Case presentations: challenges in infective endocarditis:

Endocarditis in the intensive care and in the critically ill

Eurovalves 2016

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Case presentation (1)

- Male, 32 years old, US patient

- History
  - Fever 2 weeks before admission (38.2 °)
  - Progressively increasing SOB
  - Admitted at the ICU for septic shock

•Parameters - Examination
  - SOFA score 9
  - Tachycardia 115 bpm
  - Diastolic murmur aortic 3/6

-Lab: CRP 123 mg/L; leucocytosis 15.000 /microL, 93% PN

- Blood cultures: streptoccus pneumoniae x 3

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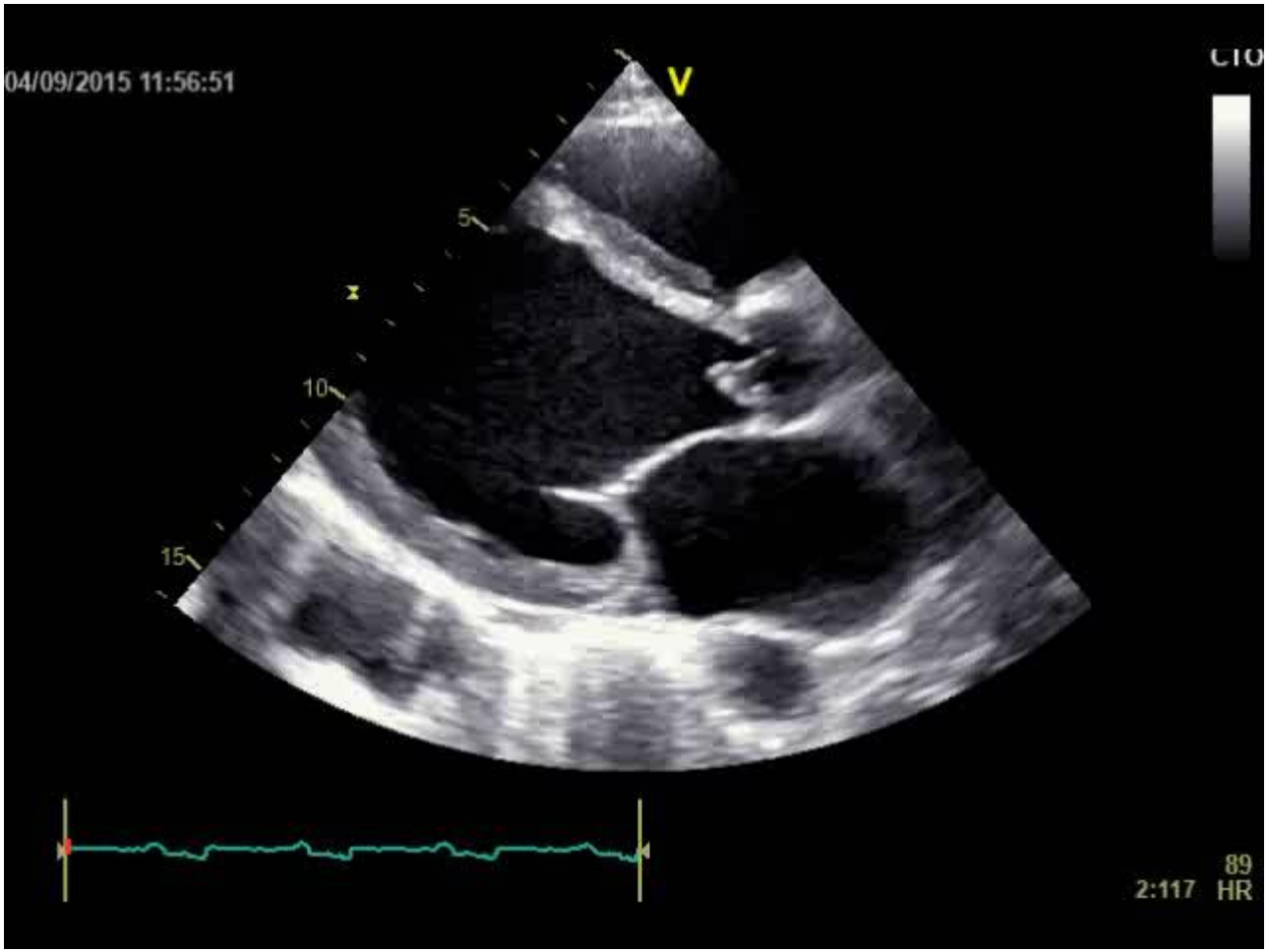
Vincent JL Intensive Care Med. 1996 Jul; 22(7):707-10

Echocardiography



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Evolution

- Develop coma (Glasgow 6)

- Rapid evolution in multiple organ failure
    - Intubation and mechanical ventilation
    - Hepatic failure with severe coagulation dysfunction
    - Acute renal failure

- Cerebral CT in emergency showing a small cerebral haemorrhagic stroke

- Abdominal echocardiography showing no hepatic abcess

- Classical antibiotherapy: penicillin G, 3 g every 6-8 hours IV (MIC< 0.1 microg/L)

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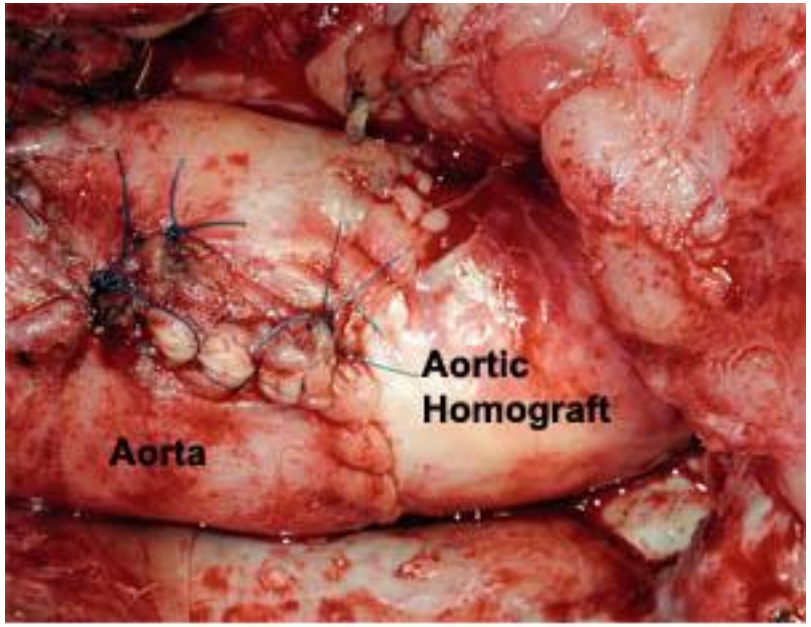
Evolution (2)

- Despite several contra-indications for surgery

- Emergency surgery – cleaning + homograft



- Long stay, progressive recovery

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ICU infective endocarditis

- Presentation
- Causal agents
- Surgical procedure
- Prognostic factors

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Main indications for IE/ICU admission

