Case-based challenges in endocarditis: Applying the 2023 ESC guidelines

A Patient with Large Vegetation

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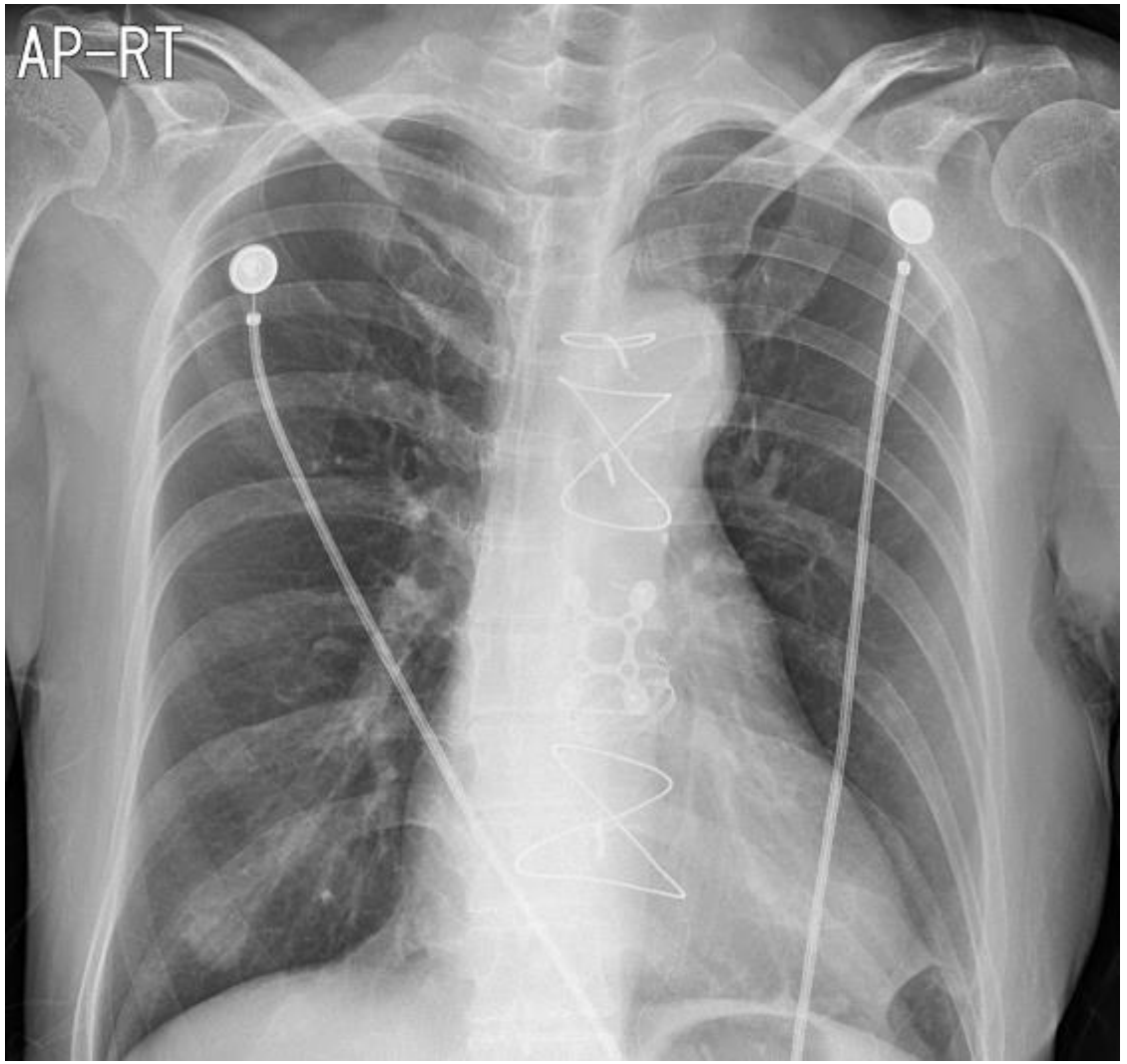
52 / F with fever for 3 days

- **PMHx:**

  - S/P VSD closure (1985')
  - S/P Bentall, Hemiarch replacement, OPCAB (Ao – RCA SVG) (2022.09.27) d/t Severe AR, Annulo-aortic ectasia, SoV aneurysm, Coronary anomaly

- Paroxysmal AF (CV Score : 2)
- HFimpEF (22→52%)
- 165.0cm / 55kg, BSA 1.59m^2
- V/S: 101/60mmHg, HR 74bpm, RR 18/min, 37.7℃



