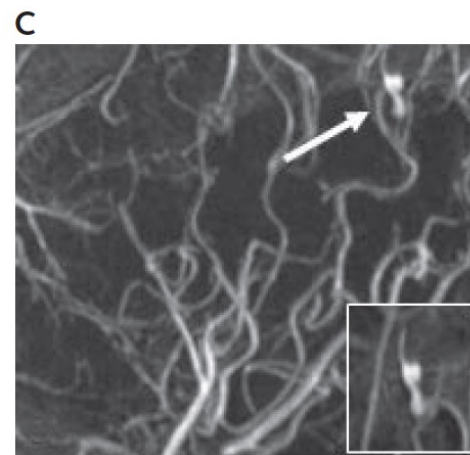
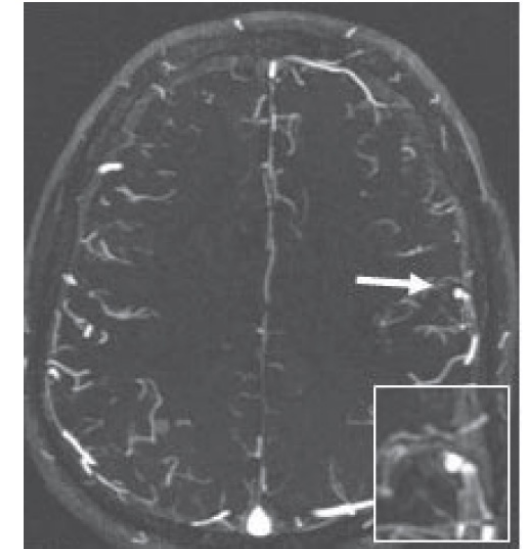
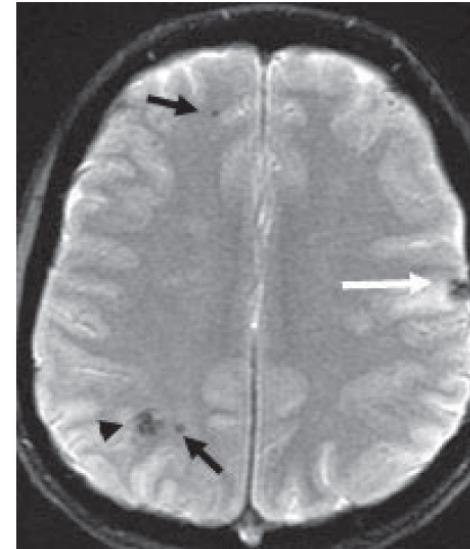
ischemia

Cerebral microbleeds

Aneurysms

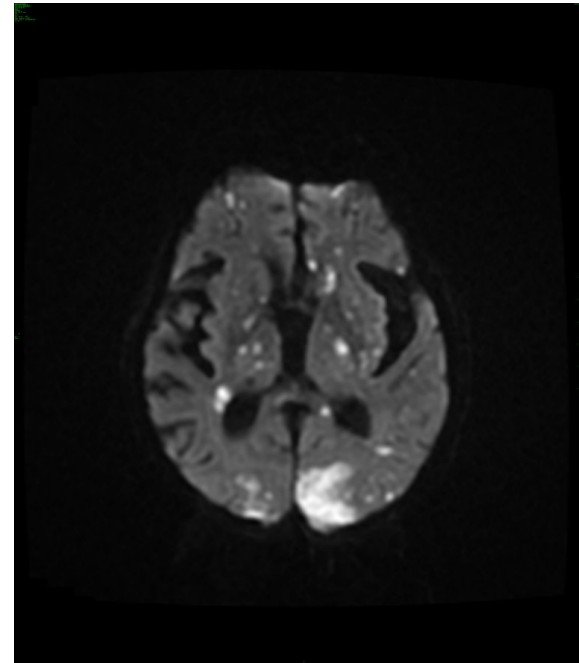
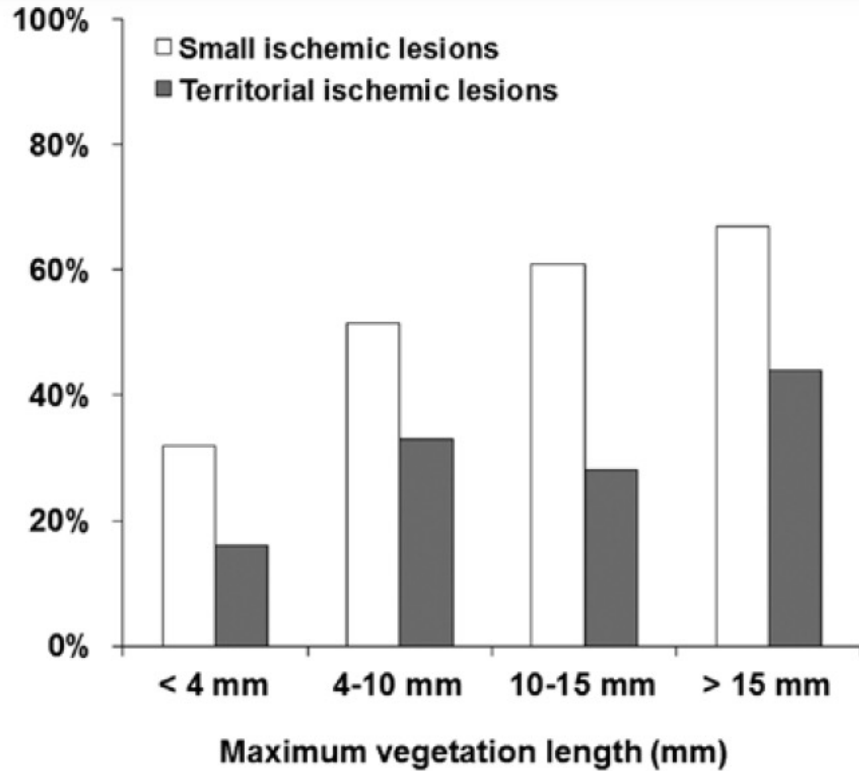
Diagnostic changes: 32% patients