Septic shock

Severe valvular regurgitation

Cardiogenic shock

Acute renal failure

Acute respiratory failure requiring mechanical ventilation

Neurological complications

Community-acquired/hospital-acquired IE

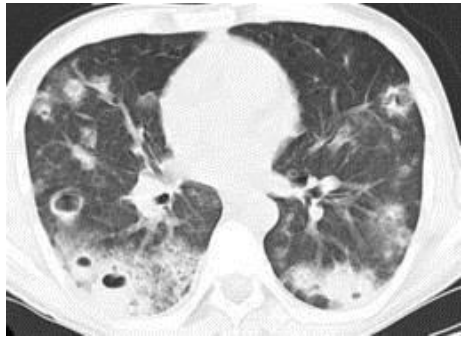
Native valve/prosthetic valve IE

Presentation: specific features

- Frequent extra-cardiac involvement (35% - >50 %)

  -Mainly central nervous system (> 70%) < CT, MRI, spinal fluid
    -Ischemic stroke
    -Cerebral haemorrhage
    -Meningitis
    -Cerebral abcess
    -Intracranial mycotic aneurysm

  -Systemic embolism or metastatic infective events (> 25%)
    -Spleen
    -Bone and joints
    -Kidneys
    -Lungs
    -Liver



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Causal agents IE in ICU

- Stapylococcus aureus (43-56 %) > general population

- Streptococcus sp (20-58 %)

- Negative blood culture (15%)

- Depending on Native vs. Native and Prosthetic

- Depending on left side vs. Left and right side

Mourvilliers et al Intensive Care Med. 2004 Nov; 30(11):2046-52

Murdoch et al Arch Intern Med. 2009 Mar 9; 169(5):463-73

Samol et al Infection. 2015 Jun; 43(3):287-95

Selton-Suty et al Clin Infect Dis. 2012 May; 54(9):1230-9

Akinosoglu et al Eur J Intern Med. 2013 Sep; 24(6):510-9

Surgery in critically ill

- Need for surgery 35-52 %
- Emergency surgery Indicated in 75 % - performed in 53%
- Cardiac surgery available or not (crucial point) cf ENDOREA
- Impact of timing

Timing of surgery	Indications	Number of patients with contra-indications	Contra-indications
Emergency $n = 69$	Cardiogenic shock $n = 41$	33 (47.8 %)	Multiple organ failure $n = 16$
	Refractory pulmonary oedema $n = 28$		Hemorrhagic stroke $n = 8$
			Severe underlying diseases $n = 7$
			Risk of extra cerebral hemorrhage $n = 2$
Urgent $n = 102$	Very large vegetations = 43	50 (49 %)	Risk of cerebral hemorrhage $n = 22$
	Large vegetations and embolic episodes $n = 21$		Multiple organ failure $n = 16$
	Annular abscess n = 27		Severe underlying diseases $n = 11$
	Uncontrolled infection $n = 8$		Risk of extra cerebral haemorrhage $n = 1$
	Severe acute regurgitation $n = 3$		
Elective $n = 15$	Severe regurgitation without heart failure $n = 12$	2 (13.3 %)	Severe underlying diseases $n = 1$
	Severe prosthetic dehiscence $n = 3$		Multiple organ failure $n = 1$

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Sonneville et al Crit Care Med 2011; 39: 1474

Leroy et al Ann Intensive Care. 2015; 5: 45.

Mourvilliers et al Intensive Care Med. 2004 Nov; 30(11):2046-52

Mirabel et al Eur Heart J. 2014 May; 35(18):1195-204

Samol et al Infection. 2015 Jun; 43(3):287-95

Surgery in critically ill : mortality

Timing of surgery	Number of patients	Number of patients with surgery performed during ICU stay	In hospital mortality *n* (%)	Number of patients with surgery not performed during ICU stay	In hospital mortality *n* (%)
Patients with contra-indications to surgery *n* = 85					
Emergency	33	6	1 (16.7 %)	27	25 (92.6 %)
Urgent	50	8	1 (12.5 %)	42	30 (71.4 %)
Elective	2	1	0	1	0
Patients without contra-indications to surgery *n* = 101					
Emergency	36	36	6 (16.6 %)	0	0
Urgent	52	41	11 (21.2 %)	11	0
Elective	13	7	0	6	2 (33.3 %)

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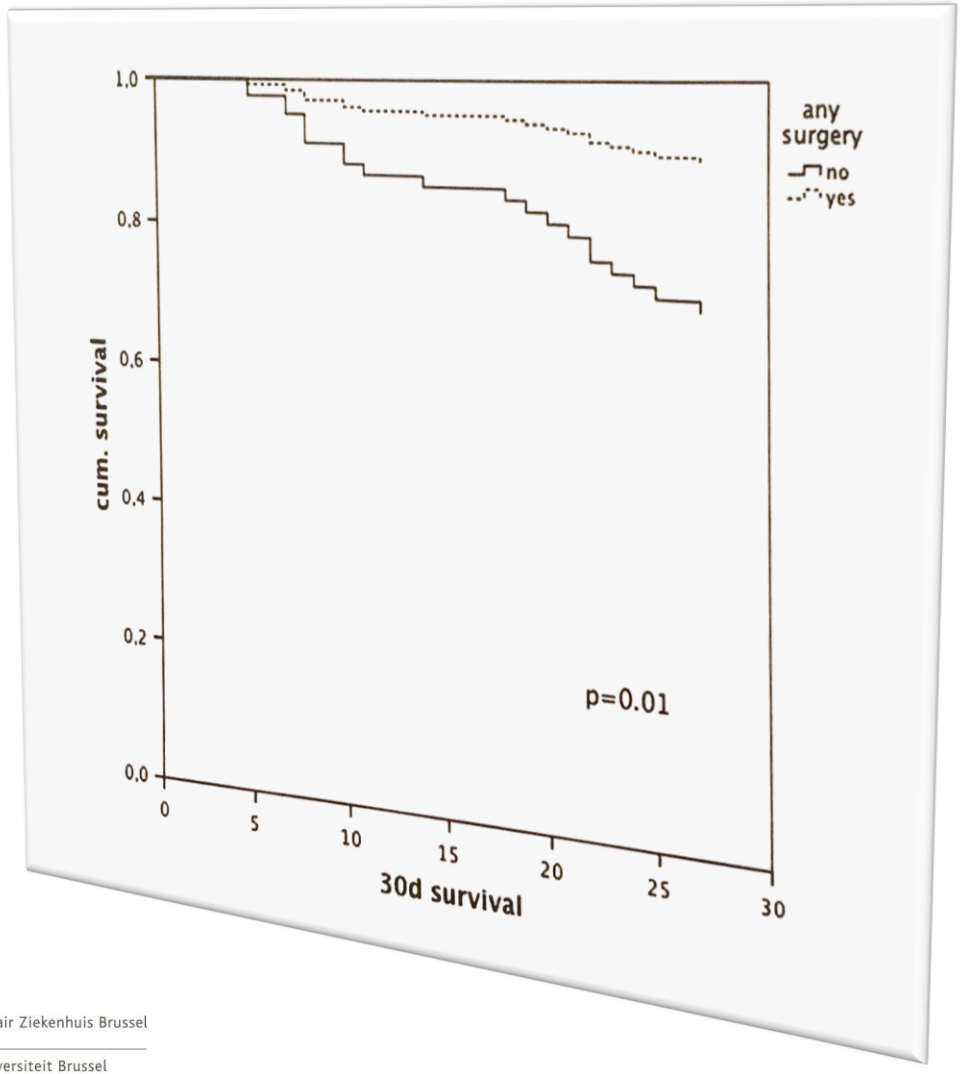
Leroy et al Ann Intensive Care. 2015; 5: 45.