52 / F with fever for 3 days

- CBC : 14.7 – 7000 – 39K

  BUN/Cr : 31.9 (7.3-20.5) / 1.01

  (0.49-0.91) mg/dL

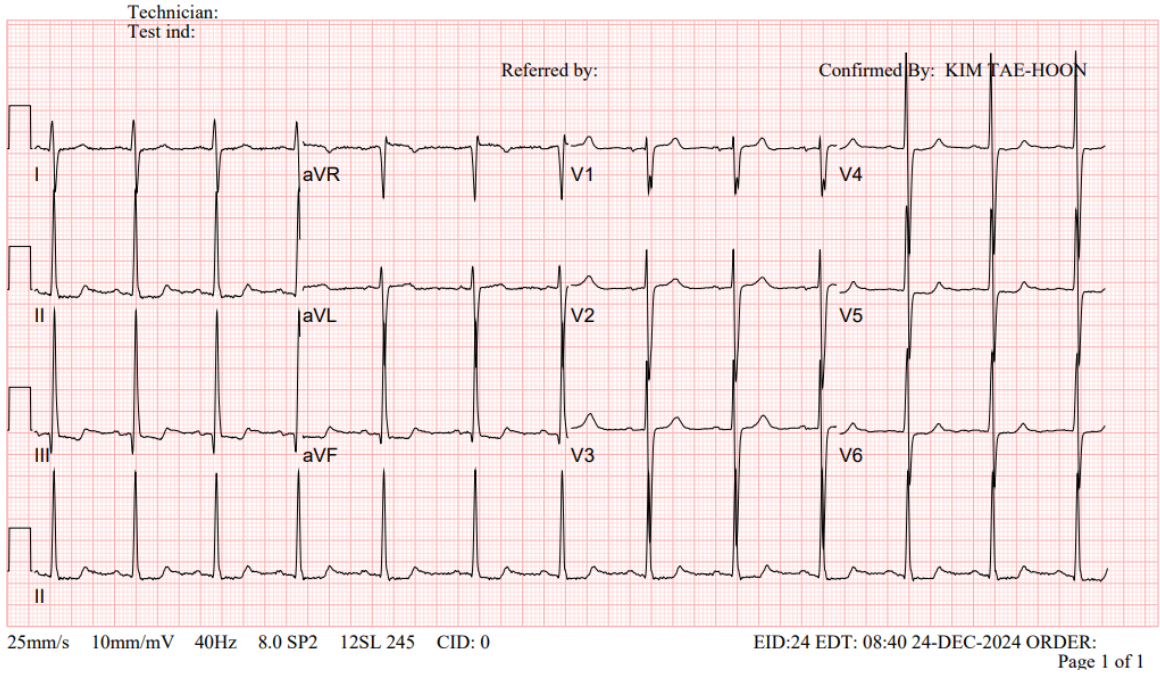
  NT-proBNP 4264 (0-249)pg/mL

  CRP 377.0 (0-8)mg/L

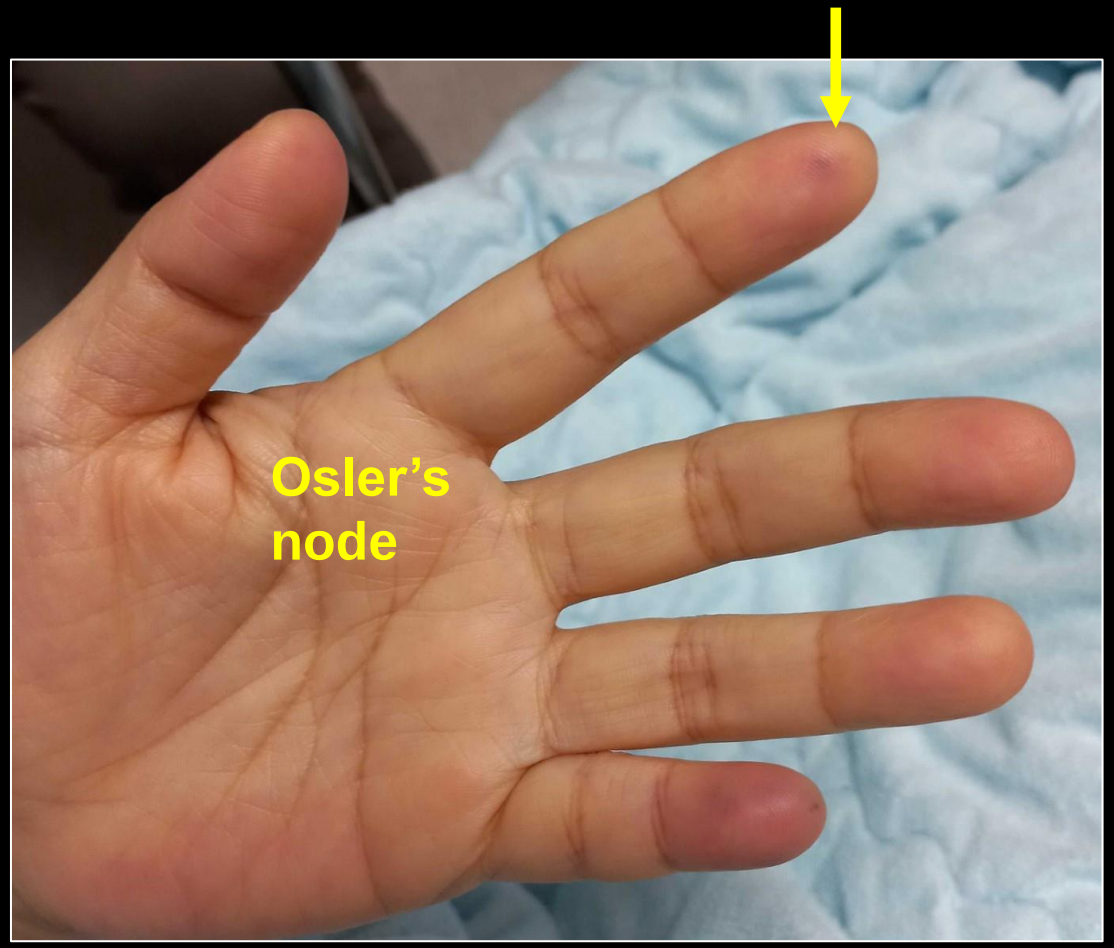
  Procalcitonin 14.40 (0-0.50)ng/mL

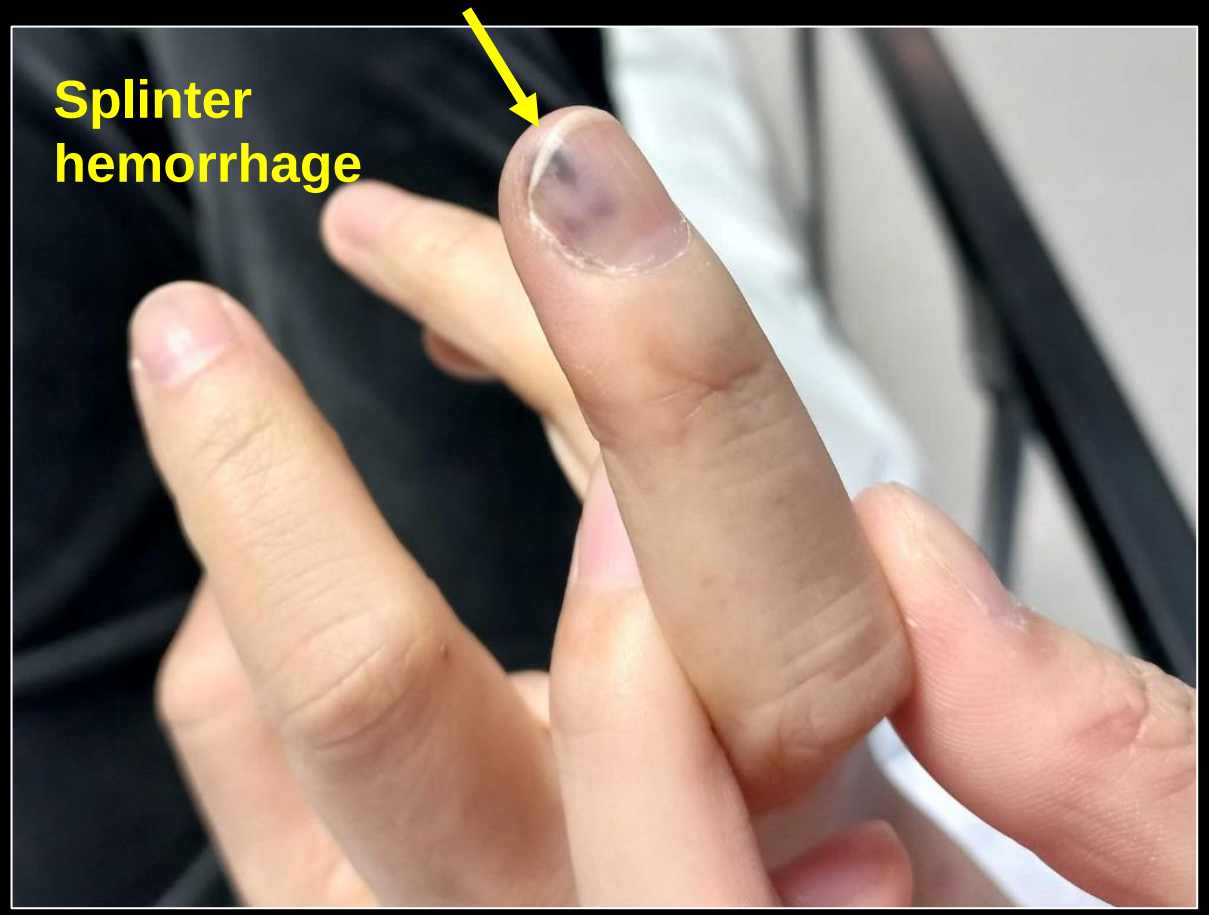
