Endocardite infectieuse

Prof. Alexandre OUATTARA
Service d'Anesthésie-Reanimation cardiovasculaire,
Hôpital Haut-Lévêque, 33600 Pessac, France
E-mail: alexandre.ouattara@chu-bordeaux.fr

CHU BDX CENTRE HOSPITALIER UNIVERSITAIRE BORDEAUX — université de BORDEAUX — Inserm

Définition et épidémiologie

Définition

Greffe d'agent infectieux (bactérie, levure)

- Endocarde valvulaire antérieurement lésé (endocardite subaiguë ou maladie d'Osler)
- Plus rarement sain (endocardite aiguë)

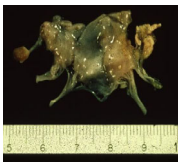
Epidémiologie

Incidence : 32 cas/million hab./an (≈1500-2000 cas en France)

Endocardite cœur gauche > droite

40-50% des patients bénéficient d'une chirurgie cardiaque

Mortalité 15-30%



Physiopathologie (1)

Lésion cardiaque à « risque »

- Valvulopathies aortiques, mitrales (régurgitations+++)
- Bicuspidie
- Prothèses valvulaires +++
- Cardiopathies congénitales cyanogènes

Portes d'entrée

- ORL+++, digestive, cutanée…

Germes

- Bactériens : *Strepto (alpha-hémolytique, D), Staph, BGN...*
- Champignon : *candida...*

European Heart Journal (2015) **36**, 3075–3123
doi:10.1093/eurheartj/ehv319

ESC GUIDELINES

2015 ESC Guidelines for the management of infective endocarditis

Recommendations	Class[a]	Level[b]
Antibiotic prophylaxis should be considered for patients at highest risk for IE: (1) Patients with any prosthetic valve, including a transcatheter valve, or those in whom any prosthetic material was used for cardiac valve repair. (2) Patients with a previous episode of IE. (3) Patients with CHD: (a) Any type of cyanotic CHD. (b) Any type of CHD repaired with a prosthetic material, whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if residual shunt or valvular regurgitation remains.	IIa	C
Antibiotic prophylaxis is not recommended in other forms of valvular or CHD.	III	C

Recommendations	Class[a]	Level[b]
A. Dental procedures		
• Antibiotic prophylaxis should only be considered for dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa	IIa	C
• Antibiotic prophylaxis is not recommended for local anaesthetic injections in non-infected tissues, treatment of superficial caries, removal of sutures, dental X-rays, placement or adjustment of removable prosthodontic or orthodontic appliances or braces or following the shedding of deciduous teeth or trauma to the lips and oral mucosa	III	C
B. Respiratory tract procedures[c]		
• Antibiotic prophylaxis is not recommended for respiratory tract procedures, including bronchoscopy or laryngoscopy, or transnasal or endotracheal intubation	III	C
C. Gastrointestinal or urogenital procedures or TOE[c]		
• Antibiotic prophylaxis is not recommended for gastroscopy, colonoscopy, cystoscopy, vaginal or caesarean delivery or TOE	III	C

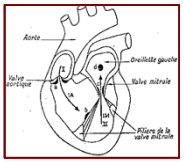
Prophylaxis for dental procedures

Oral Strepotococci

Situation	Antibiotic	Single-dose 30–60 minutes before procedure	
		Adults	Children
No allergy to penicillin or ampicillin	Amoxicillin or ampicillin[a]	2 g orally or i.v.	50 mg/kg orally or i.v.
Allergy to penicillin or ampicillin	Clindamycin	600 mg orally or i.v.	20 mg/kg orally or i.v.

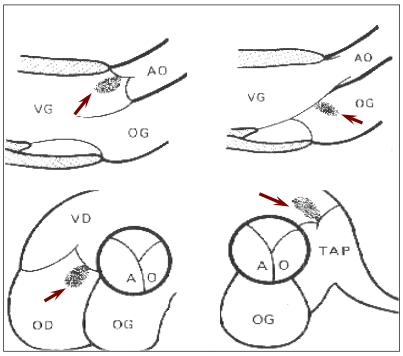
Physiopathologie de l'atteinte valvulaire (1)