Surgery in critically ill : mortality IP



HR 0.31 (0.12-0.79) , p< 0.01
25 % mortality ICU stay
N=216

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Samol et al Infection. 2015 Jun; 43(3):287-95

Prognostic factors

- Infective agent and affected valve not independent predictors (ST/LT)

- Comorbidities (CAD, prior transplant, prior endocarditis) no significant influence

- Low WBC count (less than 13.000/ microL) IP of better prognosis

- Organ failure and high ICU scores are independent predictors (ST/LT)

- Surgical clearance is an independent predictor of 30 d outcome

Samol et al Infection. 2015 Jun; 43(3):287-95

Prognostic factors (2)

Factor	Survivors $n = 145$	Non-survivors $n = 103$	p
Charlson score	4.18 ± 2.80	5.15 ± 2.46	0.003
SAPS II	30.99 ± 13.16	44.60 ± 17.95	<0.0001
SAPS II > 35	43 (38.4 %)	69 (61.6 %)	<0.0001
SOFA score	5.65 ± 2.77	8.93 ± 3.91	<0.0001
SOFA score >8	30 (33 %)	61 (67 %)	<0.0001
Glasgow Coma Score <9	7 (17.9 %)	32 (82.1 %)	<0.0001
ICU admission for septic shock	17 (31.5 %)	37 (68.5 %)	<0.0001
ICU admission for cardiogenic shock	16 (41 %)	23 (59 %)	0.016
ICU admission for acute respiratory failure	22 (78.6 %)	6 (21.4 %)	0.02
ICU admission for severe valvular regurgitation	40 (87 %)	6 (13 %)	<0.0001
Mitral IE	80 (52.6 %)	72 (47.4 %)	0.02
Native IE	121 (62.05 %)	74 (37.95 %)	0.03
Prosthetic IE	24 (45.3 %)	29 (54.7 %)	0.03
Annular abscess	31 (46.3 %)	36 (53.7 %)	0.02
Severe aortic regurgitation	50 (75.8 %)	16 (24.2 %)	0.0009
Left ventricular ejection fraction (%)	57 ± 11	52 ± 13	0.005
IE due to *Streptococcus* spp.	72 (67.3 %)	35 (32.7 %)	0.01
IE due to MSSA	36 (48.70 %)	38 (51.3 %)	0.04
IE due to MRSA	4 (25 %)	12 (75 %)	0.005
Adequate antimicrobial treatment	127 (61.7 %)	79 (38.3 %)	0.02
Surgery during ICU stay	80 (80.8 %)	19 (19.2 %)	<0.0001
Surgery (overall)	102 (81.6 %)	23 (18.4 %)	<0.0001
Adequate surgery	65 (85.5 %)	11 (14.5 %)	<0.0001

Leroy et al Ann Intensive Care. 2015; 5: 45.

Take home messages

- Mortality of IE in ICU remains high

- High ICU scores (SPAPS II, SOFA) are independent predictors of mortality

- Multiple organ failure is also an independent predictor of mortality

- Search for extra cardiac extension (more frequent)

- Surgery is conveying a better prognosis – referring to tertiary center

- IA and affected valve are not independent predicitors of mortality in ICU patients

- Our patient was lucky to survive

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mortality

Use the *worst* value for each physiological variable within the past 24 hours.

VITALS

HR	BP	RR	Temp	GCS
bpm	/ mmHg	bpm	C or F	

ARTERIAL BLOOD GAS

pH	pCO2	pO2	FIO2
	mmHg	mmHg	%

Mechanical ventilation or CPAP: Yes / No

CHEM-7

Na	K	CO2	BUN	SCr
mEq/L	mEq/L	mEq/L	mg/dL	mg/dL

Acute renal failure: Yes / No

CBC

WBC	Hct	Plt
x 10^9/L	%	x10^3/mm^3

MISC METRICS

Urine output: mL per hour

Bilirubin: mg/dL

Vasopressors: No / Yes

CHRONIC HEALTH

Age: years

Chronic diseases:
- Metastatic cancer
- Hematologic malignancy
- AIDS

Type of admission: Scheduled (elective) surgical

Case presentation (2)

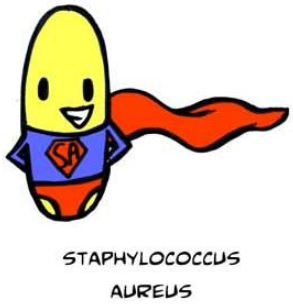
- Male, 77 years old

- History
  - AMI and CABG (2003)
  - End stage renal disease (dialysis)
  - Diabetes mellitus type 2
  - Arterial hypertension
  - Ischemic CVA
  - Prostate carcinoma

- Dec 2015: admitted to our hospital with recurrent fever
- Lab: CRP 71 mg/L, mild leucocytosis.
- Blood cultures: oxacilline-sensitive S. aureus (MSSA)

Case presentation (2)

- Three previous reoccurrences of MSSA sepsis of unknown origin in other hospitals, within 6 months:

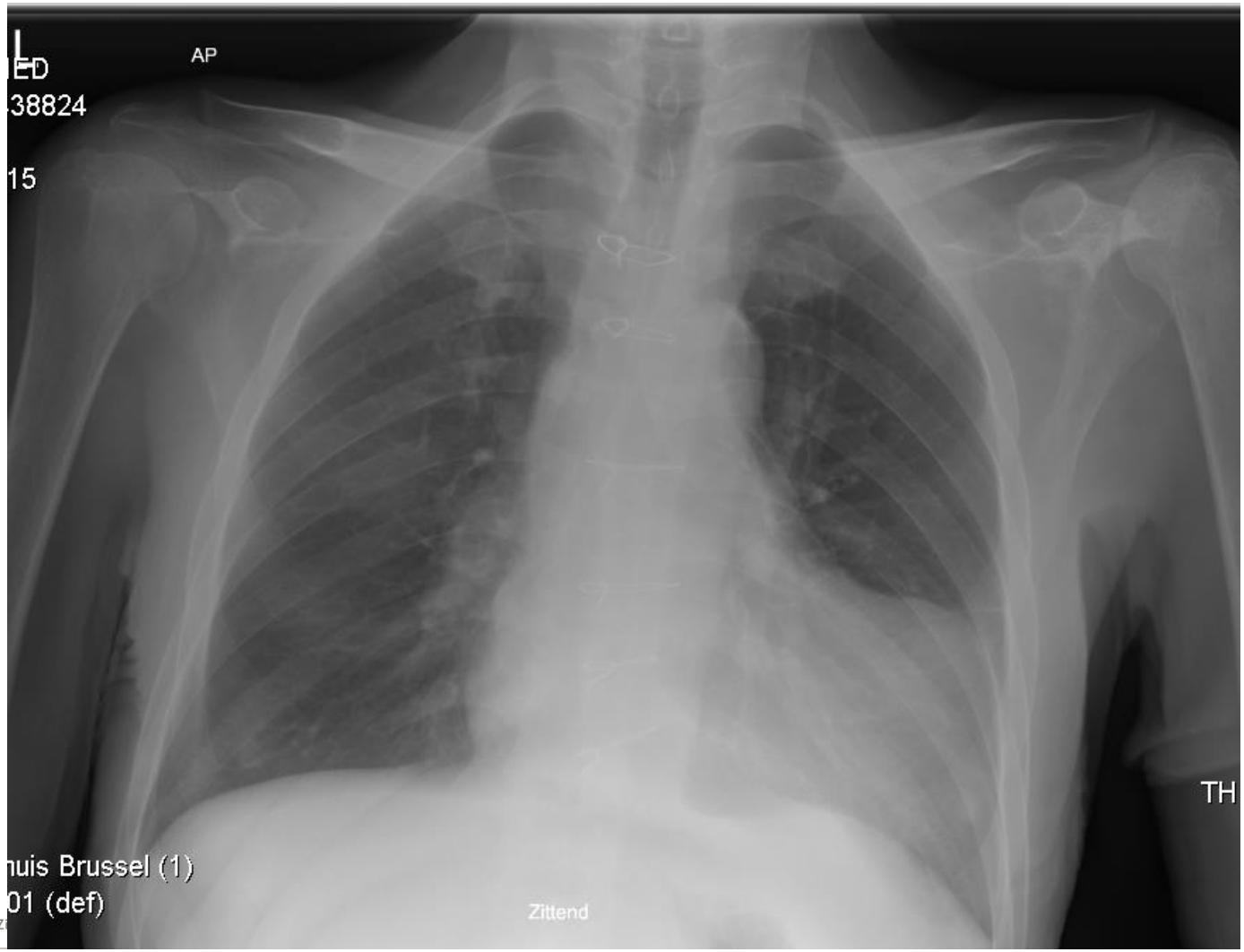


  - July 2015:
    - Fever, vomiting, diarrea
    - HC: MSSA + 4 days. Flucloxacilline IV 14 days.
    - Negative investigations (TEE, CT abdomen, Head CT, NMR spine)

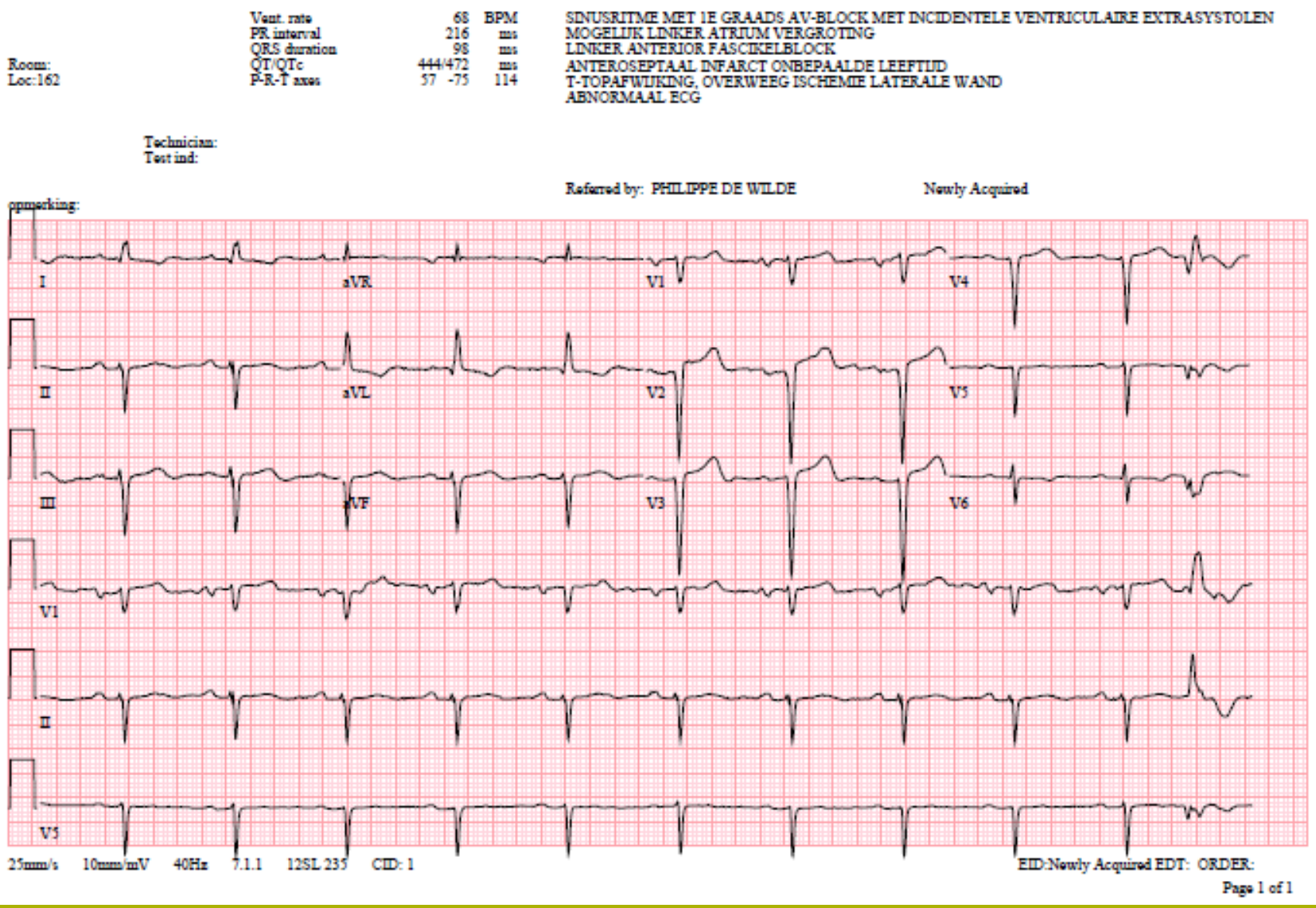
  - August-September 2015:
    - Fever
    - HC MSSA: + 9 days.Vancomycine → Flucloxacilline IV 35 days
    - Negative investigations (TEE, CT abdomen-thorax, WBC scintigraphy)

  - October 2015:
    - Fever during dialysis.
    - HC: MSSA +. Flucloxacilline IV 7 days → Cefazoline PO 15 days
    - Refuses investigations, demands hospital discharge.