  INR 3.11, D-dimer 14911 (0-243)ng/mL

- Blood culture : MSSA

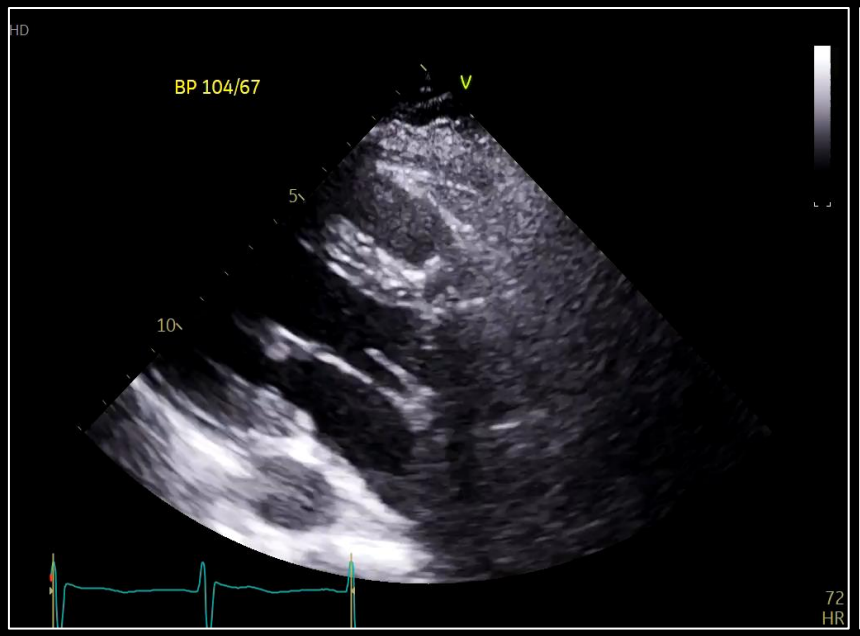


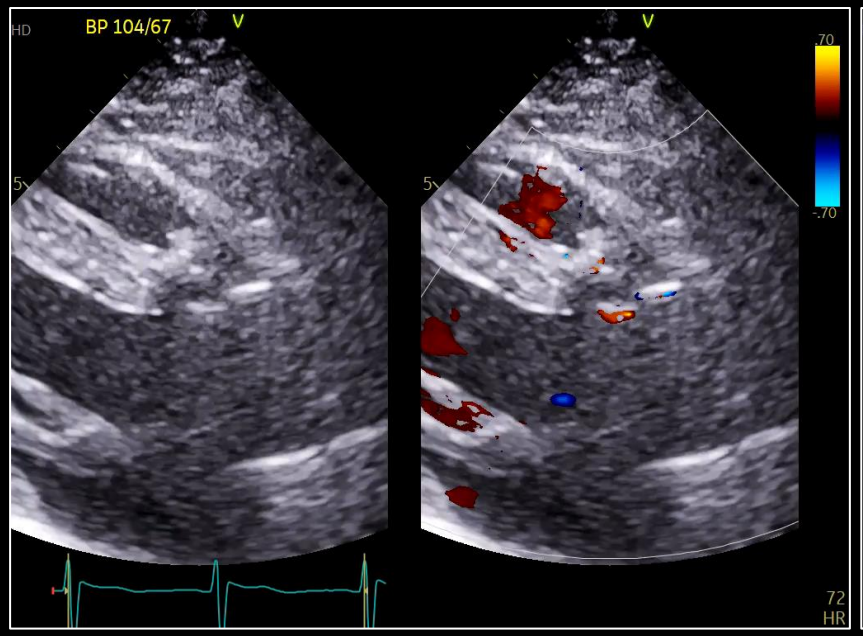
PEx

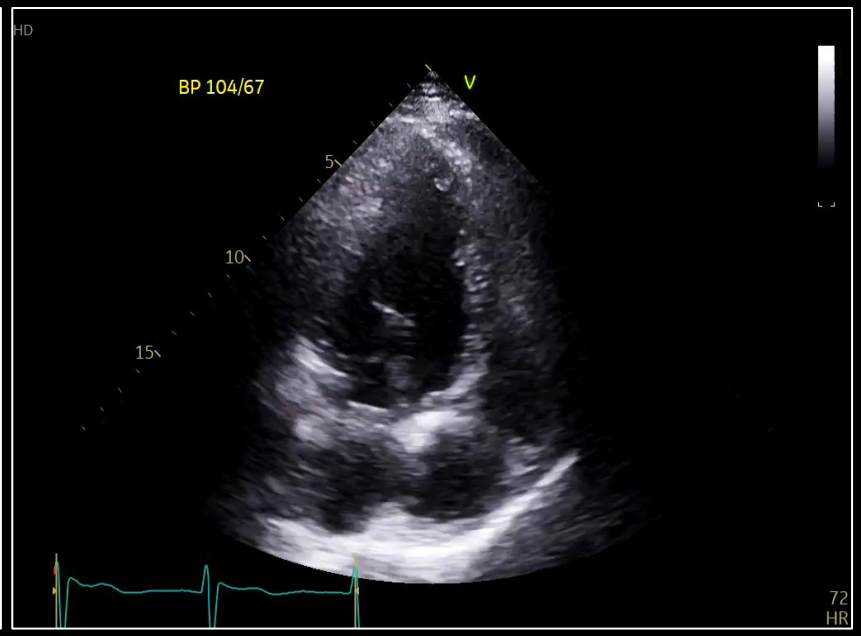


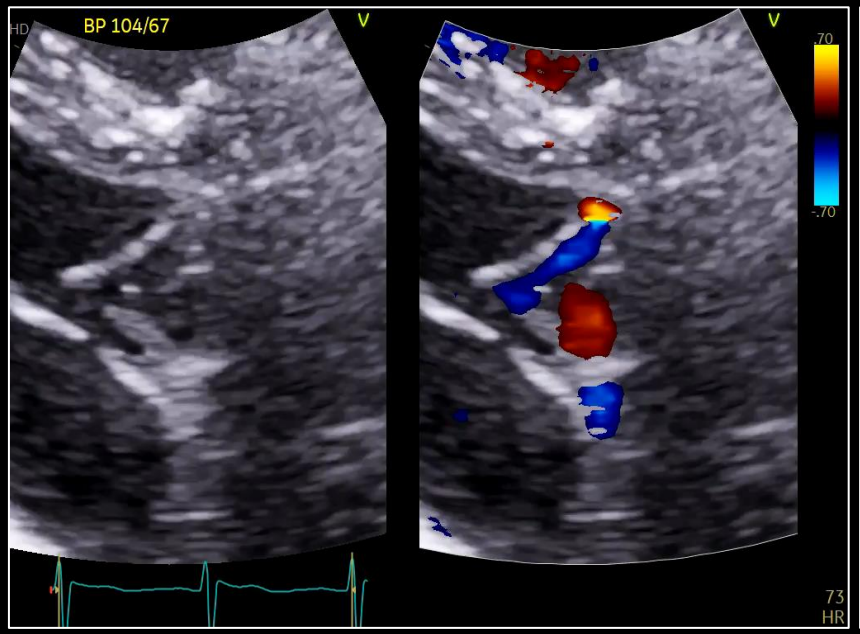


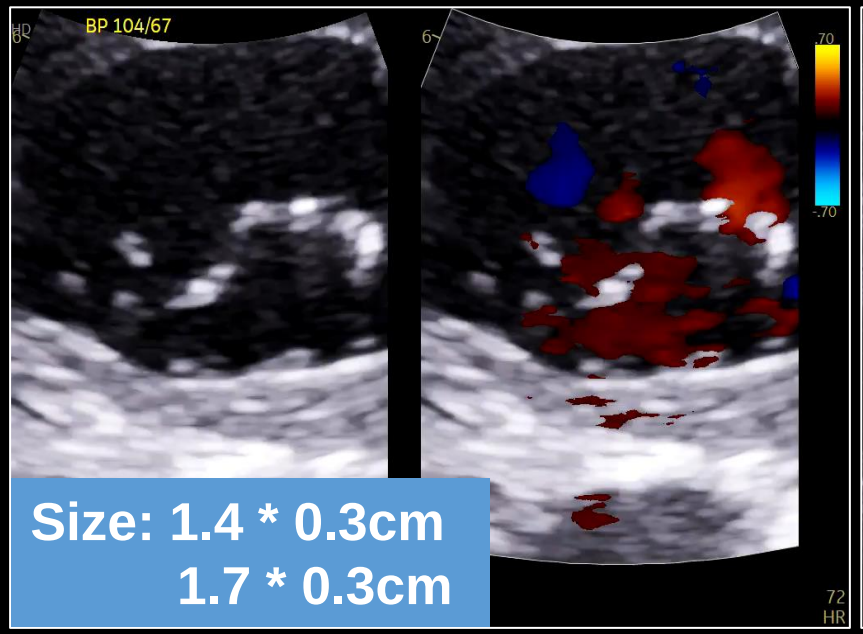
TTE (2024.12.23)