- **Stade I:** Lésions jet régurgitant sur face valvulaire exposée aux plus basses pressions
- **Stade II:** Dépôts fibrino-plaquettaires
- **Stade III:** Colonisation bactérienne
- **Stade IV:** Lésions végétantes et destructrices



- **Stade V:** Complexe immuns circulants (purpura vasculaire, faux panaris d'Osler, protéinurie, hématurie, …)

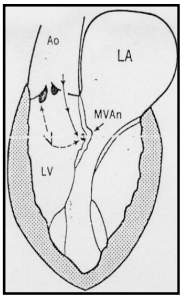
Physiopathologie de l'atteinte valvulaire (2)

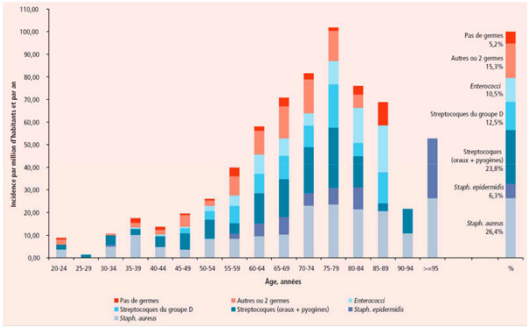


Physiopathologie de l'atteinte valvulaire (3)

Localisation pluri-valvulaire

- Endocardite aortique initiale
- Localisation secondaire au niveau de la lésion du jet régurgitant sur la valve mitrale antérieure





Revest M et al. Bull Epidémiologique Hebdomadaire 2013

Major criteria

1. Blood cultures positive for IE

a. Typical microorganisms consistent with IE from 2 separate blood cultures:
- *Viridans streptococci, Streptococcus gallolyticus (Streptococcus bovis), HACEK group, Staphylococcus aureus*; or
- Community-acquired enterococci, in the absence of a primary focus; or

b. Microorganisms consistent with IE from persistently positive blood cultures:
- ≥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

c. Single positive blood culture for Coxiella burnetii or phase I IgG antibody titre >1:800

2. Imaging positive for IE

a. Echocardiogram positive for IE:
- Vegetation;
- Abscess, pseudoaneurysm, intracardiac fistula;
- Valvular perforation or aneurysm;
- New partial dehiscence of prosthetic valve.

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.

c. Definite paravalvular lesions by cardiac CT.

Minor criteria

1. Predisposition such as predisposing heart condition, or injection drug use.
2. Fever defined as temperature >38°C.
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.
4. Immunological phenomena: glomerulonephritis, Osler's nodes, Roth's spots, and rheumatoid factor.
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.

European Heart Journal (2015) 36, 3075–3123
doi:10.1093/eurheartj/ehv319

ESC GUIDELINES

2015 ESC Guidelines for the management of infective endocarditis

Diagnostic positif

Definite IE

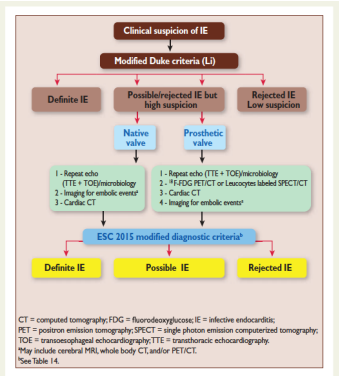
Pathological criteria
- Microorganisms demonstrated by culture or on histological examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or
- Pathological lesions; vegetation or intracardiac abscess confirmed by histological examination showing active endocarditis

Clinical criteria
- 2 major criteria; or
- 1 major criterion and 3 minor criteria; or
- 5 minor criteria

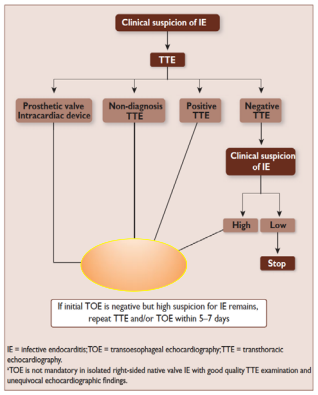
Possible IE
- 1 major criterion and 1 minor criterion; or
- 3 minor criteria

Rejected IE
- Firm alternate diagnosis; or
- Resolution of symptoms suggesting IE with antibiotic therapy for ≤4 days; or
- No pathological evidence of IE at surgery or autopsy, with antibiotic therapy for ≤4 days; or
- Does not meet criteria for possible IE, as above

ESC 2015 Algorithm for Diagnosis of Infective Endocarditis



CT = computed tomography; FDG = fluorodeoxyglucose; IE = infective endocarditis; PET = positron emission tomography; SPECT = single photon emission computerized tomography; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.
[a]May include cerebral MRI, whole body CT, and/or PET/CT.
[b]See Table 14.