Rx thorax



ECG


Vent. rate 68 BPM
PR interval 216 ms
QRS duration 98 ms
QT/QTc 444/472 ms
P-R-T axes 57 -75 114
SINUSRITME MET 1E GRAADS AV-BLOCK MET INCIDENTELE VENTRICULAIRE EXTRASYSTOLEN
MOGELIJK LINKER ATRIUM VERGROTING
LINKER ANTERIOR FASCIKELBLOCK
ANTEROSEPTAAL INFARCT ONBEPAALDE LEEFTIJD
T-TOPAFWIJKING, OVERWEEG ISCHEMIE LATERALE WAND
ABNORMAAL ECG
Room:
Loc:162
Technician:
Test ind:
Referred by: PHILIPPE DE WILDE
Newly Acquired
opmerking:
I
aVR
V1
V4
II
aVL
V2
V5
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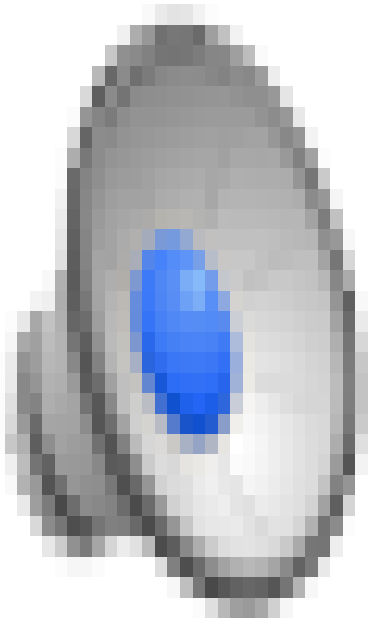
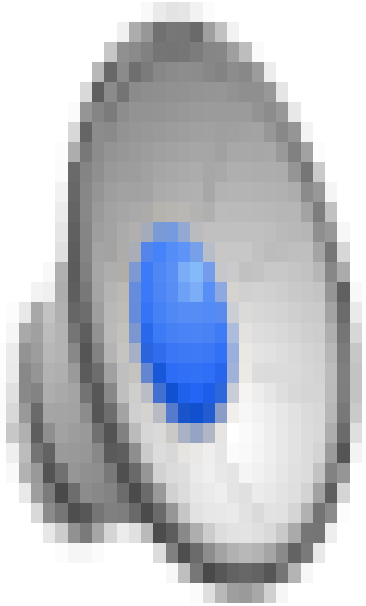
aVF
V3
V6
V1
II
V5
25mm/s 10mm/mV 40Hz 7.1.1 12SL 235 CID: 1
EID:Newly Acquired EDT: ORDER:
Page 1 of 1

Transthoracic echocardiography (1)



Transthoracic echocardiography (2)



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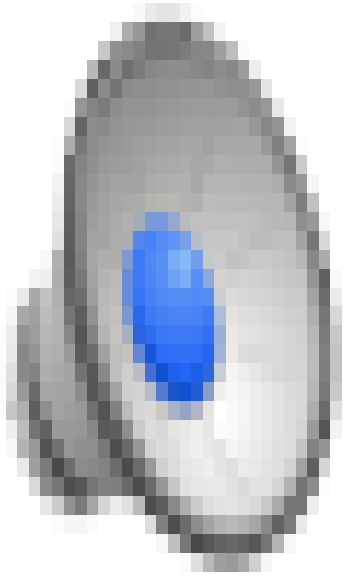
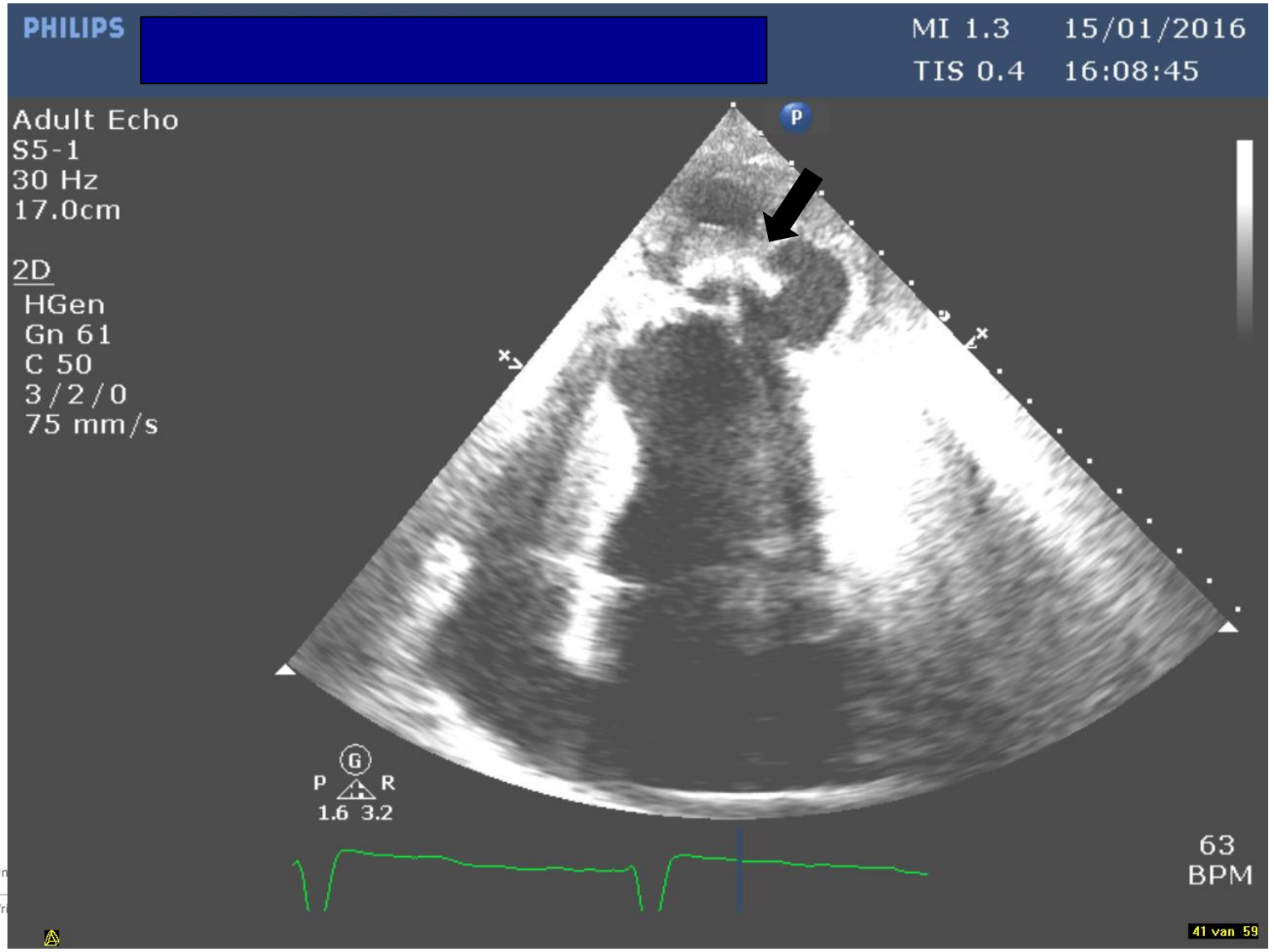
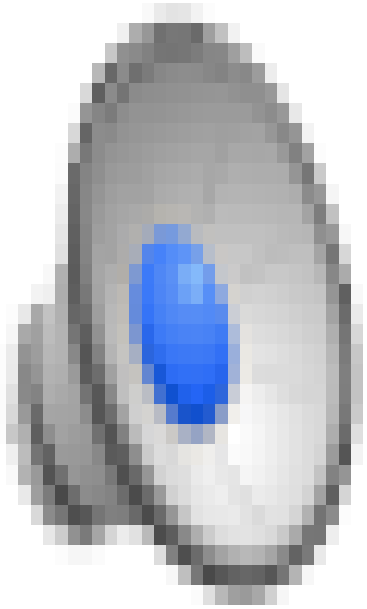
Transthoracic echocardiography (3)