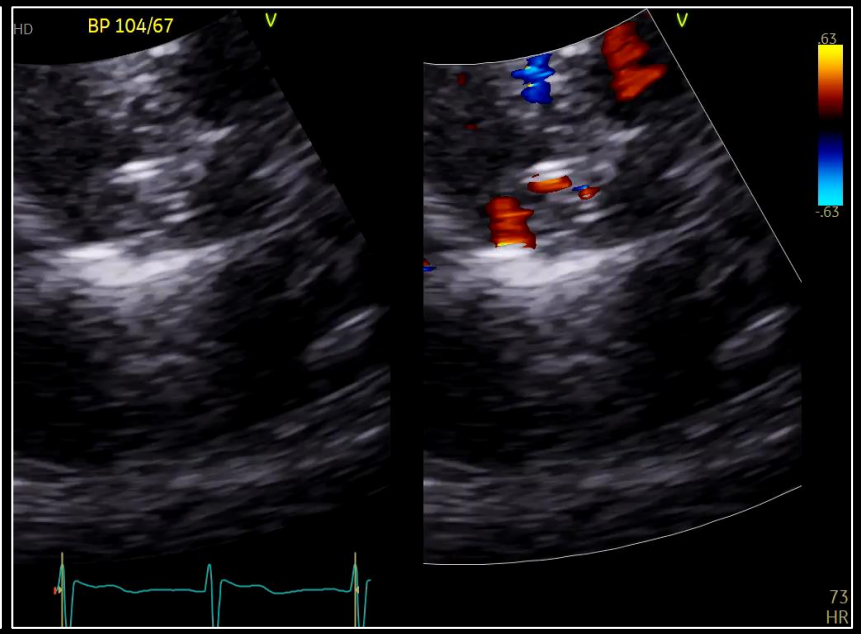




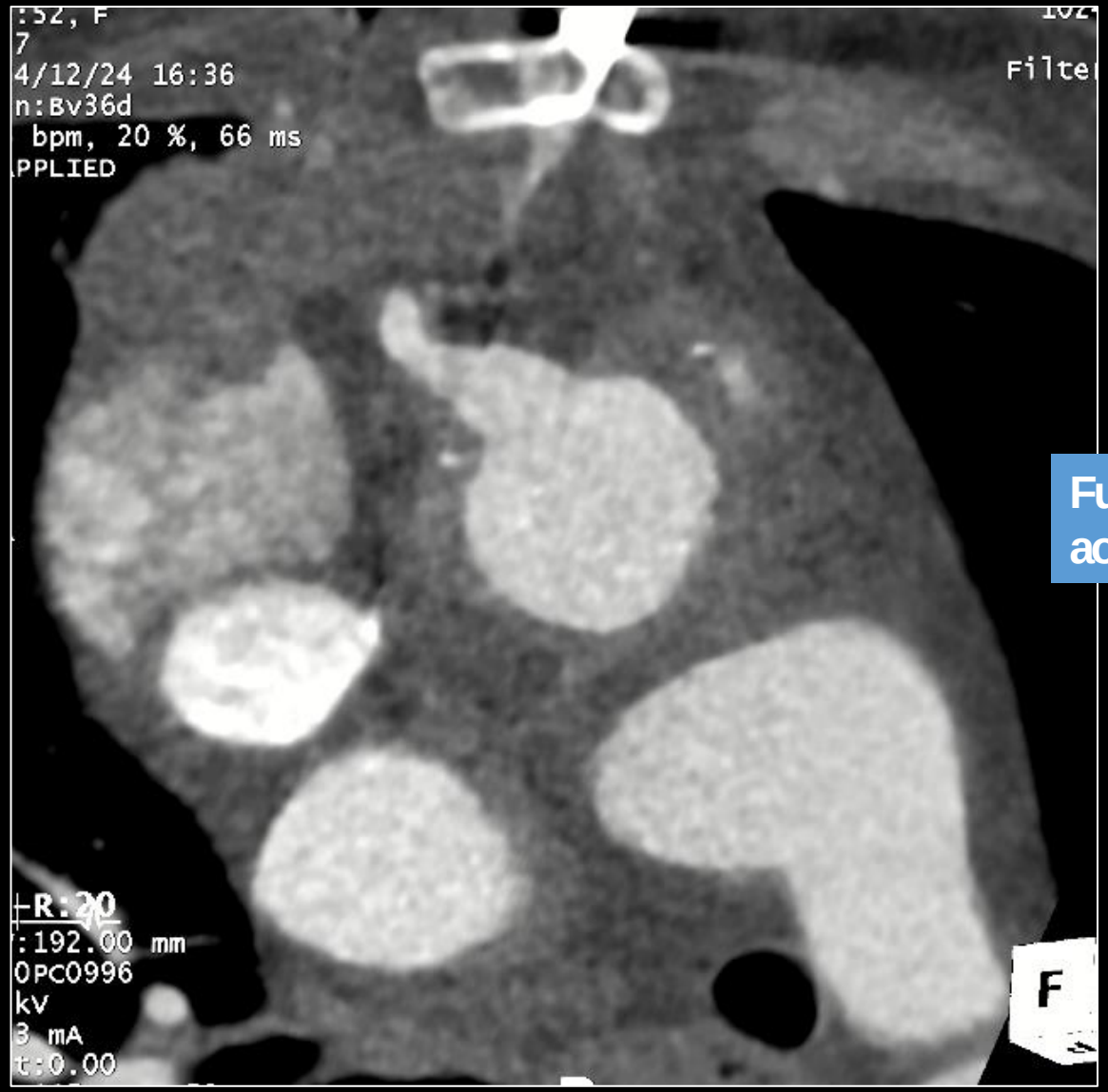


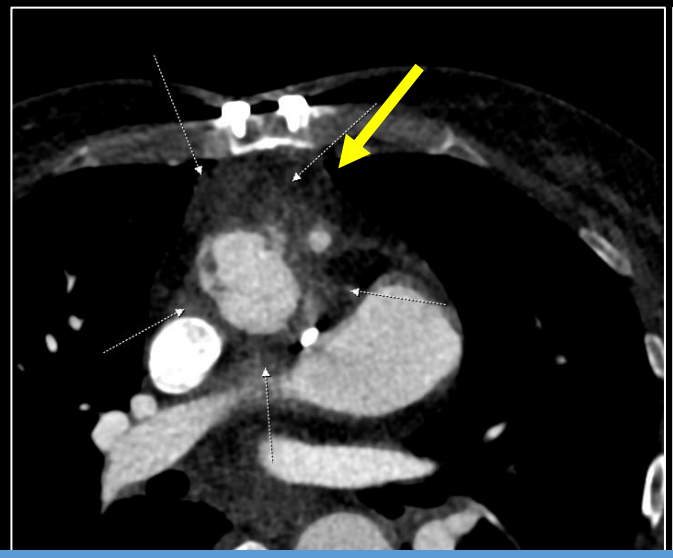


Size: 1.4 * 0.3cm
1.7 * 0.3cm

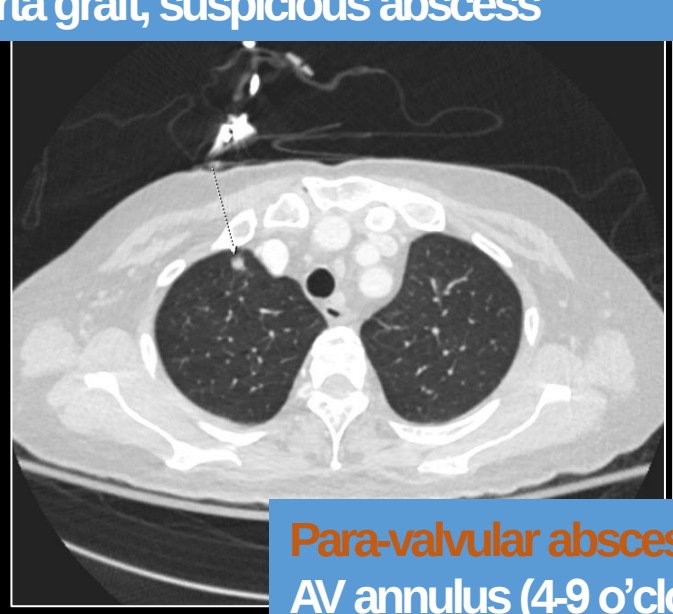


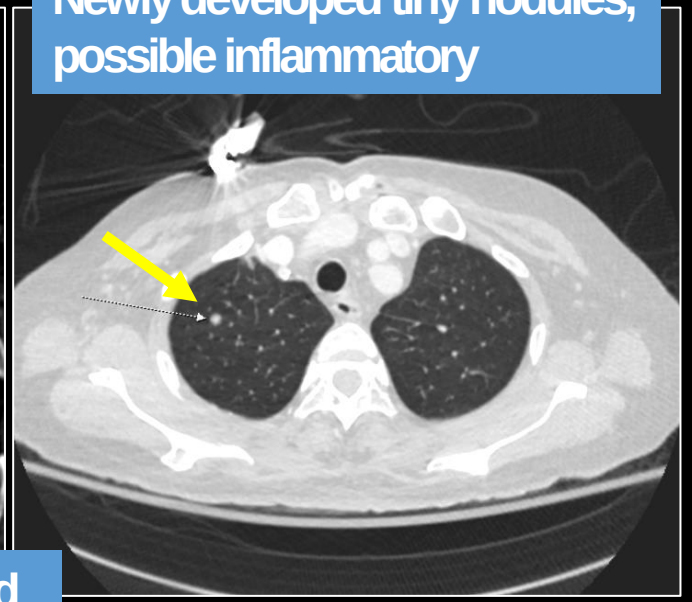
Heart CT (2024.12.24)



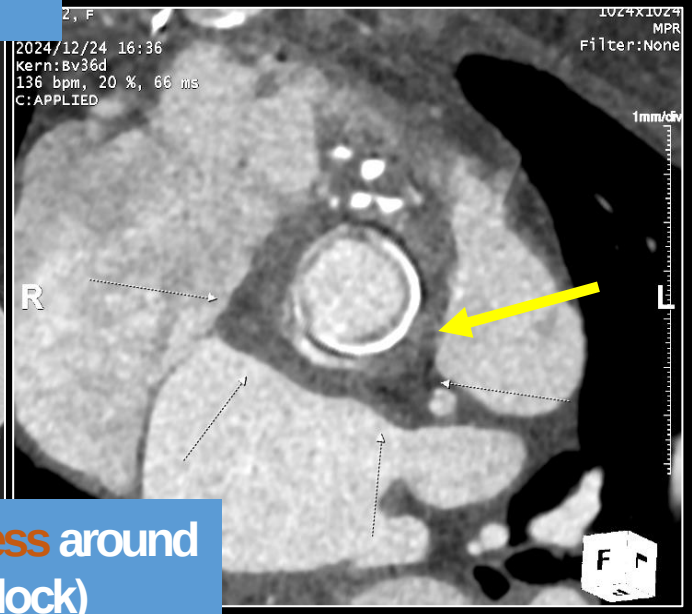


Fuzzy hypoattenuating lesions around aorta graft, suspicious abscess



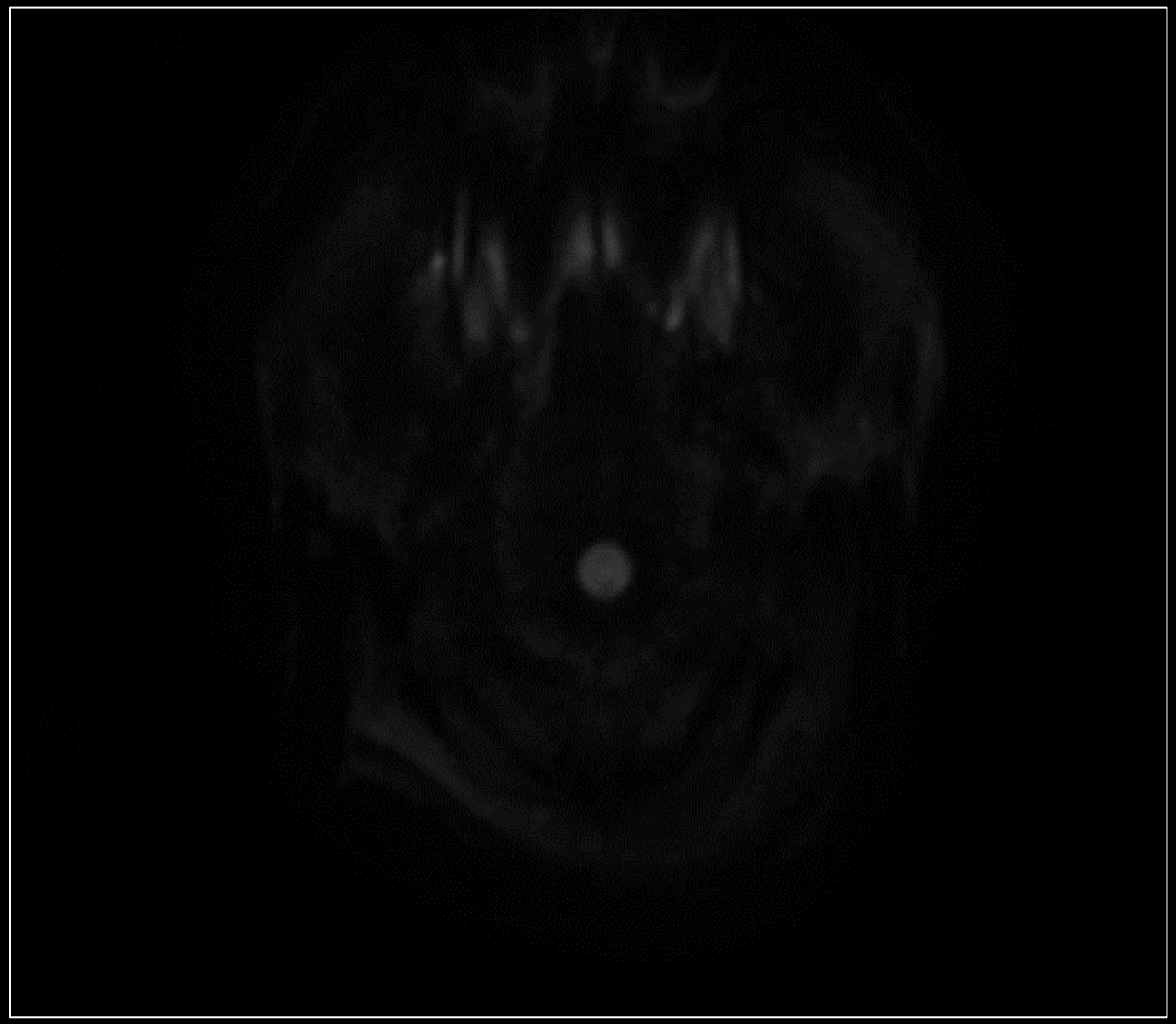


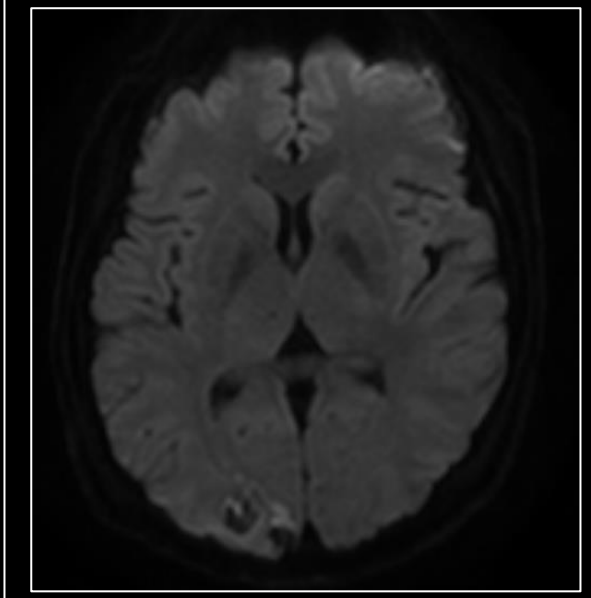
Newly developed tiny nodules, possible inflammatory