IE = infective endocarditis; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.
[a]TOE is not mandatory in isolated right-sided native valve IE with good quality TTE examination and unequivocal echocardiographic findings.

European Heart Journal (2015) 36, 3075–3123
doi:10.1093/eurheartj/ehv319

6 types de lésions

ETT et ETO +++ apport diagnostic majeur

Difficulté d'interprétation si valve prothétique mécanique

Diagnostic systématiquement évoqué devant une régurgitation para-prothétique à fortiori devant une désinsertion prothétique

En l'absence de diagnostic, savoir répéter l'examen +++

	Surgery/necropsy	Echocardiography
Vegetation	Infected mass attached to an endocardial structure or on implanted intracardiac material.	Oscillating or non-oscillating intracardiac mass on valve or other endocardial structures, or on implanted intracardiac material.
Abscess	Perivalvular cavity with necrosis and purulent material not communicating with the cardiovascular lumen.	Thickened, non-homogeneous perivalvular area with echodense or echolucent appearance.
Pseudoaneurysm	Perivalvular cavity communicating with the cardiovascular lumen.	Pulsatile perivalvular echo-free space, with colour-Doppler flow detected.
Perforation	Interruption of endocardial tissue continuity.	Interruption of endocardial tissue continuity traversed by colour-Doppler flow.
Fistula	Communication between two neighbouring cavities through a perforation.	Colour-Doppler communication between two neighbouring cavities through a perforation.
Valve aneurysm	Saccular outpouching of valvular tissue.	Saccular bulging of valvular tissue.
Dehiscence of a prosthetic valve	Dehiscence of the prosthesis.	Paravalvular regurgitation identified by TTE/TOE, with or without rocking motion of the prosthesis.

Végétation

Masse adhérente **pédiculées** ou **sessile** (voire simple épaississement valvulaire localisé)

N'entrave pas le jeu valvulaire (rarement obstructive)

Aspect **hyper-échogène** en 2D

Aspect cheveu finement vibratile en mode TM

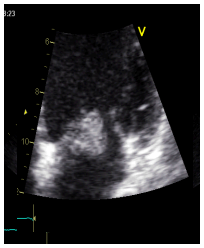
Taille variable 3 à 30 mm (emboligène si > 10 mm)

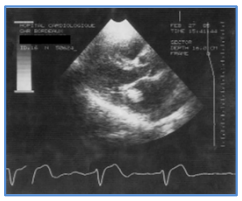
	ETT	ETO
Sensibilité (VN)	70%	96%
Sensibilité (VP)	50%	92%
Spécificité	90%	90%

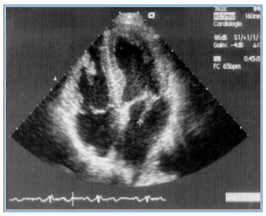
Végétation

Difficulté de diagnostic si taille < 3 mm, si valve prothétique, si lésion valvulaire préexistante, si embolisation récente et si device intracardiaque (sondes de pace-maker)

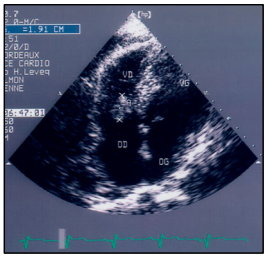
Faux positifs: thrombus, prolapsus, rupture de cordage, fibroélastome, valve myxoïde (épaissie), calcification valvulaire (gêne ouverture et artéfacts), myxome, strands (filaments de fibrine)