Transthoracic echocardiography (4)



Transthoracic echocardiography (5)



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Echocardiography (6)

TTE findings:

- LVEF 35%
- Akinesia apical, anterior
- Mildly reduced RV longitudinal contractility
- Dilated atria
- Tricuspid aortic valve, mild aortic regurgitation, no stenosis
- Mild mitral and tricuspid valve regurgitation
- No pulmonary hypertension
- No pericardial effusion

Computed Tomography (1)

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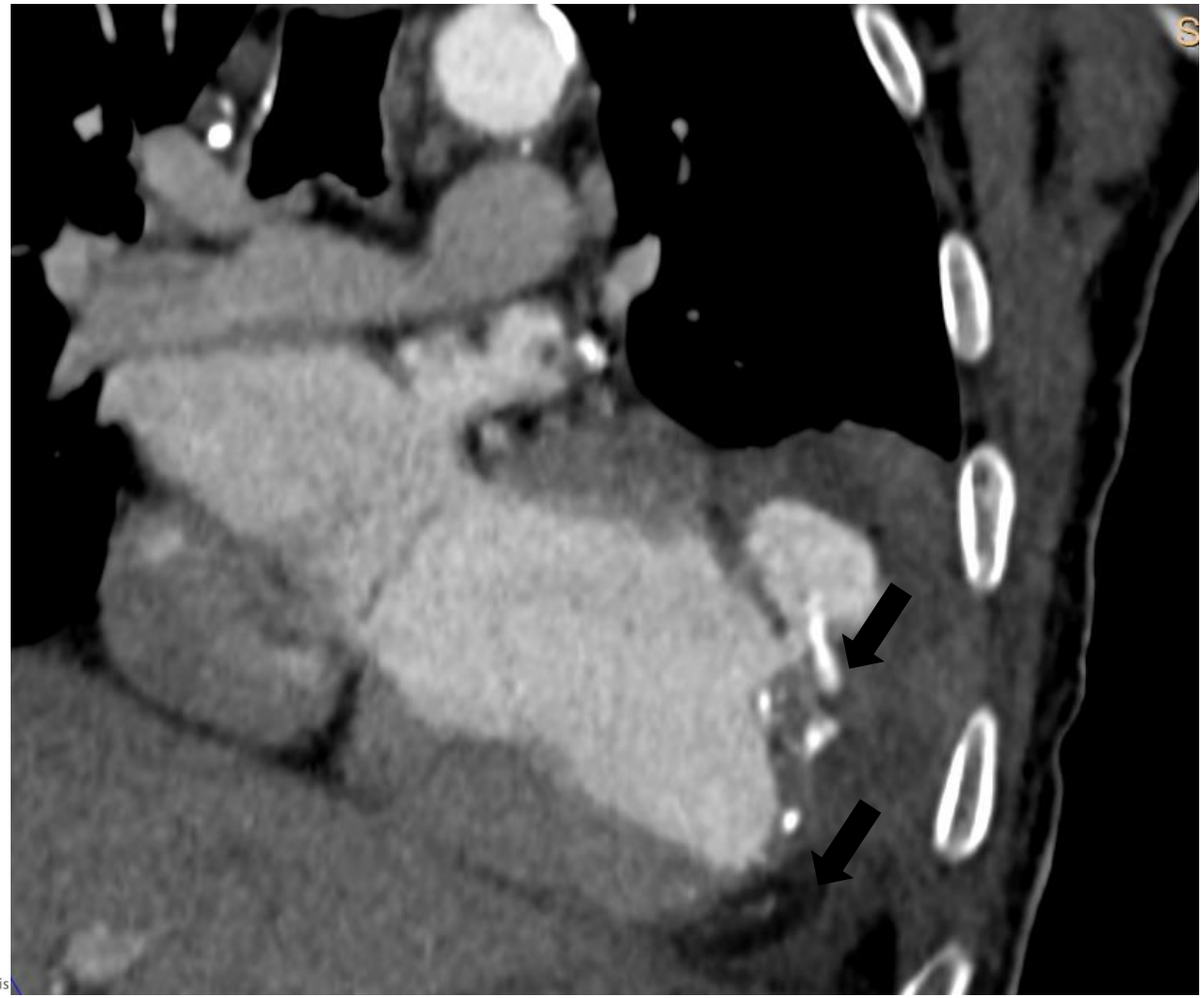
Computed Tomography (2)