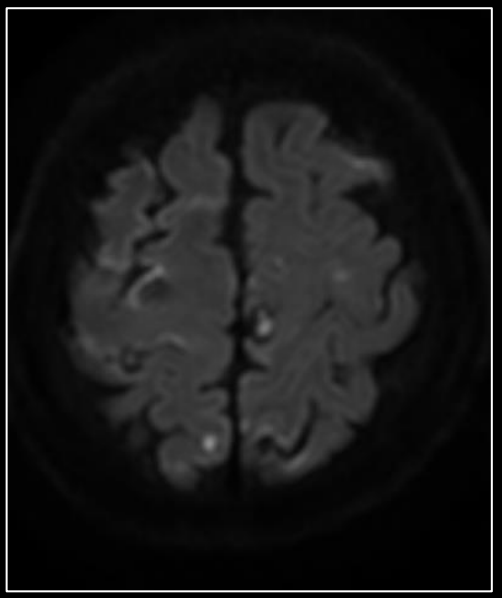


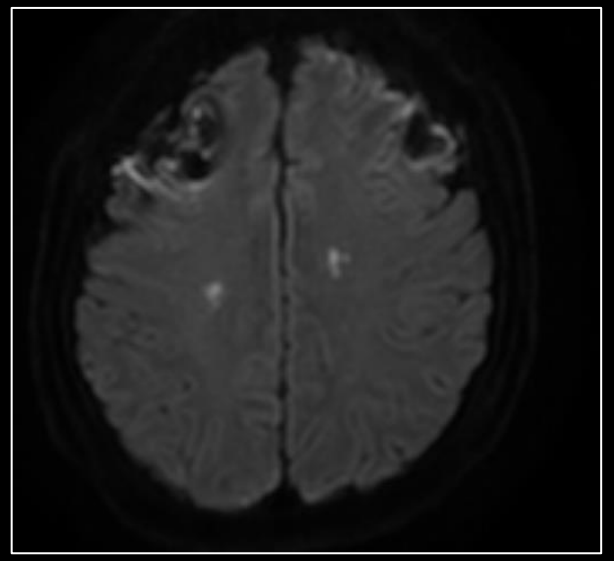
Para-valvular abscess around AV annulus (4-9 o'clock)

Brain MRA (2024.12.24)





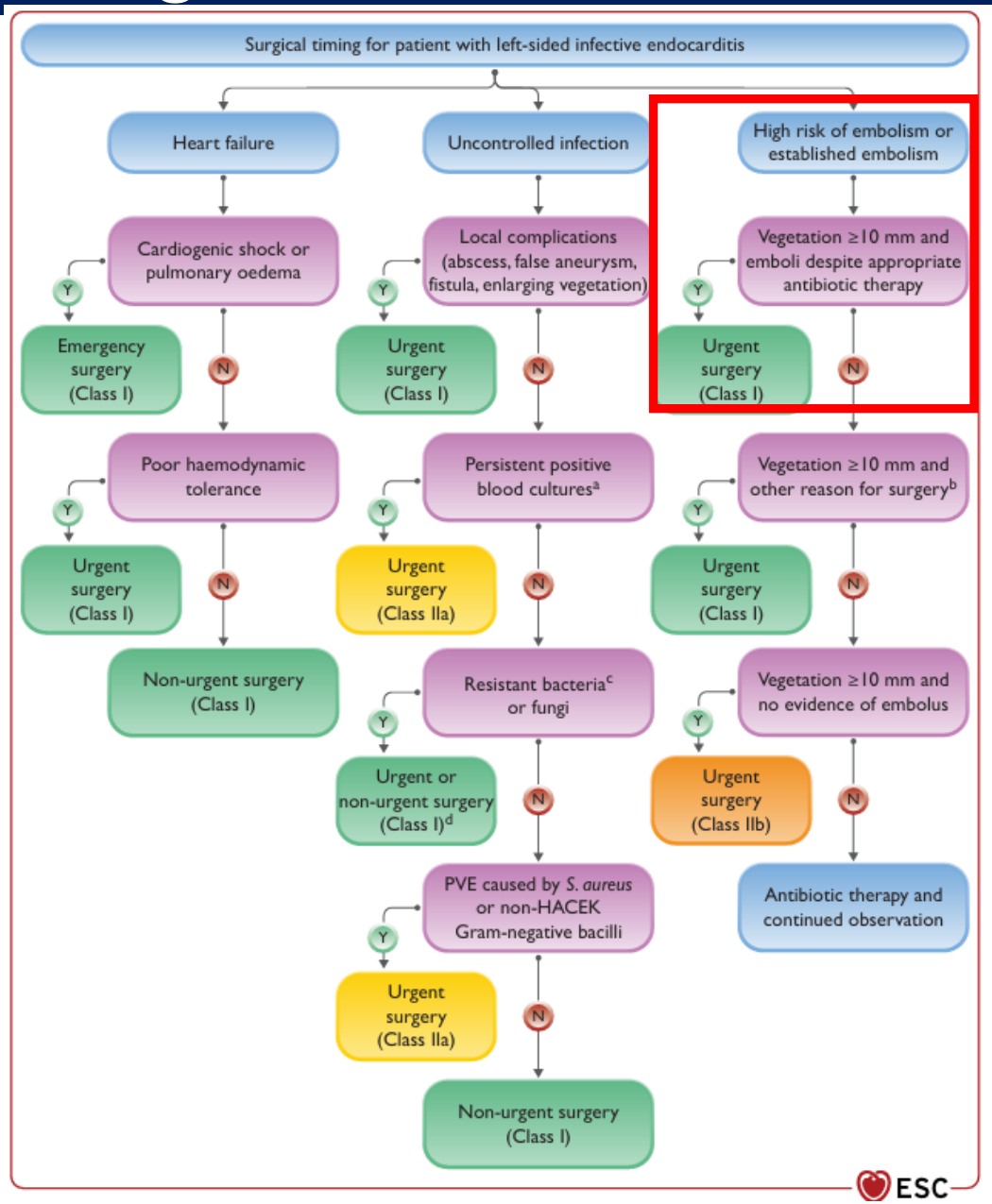




Multi-focal acute infarcts with hemorrhagic transformation and gyral swelling at the entire brain.

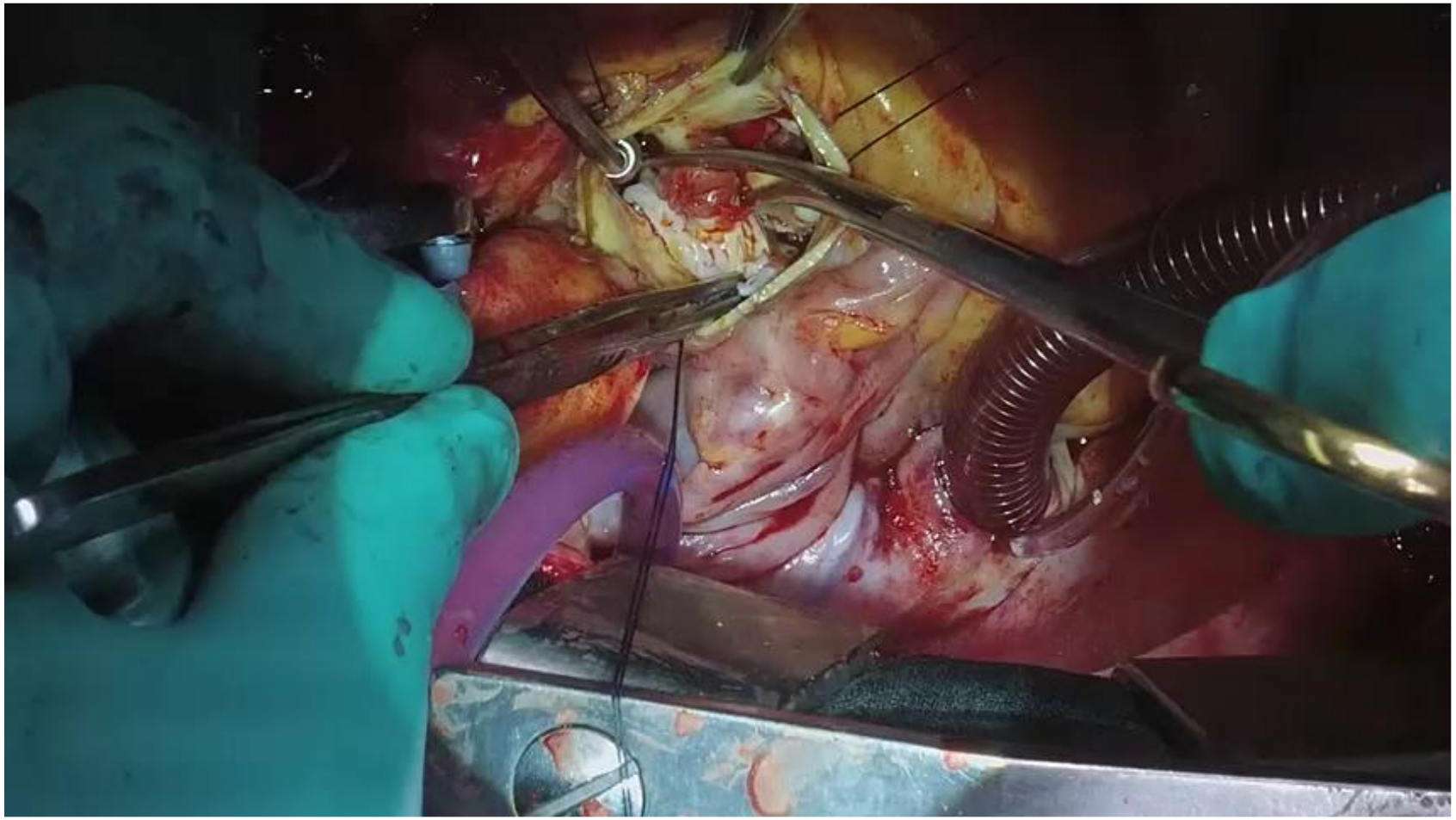
- **Infective endocarditis at prosthetic AV**
  - **Combined abscess formation**
  - **Multiple systemic infarction (spleen, liver, renal)**
  - **Multiple brain infarction with hemorrhagic transformation**
- S/P Bentall, Hemiarch replacement, OPCAB
- HFmrEF (LVEF 49%)
- Paroxysmal AF(CV Score : 2)