Therapeutic changes: 18% patients



Determinants of Cerebral Lesions in Endocarditis on Systematic Cerebral Magnetic Resonance Imaging

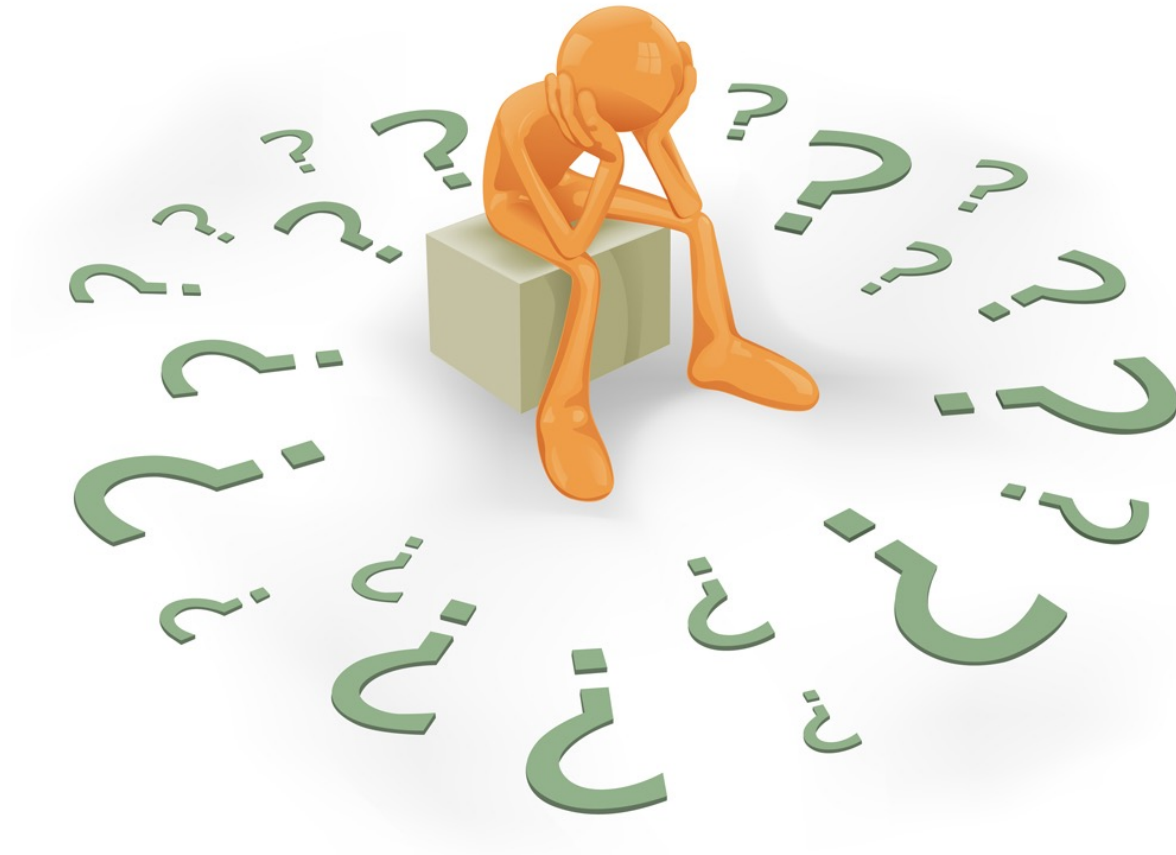
A Prospective Study



Factors associated with ischemic lesions, multivariate analysis (n=120)

Variable	OR	95% CI
S. aureus	2.65	1.01–6.96
Vegetation length, / mm	1.10	1.03-1.16

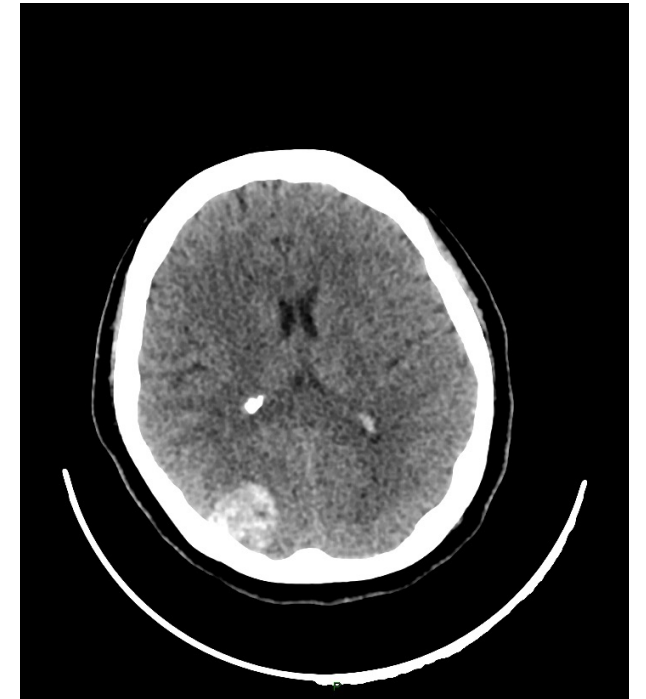
Quel est le risque de complication
neurologique (embolique) à la phase aiguë ?