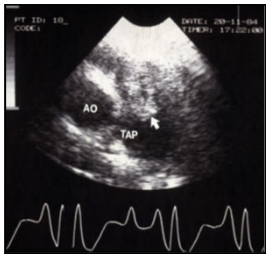




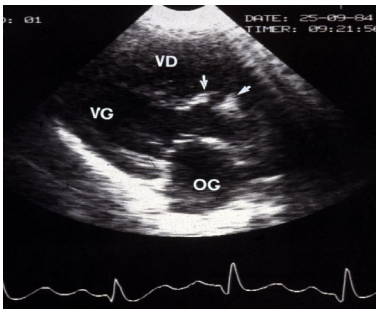


Endocardite du cœur droit

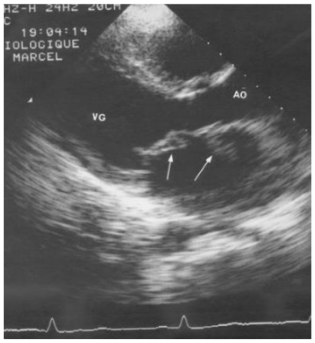




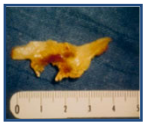
Endocardite sur CIV membraneuse



Végétation murale

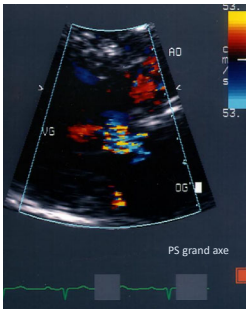


Lésions destructrices (1)

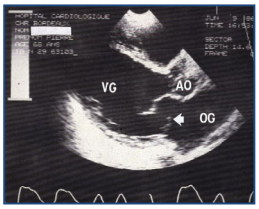


Perforation/déchirures valvulaires

Trou à l'emporte pièce avec jet directionnel excentré dont le point de départ est souvent au centre d'un feuillet et non au point de coaptation des 2 valves



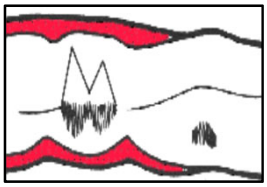
2D
Rupture/déchirure de la valve/capotage



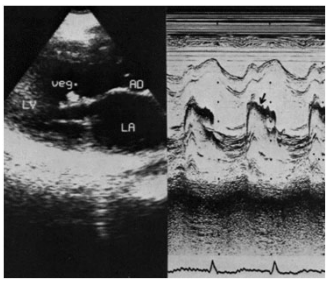
TM

Fluttering chaotique des valves: mouvement paradoxal diastolique de la valve postérieure

Capotage valve dans OG en systole (aspect vibratile: « fluttering »)



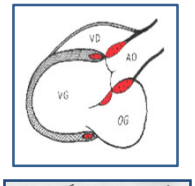
Coupe mode TM
(aspect chevelu et finement vibratile)

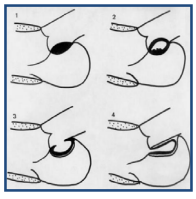


Lésions destructrices (2)

Abcès annulaires ou myocardiques

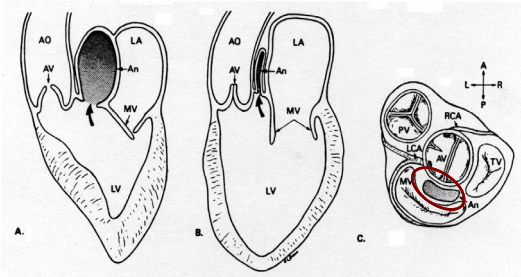
- Epaississement anormal de la paroi (zone hyperéchogène)
- Indice de gravité (risque de fistulisation)
- Chirurgie précoce +++
- Abcès péri- valvulaires : 30-50 %
- Atteinte élective de la racine aortique avec localisation antérieure (extension SIV membraneux) et localisation postérieure (extension trigone fibreux aorto-mitral)
- Abcès kystique : épaississement pariétal d'aspect kystique
- Abcès fistulisé « détergé » : poche vide d'écho communicant dans l'aorte ou VG via trigone fibreux aorto-mitral (= pseudo-anévrisme)