2023 ESC guideline for Endocarditis Tx



Delgado, Victoria et al. EHJ vol. 44,39 (2020): 3948-4042

OP Findings



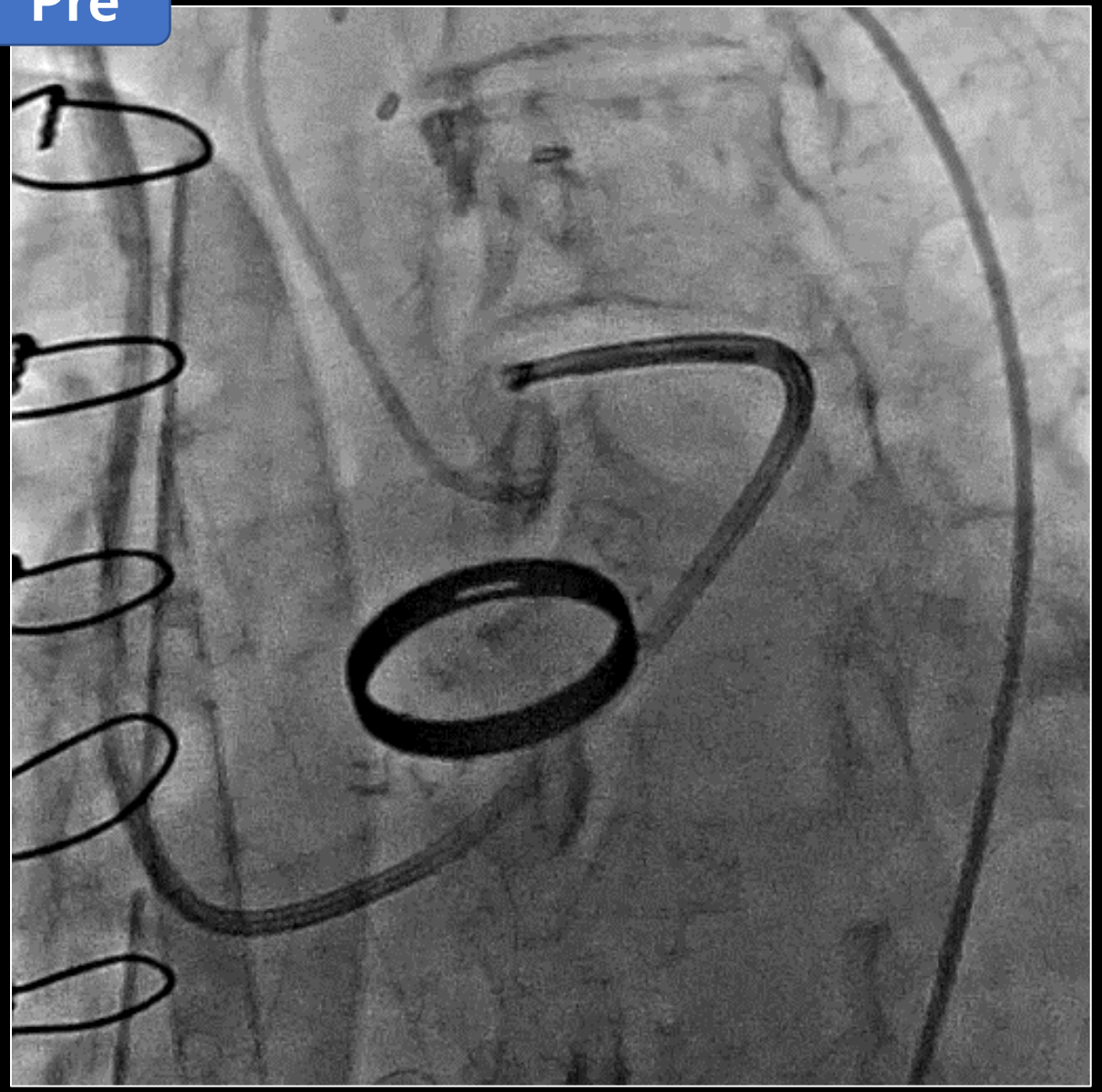
NE 18CC/HR
Vaso 10CC/HR
Epi 10CC/HR
ECMO 1.81 LPM

Weaning failure, Lt coronary RWMA + & Recurrent VF

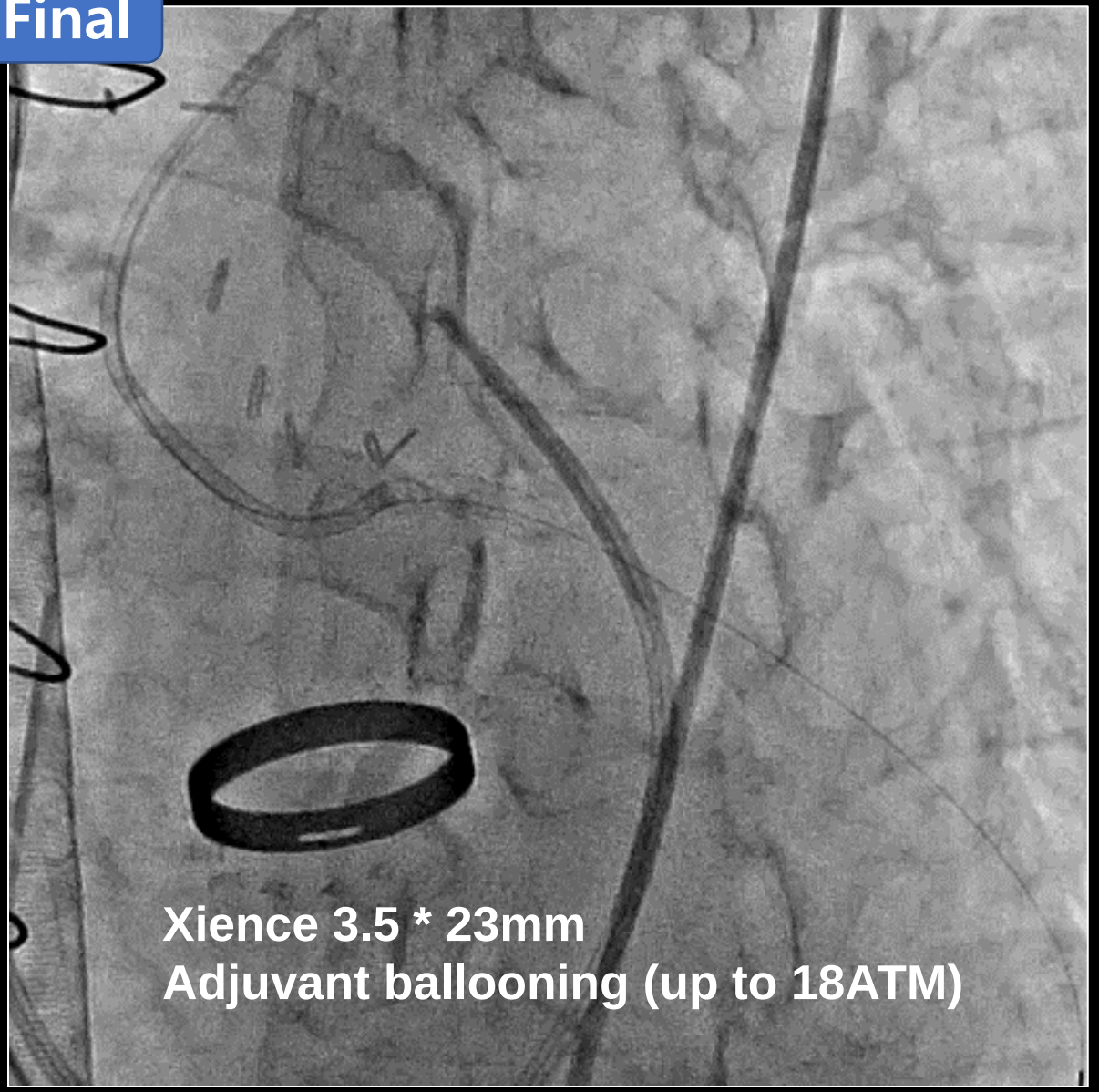
→ What happened ?