Risk factors for symptomatic neurologic complications

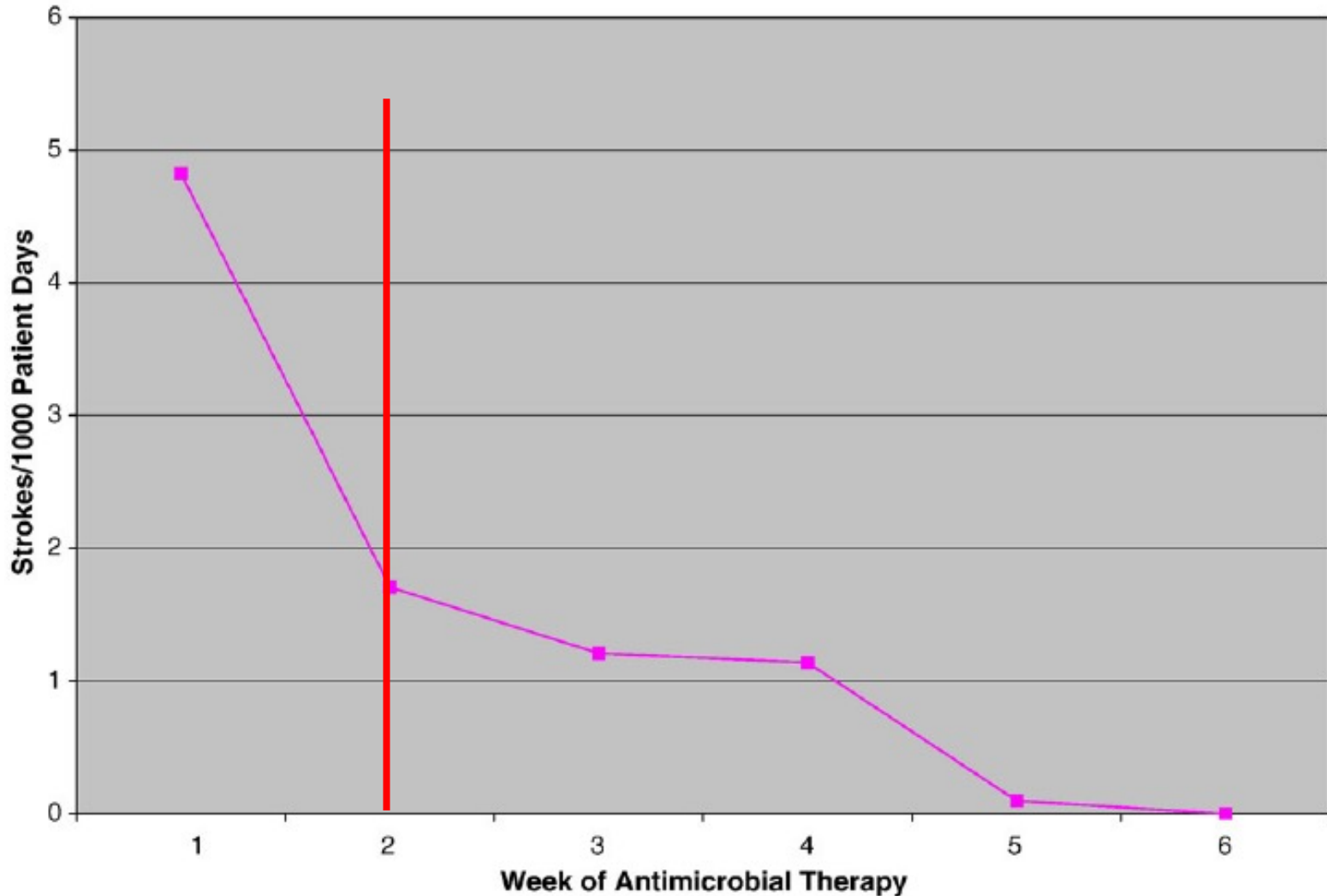
(CT-defined)

- *Staphylococcus aureus* infection
- Mitral valve IE
- Large vegetation size (> 10mm ?)
- Anticoagulant therapy
- Non-neurologic events



F. Thuny, Circulation 2005
R. Sonnevile, Crit Care Med 2011
E. Garcia Cabrera, Circulation 2013

Relationship between the initiation of antimicrobial therapy and the incidence of stroke in infective endocarditis



Stroke rate after initiation of antimicrobial therapy.

Right timing of cardiac surgery in patients with acute brain injury

**Early
surgery**

CPB
Anticoagulation



Infarct or hematoma growth



**Delayed
surgery**

Worsening heart failure
Enlarging vegetations



Recurrent CNS embolism

Neurological deterioration ?
Poor outcome ?



2015 ESC Guidelines for the management of infective endocarditis

STROKE

- After a silent embolism or transient ischemic attack, cardiac surgery, if indicated, is recommended **without delay** (IB).
- 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 hemorrhage has been excluded** by cranial CT or MR (IIa).