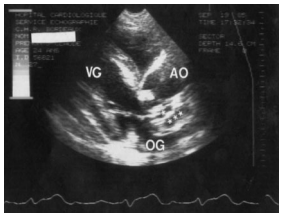




Sensibilité	ETT	ETO
	50%	90%

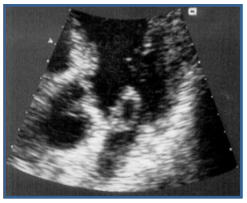
Abcès du trigone fibreux aorto-mitral





Anévrysme valvulaire sur valve native

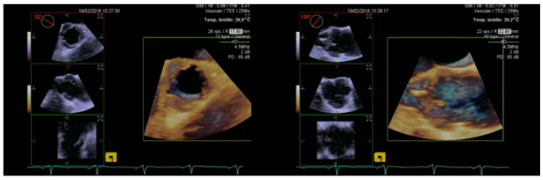
- Déformation valvulaire anévrismale
- Evolution vers perforation (shunt)
- Origine primitive (infection focale sur valve) ou secondaire (impact du jet régurgitant



ETO 3 D

Analyse des structures cardiaque en3D

Meilleur analyse des végétations et de leur taille



Liu YW et al. Scand Cardiovasc J 2009; 43:318-23

Tomodensitométrie et IRM cardiaque

TDM

- Détection abcès, pseudo-anévrysme et fistule
- Extension péri-valvulaire
- Morphologie de l'aorte ascendante
- Pour les EI du cœur droit informatif sur la présence d'abcès ou infarctus pulmonaire
- Bilan embols systémiques (cérébraux, spléniques, rénaux…)

IRM

- Intéret pour la recheche des lésions cérébrales avec un rendement plus important

Indications chirurgicales

Indications for surgery	Timing[a]	Class[b]	Level[c]
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[d]	Urgent	IIb	C

Circonstances de survenue

- ✓ Endocardite sur valve native
- ✓ Endocardite sur valve prothétique
- ✓ Endocardite sur sonde de Pace-maker

…sur valve native

- Cœur gauche : - Plus fréquentes
- Gravité des formes aiguës de l'orifice aortique
- Atteinte pluriorificielle possible voire fréquente…

- E. Tricuspide : - De plus en plus fréquentes
- Terrain: toxicomanes, patients réanimation, pacemaker++
- Stérilisation longue

- E. Pulmonaire : - Rares
- Terrain: toxicomanes, patients réanimation, congénitaux

- E. et cardiopathies congénitales : - Peu fréquentes (CIV, canal artériel…)
- Cardiopathies opérées ou non
- Nombreuses localisations décrites

…sur valve prothétique

Classiquement 10 à 20% des endocardites
Mortalité > 20%
Endocardite précoce (1ère année) grave car germes virulents +++
Diagnostic difficile avec complémentarité ETT/ETO
Abcès avec sanction chirurgicale fréquente

Particularité de la prothèse mécanique
Végétations difficile à voir car nombreux artéfacts et échos de réverbération (matériel hyperéchogène) sauf si très volumineuses et pédiculées
Désinsertion possible (doppler couleur à la recherche d'une fuite para-prothétique)
ETO +++ (végétations, abcès péri-prothétique, désinsertions de prothèse et fistules)
TEP scan ou scintigraphie leucocytes marqués (si chirurgie > 3 mois)

Particularités de la bioprothèse
Diagnostic plus aisé avec désinsertion possible
Dépistage flux anormaux
Diagnostic différentiel : lésions de dégénérescence tissulaire

Endocardites sur pacemaker

- Complication rare (Incidence 0,1 à 7%)

mais de plus en plus fréquente

mortalité +++: 10 à 30% !

- Formes précoces (< 6 sem. après implantation) vs formes chroniques

- Diagnostic

- Clinique : fièvre, signes locaux (loge PM), pneumopathie
- Bactériologique
- Echocardiographique

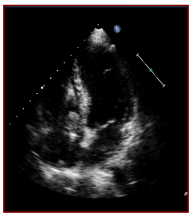
Endocardites sur pacemaker

Diagnostic difficile, rôle essentiel ETO ++

Végétations :

Arrondie, mobile, attenante aux sondes ou à la tricuspide

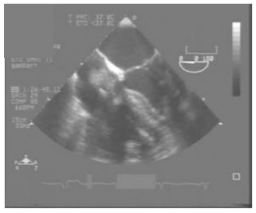
Murales ou manchon autour de la sonde moins typique

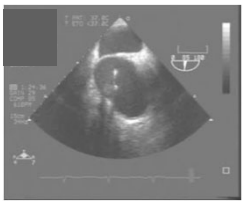


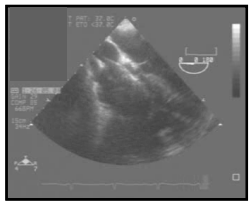
Délabrement tricuspidien avec IT possible