CAG (OP day) : Recurrent VF

Pre



Final

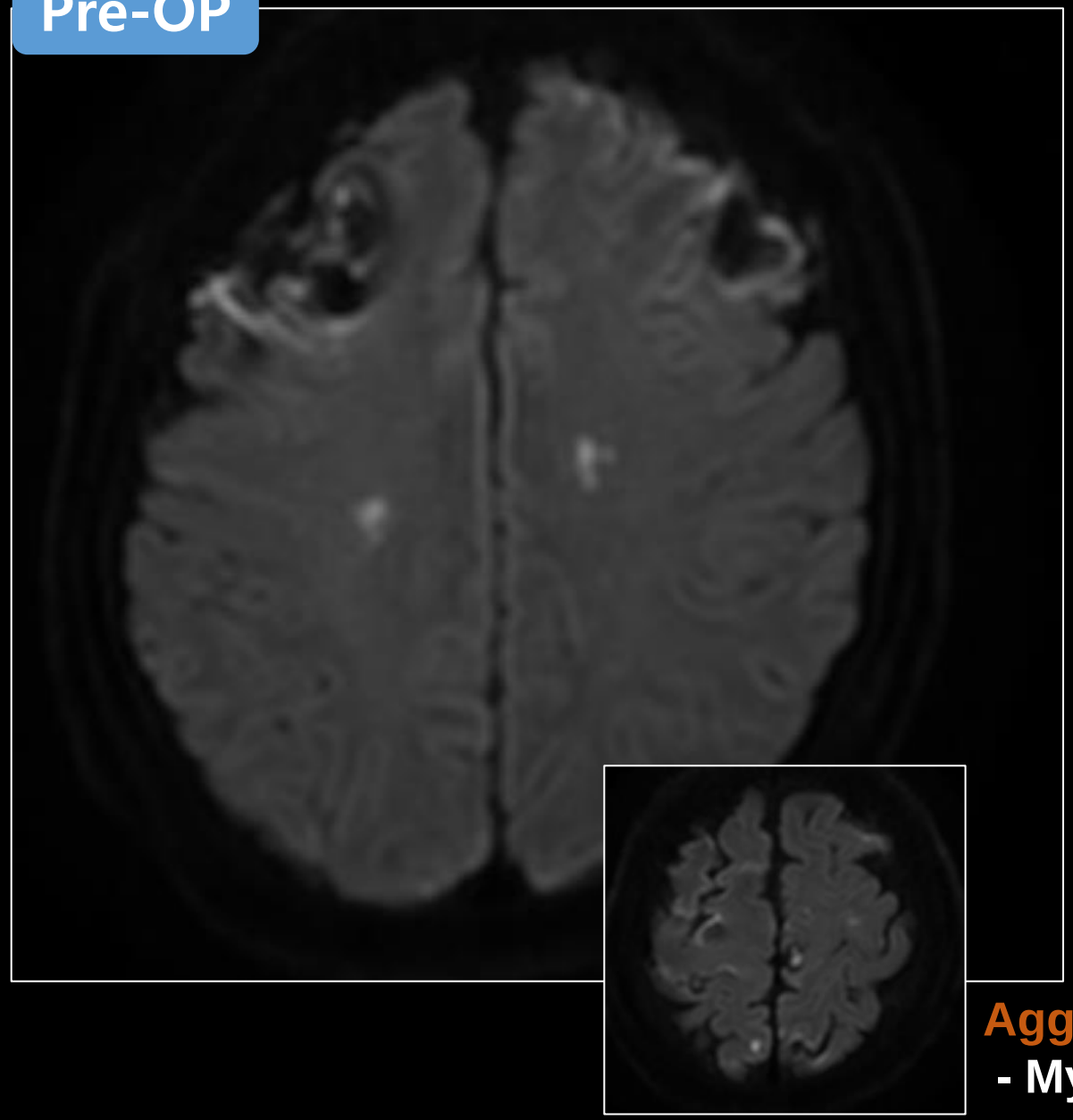


POD #2: Rt foot color change

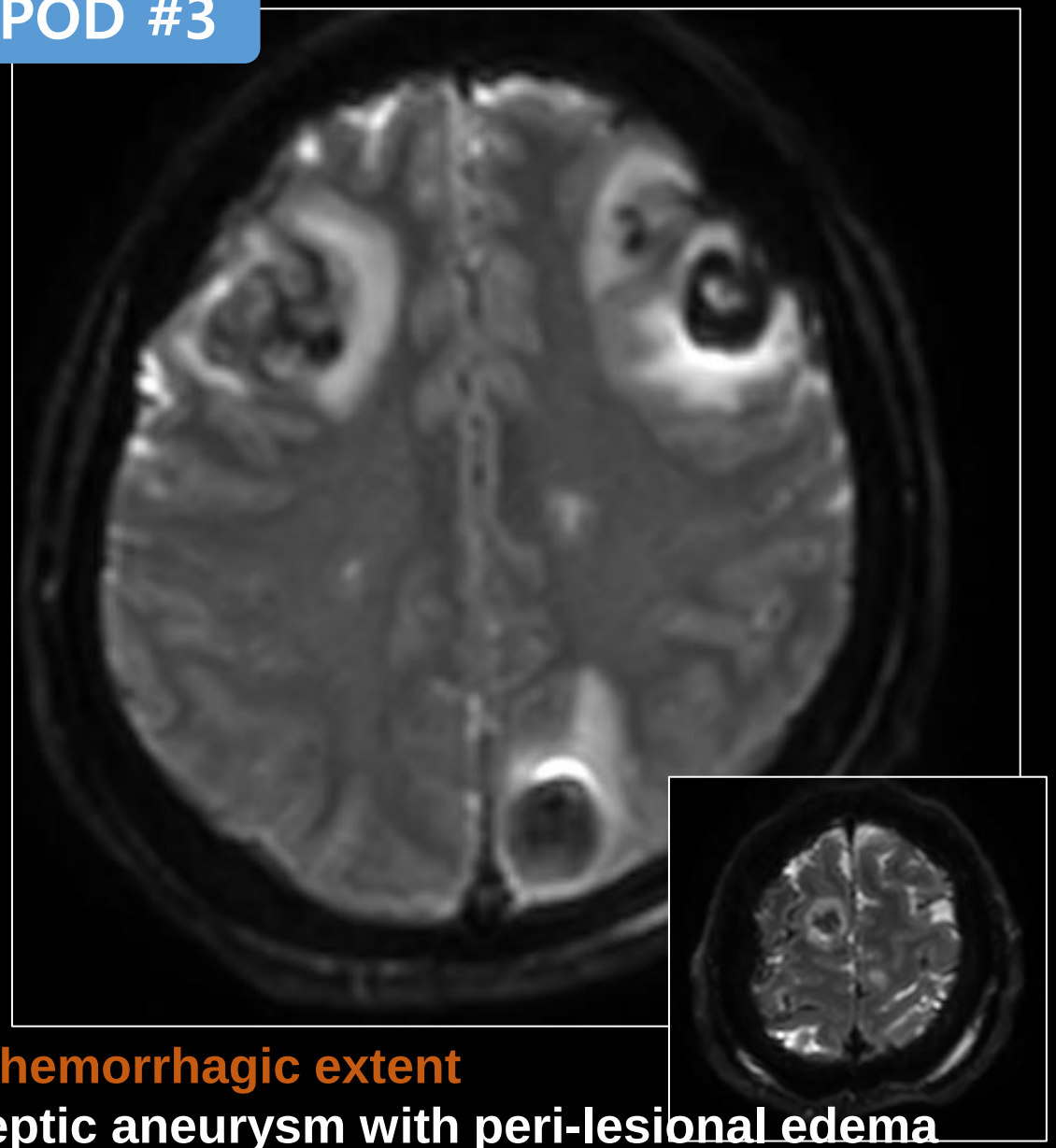
No improvement after VA-ECMO weaning
Rt. lower leg fascial enhancement & edema
-Suspicious septic occlusion