H 26 ans

EI aortique

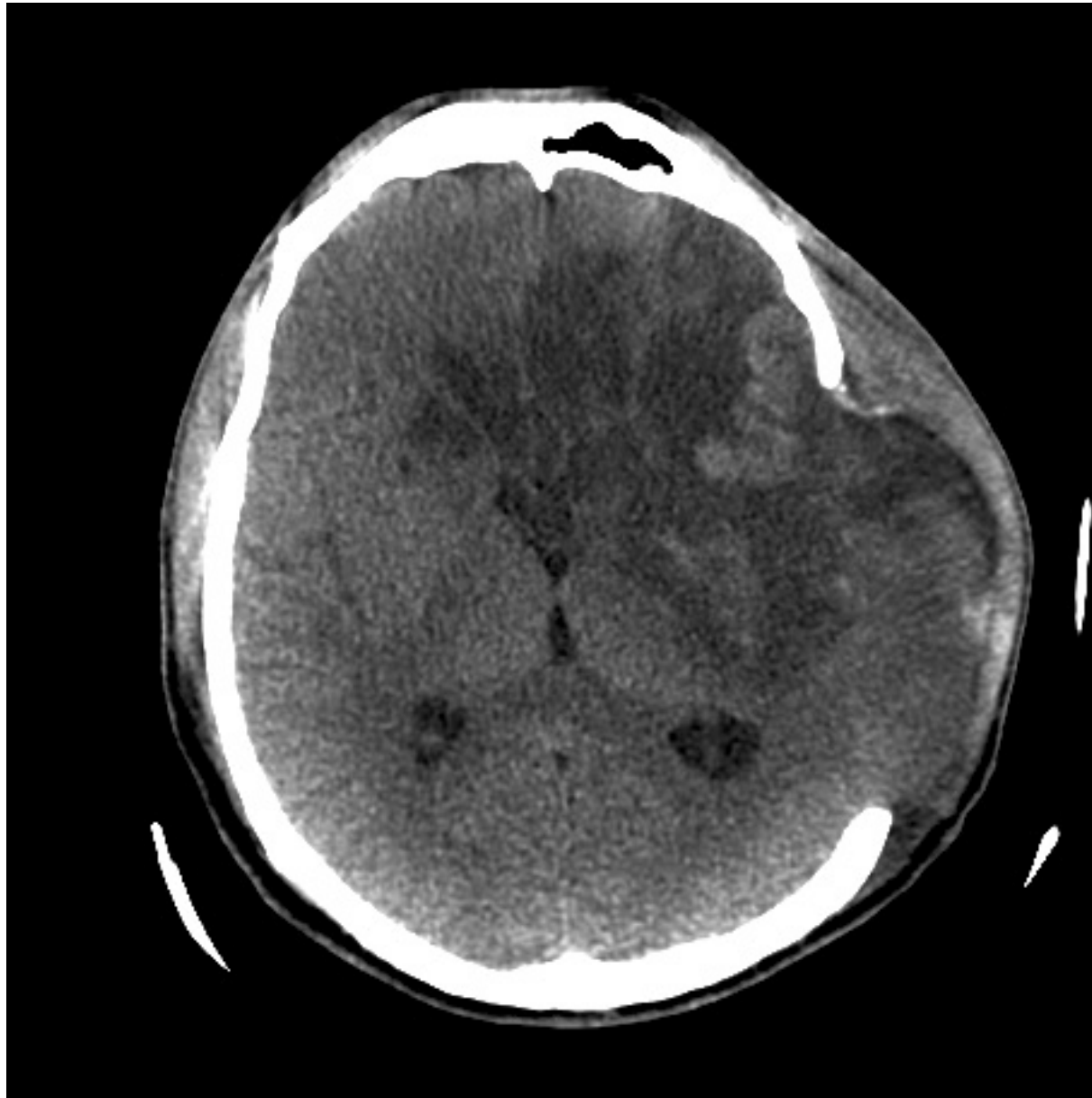
HC + *Enterococcus faecalis*

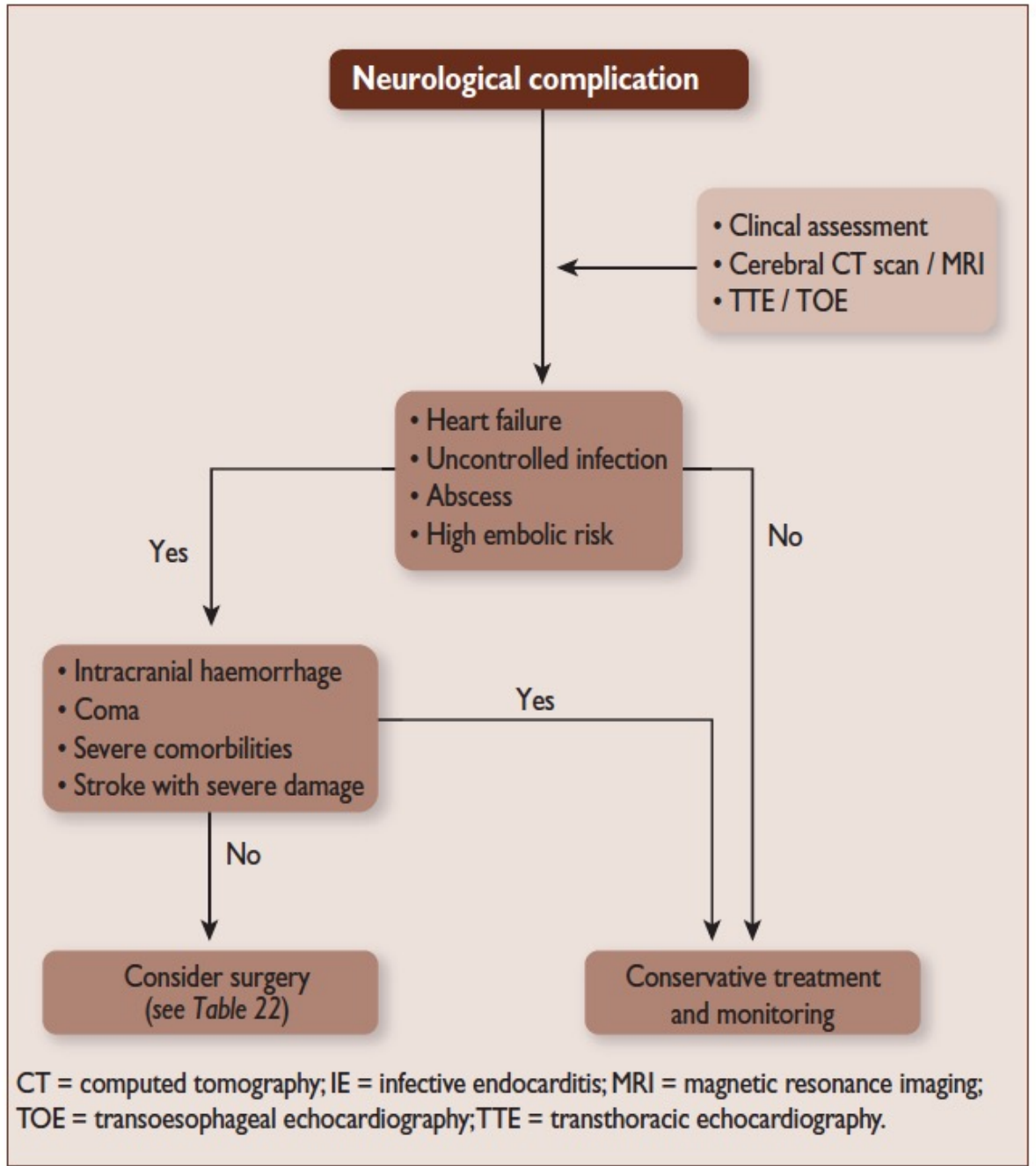
Végétation > 20 mm

IAo grade 4/4

AVC sylvien G massif

.....