Abcès rare

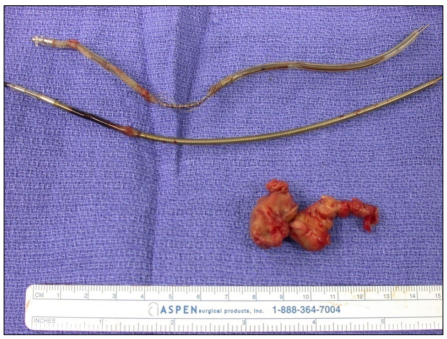
Cas clinique #1







Cas clinique #1

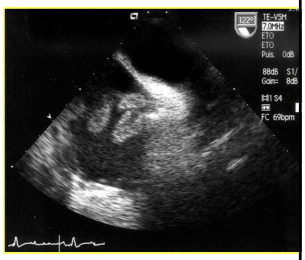


Endocardites sur pacemaker
Conduite à tenir

→ En règle : exérèse du matériel

- Végétation < 10 – 15 mm
→extraction percutanée

- Végétation > 15 mm
→extraction chirurgicale



ETO OM Bicave

Critères de gravité

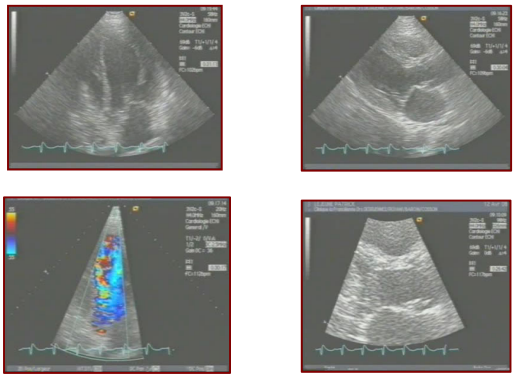
Patient characteristics
- Older age
- Prosthetic valve IE
- Diabetes mellitus
- Comorbidity (e.g., frailty, immunosuppression, renal or pulmonary disease)

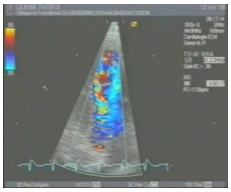
Clinical complications of IE
- Heart failure
- Renal failure
- >Moderate area of ischaemic stroke
- Brain haemorrhage
- Septic shock

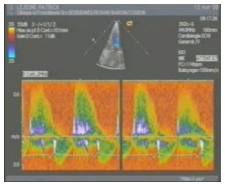
Microorganism
- *Staphylococcus aureus*
- Fungi
- Non-HACEK Gram-negative bacilli

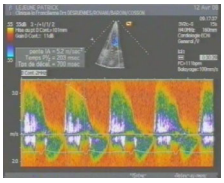
Echocardiographic findings
- Periannular complications
- Severe left-sided valve regurgitation
- Low left ventricular ejection fraction
- Pulmonary hypertension
- Large vegetations
- Severe prosthetic valve dysfunction
- Premature mitral valve closure and other signs of elevated diastolic pressures

Cas clinique #2



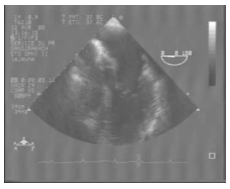


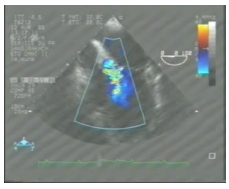


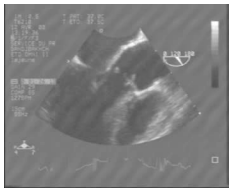


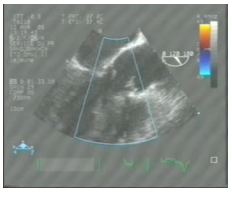
Pente d'IA =5.2 m.sec^{-1}
T1/2P= 203 ms