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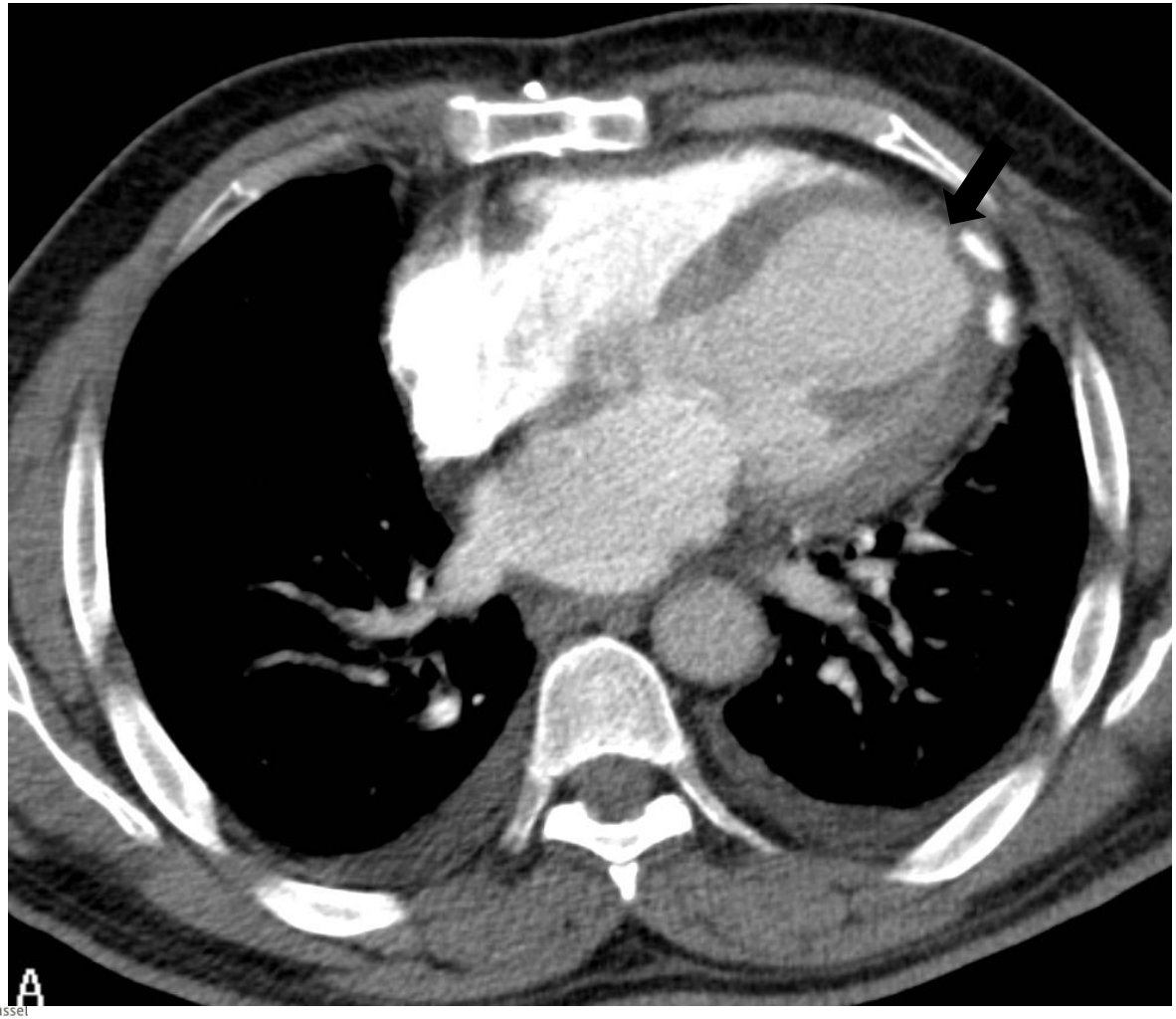
Computed Tomography (3): 6 years earlier



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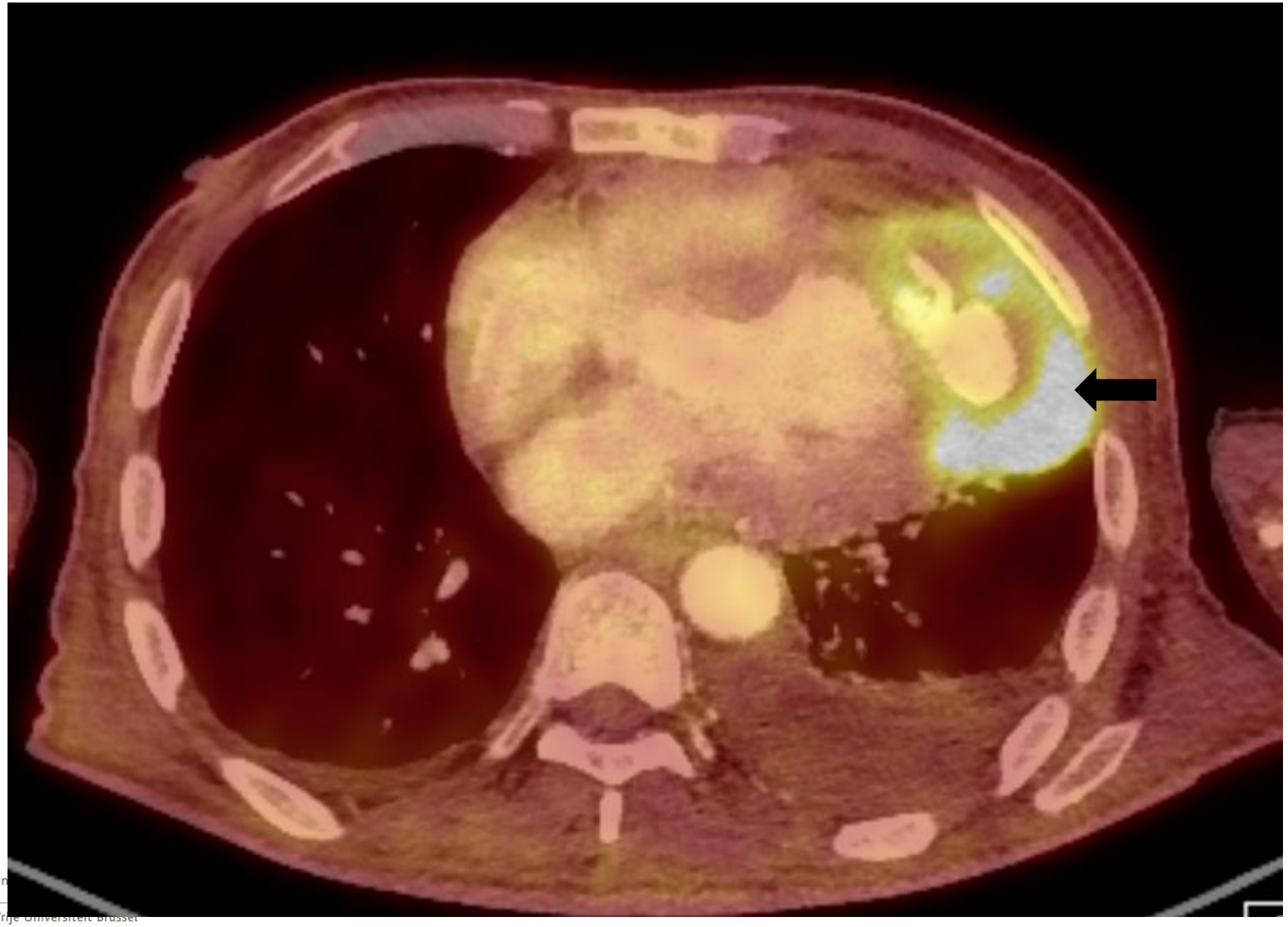
PET-CT