CT = computed tomography; IE = infective endocarditis; MRI = magnetic resonance imaging; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.



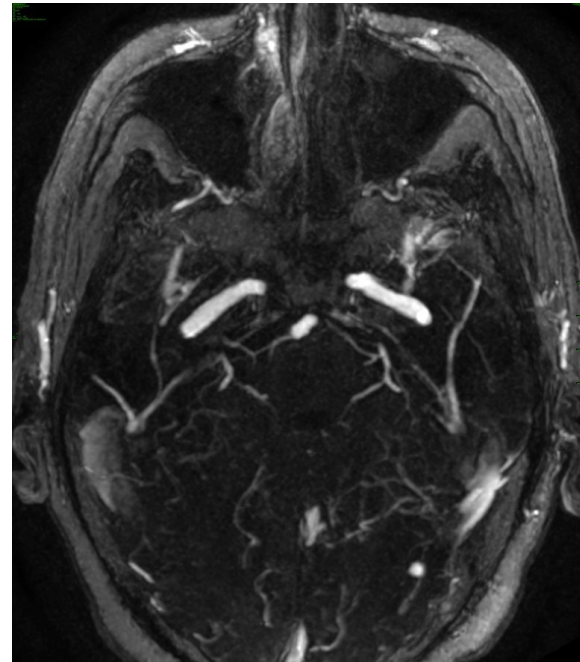
2015 ESC Guidelines for the management of infective endocarditis