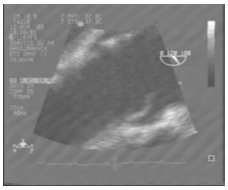
ETO complémentaire

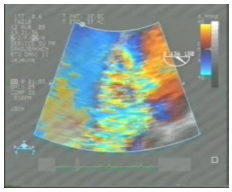


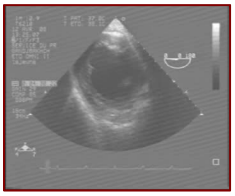


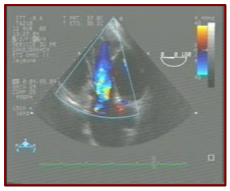


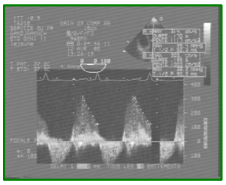


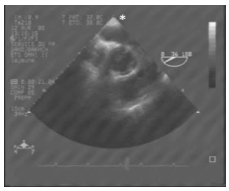


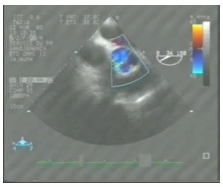


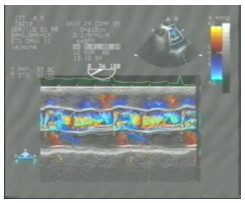


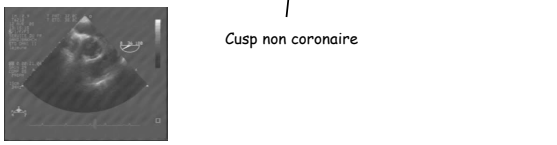


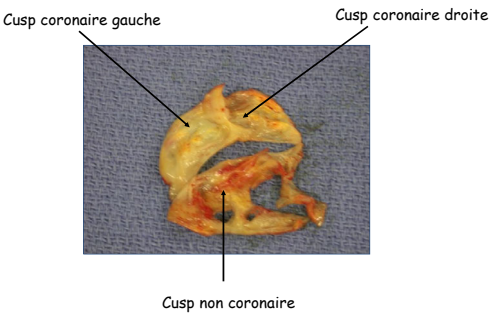






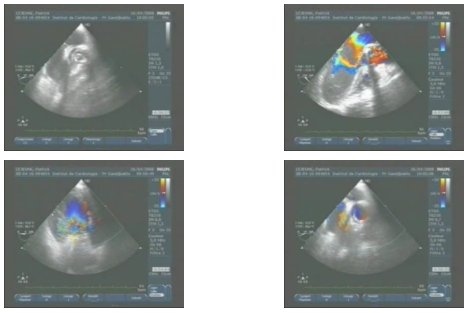




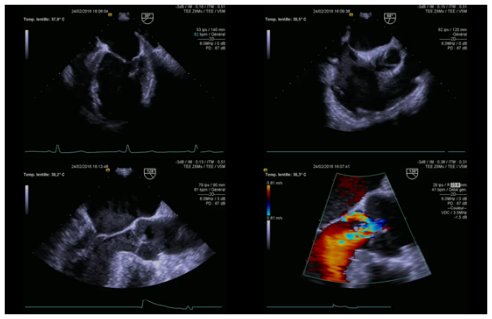


Bicuspidie aortique avec perforation valvulaire