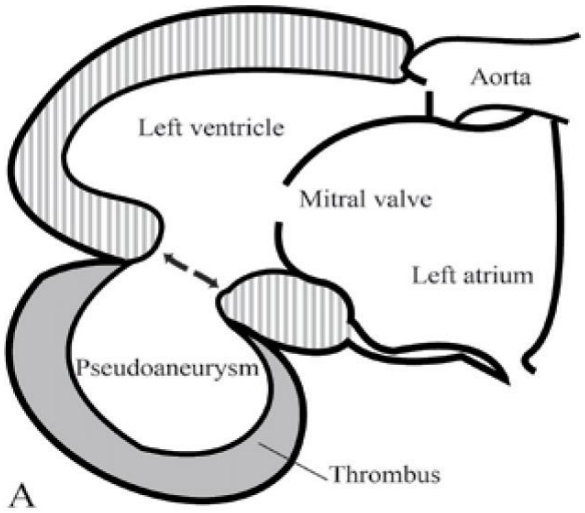


Computed Tomography: comparison

Pseudo-aneurysm (1)

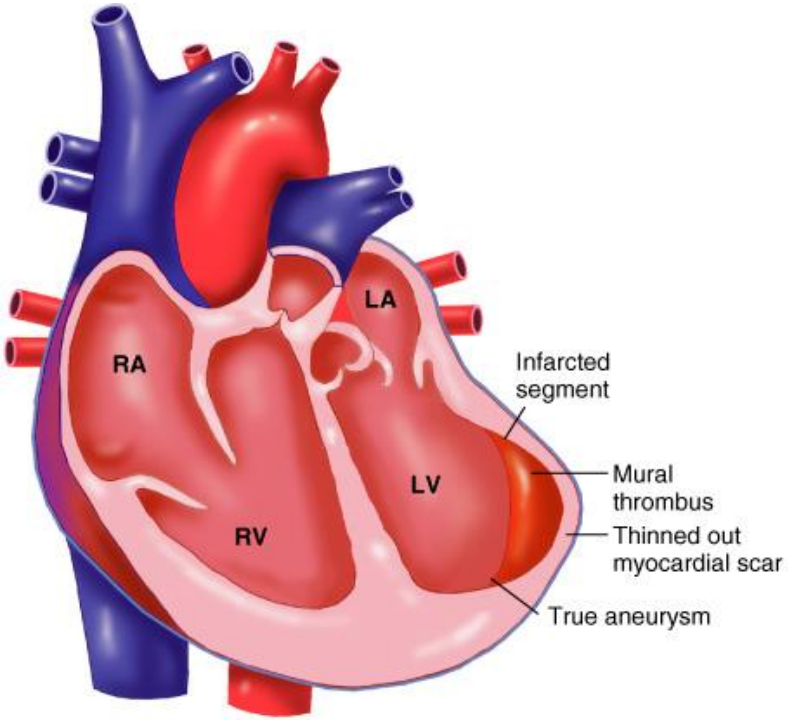
- Not common, median age = 60 years old

- Etiology
  - Post- transmural myocardial infarction
  - 33% post-surgery (MVR, CABG)
  - Trauma
  - Infection
  - …



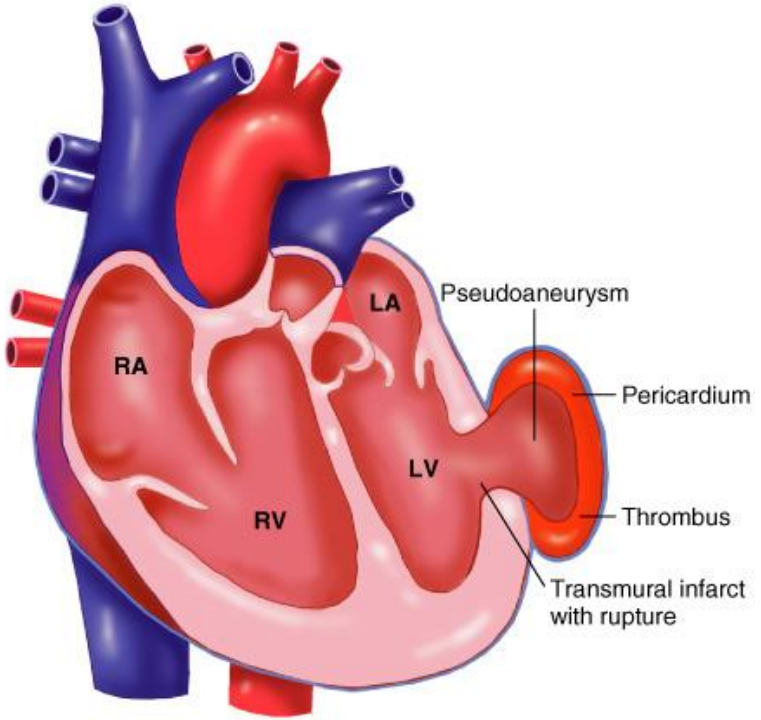
- Rupture through thinned myocardial wall
- Contained by adherent pericardium or scar tissue
- Filled with thrombus material or adhesion tissue

Pseudo-aneurysm (2)



True Aneurysm

1. Wide base
2. Walls composed of myocardium
3. Low risk of rupture



Pseudoaneurysm

1. Narrow base
2. Walls composed of thrombus and pericardium
3. High risk of rupture

Pseudo-aneurysm (3)

Evolution

- >10% asymptomatic
- Congestive heart failure, chest pain and dyspnea are the most frequently reported symptoms

- Risk of infection with repetitive sepsis
- Risk of fistulation (to lungs)
- Risk of embolic cerebrovascular accidents
- Risk of arythmia
- Risk of rupture (45%) with tamponade: sudden death
- High mortality rate, especially those who do not undergo surgery

Pseudo-aneurysm (4)

Diagnosis

- Abnormalities on the electrocardiogram (95%): nonspecific ST segment changes
- Abnormal chest X-ray: mass, cardiomegaly (95%)

- Angiography
- (2D) color Doppler echocardiography (TTE/TEE)
- Radionuclide and CT scans, MRI

Pseudo-aneurysm (5)

Therapy

- Goal: to reduce the risk of expansion or rupture
- No randomized controlled trial exists to guide treatment decision

- For appropriate candidates, surgery is the treatment of choice
  - Direct suture
  - Endoventricular patch plasty
- Recurrence of pseudoaneurysm after surgery in 5%

Case presentation (3)

Treatment of our patient

- Based on
  - The extension of the infarcted wall
  - The calcifications and adipose tissue transformation
  - The frailty of the patient, co-morbidities
  - Wishes of the patient and family

  → A conservative treatment approach was preferred for our patient.

Conclusions

- Left ventricle pseudo-aneurysm is a rare, late complication of myocardial infarction

- This case illustrates that it should be considered as a potential source of infection in patients suffering of recurrent sepsis.

- In our case, the pseudo-aneurysm was diagnosed with TTE.
It's difficult to image the apex of the LV with TEE, especially if the LV is enlarged or has an apical aneurysm.

- Surgery is the treatment of choice