INTRACRANIAL HEMORRHAGE

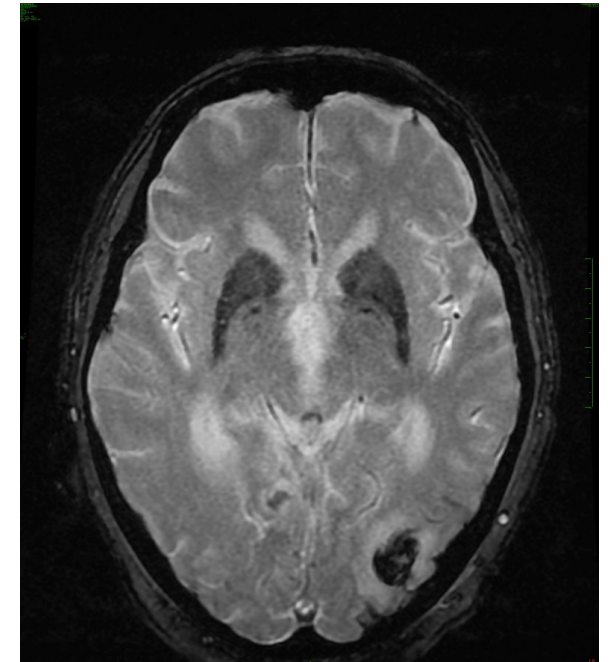
- In ICH, **interruption of all anticoagulation is recommended (IB)**.
- In patients with ICH and a **mechanical valve**, unfractionated or low molecular weight **heparin should be reinitiated as soon as possible** following multidisciplinary discussion (IIa-C).
- **Surgery** should generally be **postponed for ≥ 1 month (IIa-B)**.

Infectious aneurysms

- Infectious aneurysms result from the septic arterial embolism and spread of infection through intimal vessels.
- “Thin walled” and “friable”
- High risk of rupture
=> ICH +++