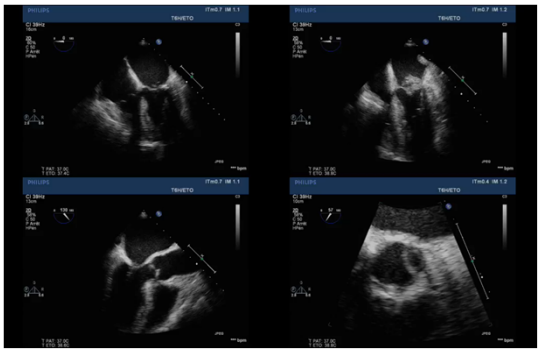
Contrôle postopératoire…



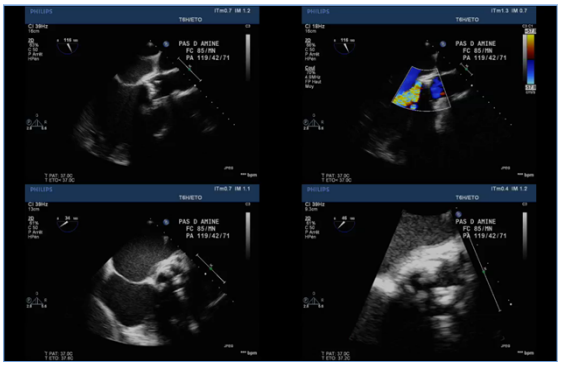
Cas clinique #3



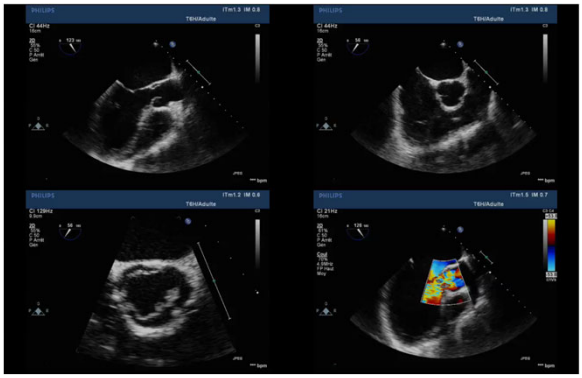
Cas clinique #4



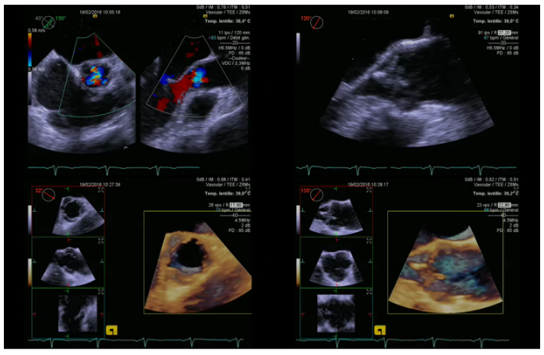
Cas clinique #5

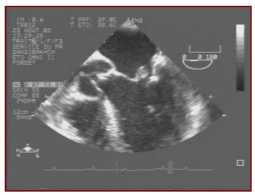


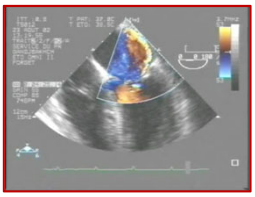
Cas clinique #6



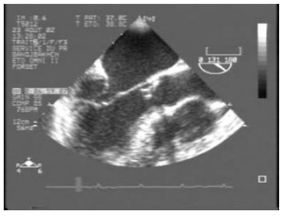
Cas clinique #7



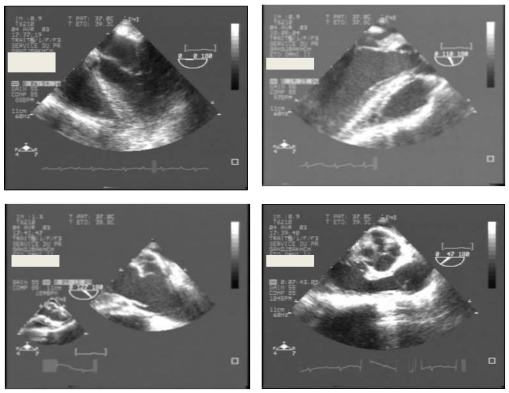


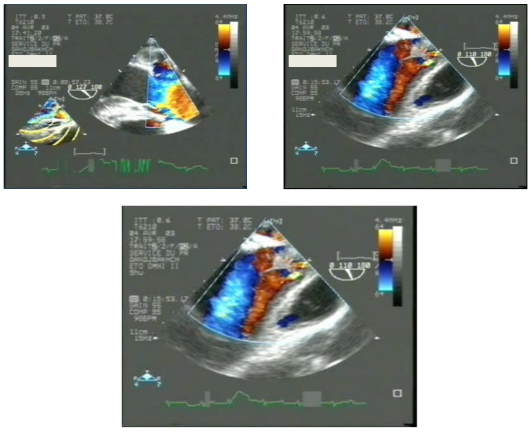


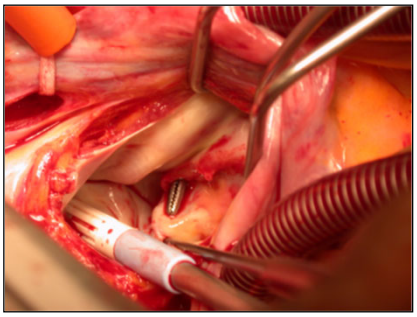
Cas clinique #8



Cas clinique #9







10