MR angiography



T2*

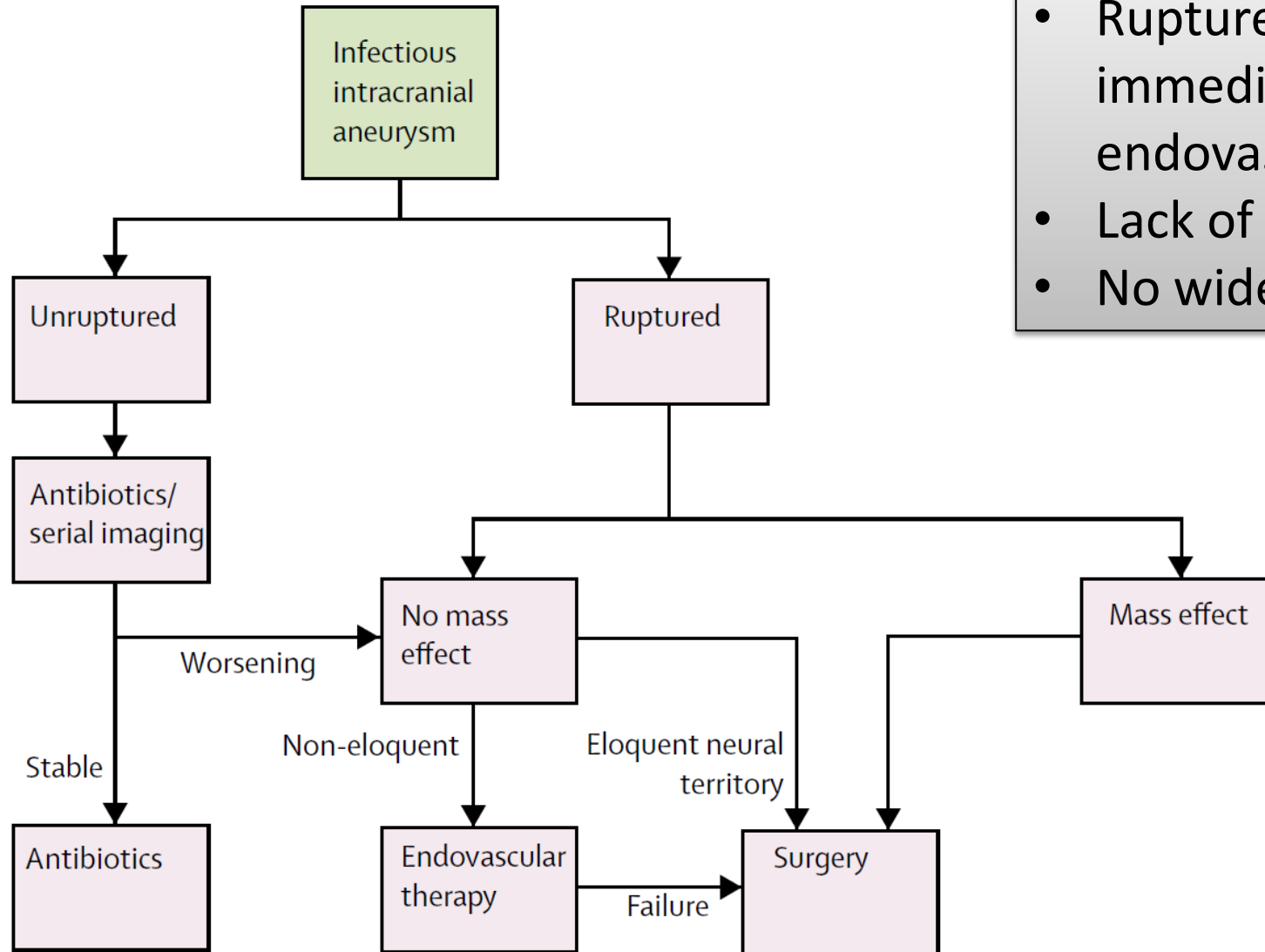


2015 ESC Guidelines for the management of infective endocarditis

INFECTIOUS ANEURYSMS

- Intracranial infectious aneurysms should be looked for in patients with IE and neurological symptoms (IIa-B)
- CT or MR angiography have both good sensitivity and specificity (IIa-B)
- Conventional angiography remains the gold standard if diagnosis suspicion remains (IIa-B)

Infectious aneurysms



- Ruptured aneurysms must be treated immediately by surgical or endovascular procedures
- Lack of RCTs....
- No widely accepted procedure ...

Meningitis and brain abscess

Non specific signs

CSF :

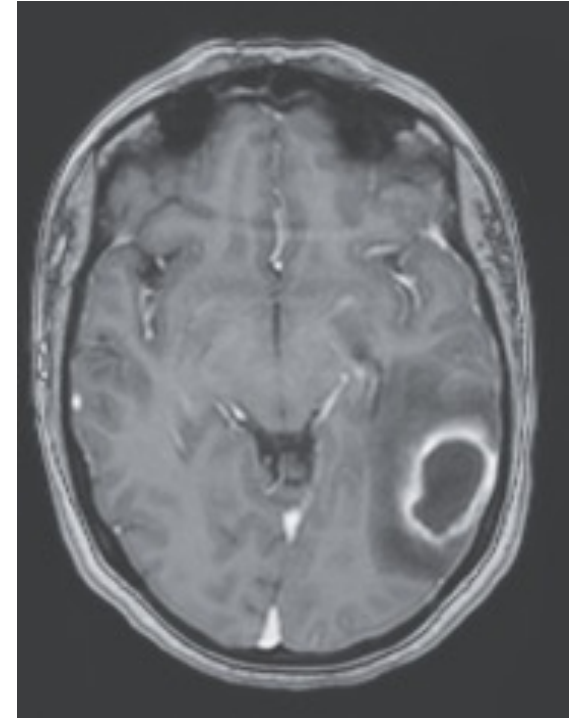
Predominance of polynuclear cells, low glucose levels

Positive cultures: 1/3 patients

Associated CNS complications (MRI) +++ ?

Same initial antibiotic regimen

Prolonged duration of treatment for brain abscess (6-8 weeks)





Systematic overdosing of oxa- and cloxacillin in severe infections treated in ICU: risk factors and side effects

Mathilde Neuville^{1*} , Najoua El-Helali², Eric Magalhaes¹, Aguila Radjou¹, Roland Smonig¹, Jean-François Soubirou¹, Guillaume Voiriot¹, Alban Le Monnier², Stéphane Ruckly³, Lila Bouadma^{1,3}, Romain Sonnevill¹, Jean-François Timsit^{1,3} and Bruno Mourvillier^{1,3}

N = 62 patients

Median trough plasma concentration of 134.3 mg/L (IQR 65.3-201 mg/L).

Eleven patients (17.7%) experienced neurological side effects attributed to a high antibiotic concentration, i.e. persistent coma and delirium.

Conclusion #1 ...

- Patients with complicated endocarditis should be referred to an **“Infective Endocarditis team”** in a reference center.
- **Early adequate antibiotic therapy** reduces the **risk of embolism**.
- **Early surgery**, when indicated and performed, is **associated with reduced mortality**.
- **Symptomatic neurologic complications** are **frequent** at IE diagnosis and are a strong determinant of **outcome**.

Conclusion #2 ...

- **Cardiac surgery**, if indicated, can be performed **without delay in patients with isolated stroke (CT)**
- **Infectious cerebral aneurysm** should be suspected (and treated) in all patients presenting with **focal intracranial hemorrhage (CT)**
- **Systematic brain MRI** allows **detection of CNS lesions in 80% of patients**
- **Cerebral microbleeds (MRI)** are **frequent** but their prognostic value remains to be investigated.