POD #3 : M/S aggravation, Motor weakness

Pre-OP



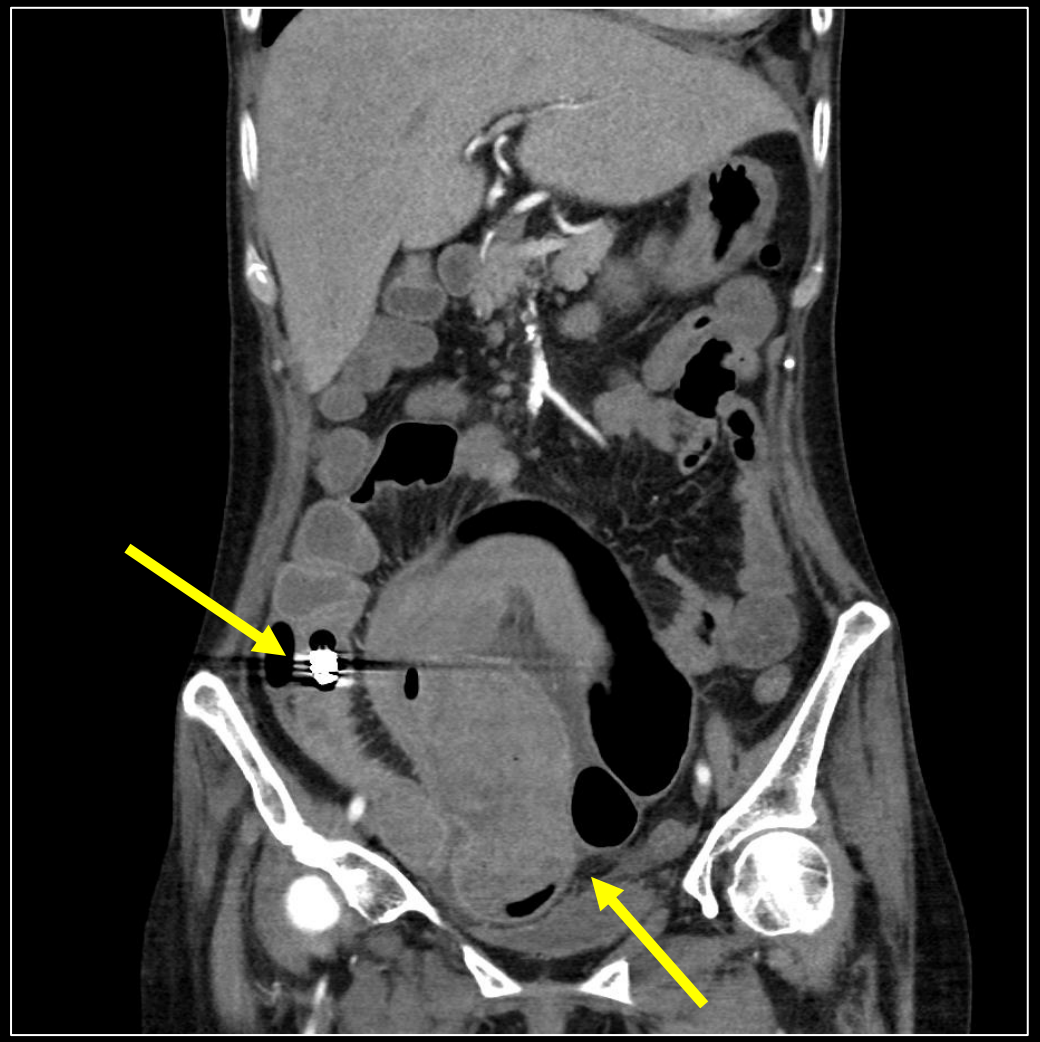
POD #3



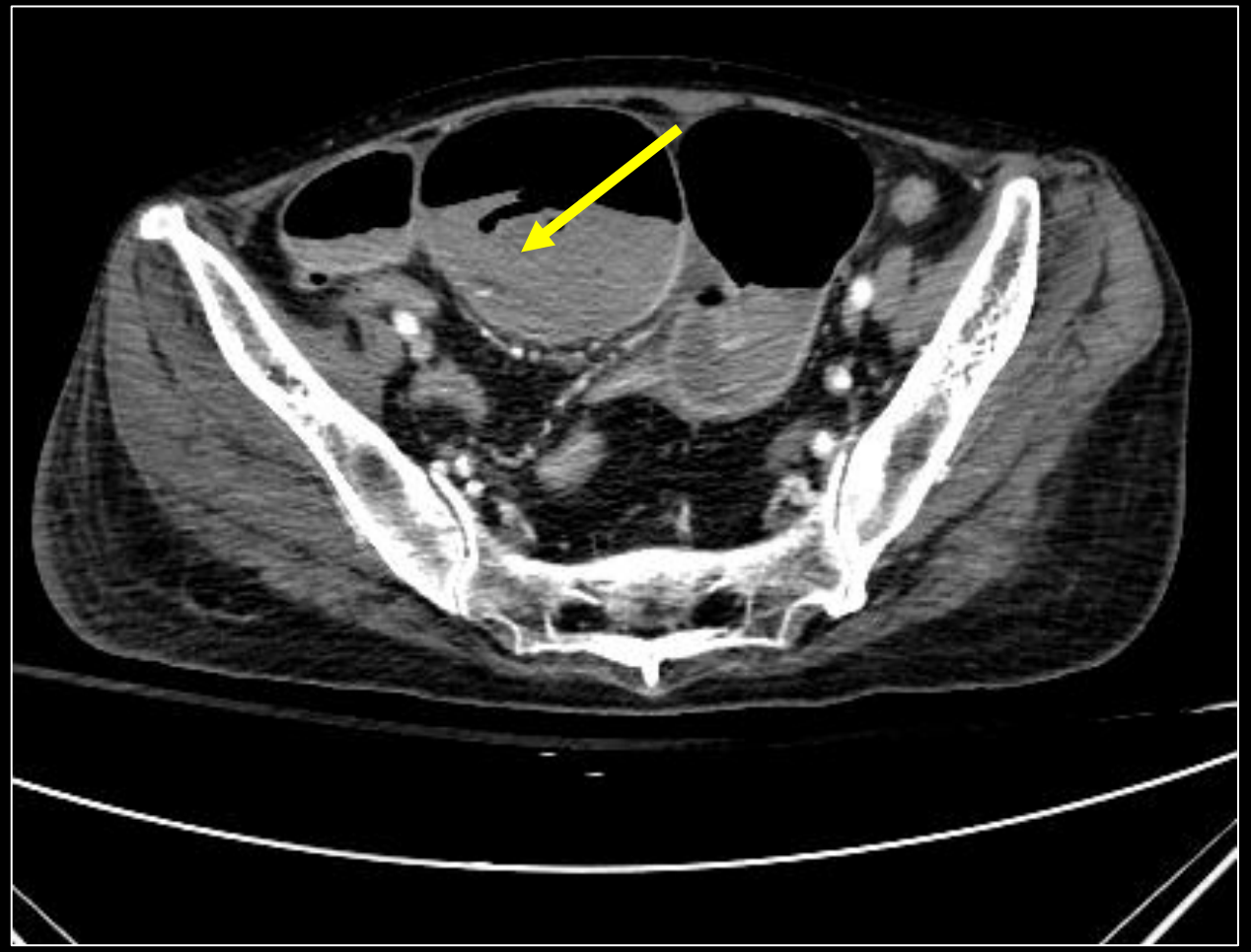
Aggravated hemorrhagic extent

- Mycotic septic aneurysm with peri-lesional edema

GI Bleeding

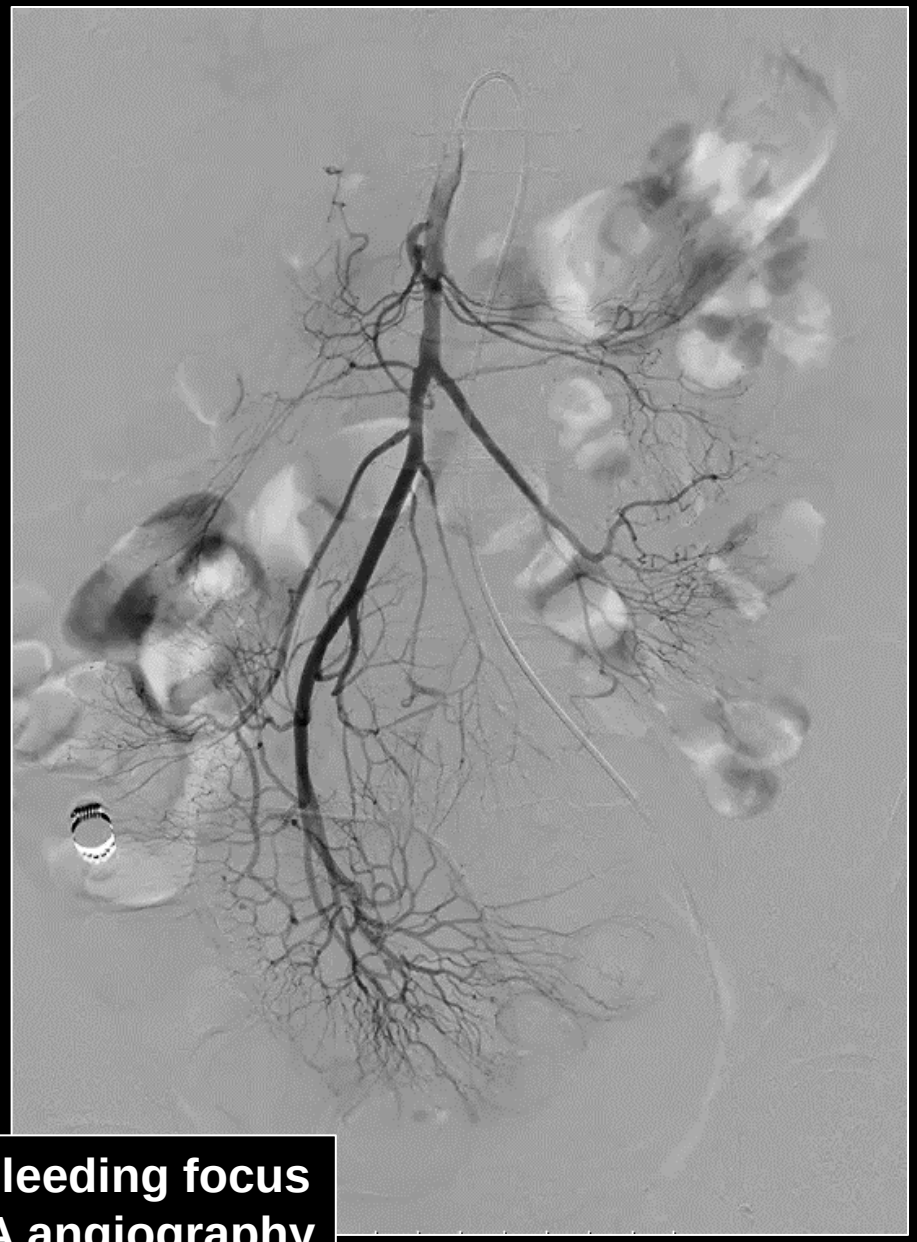


Persistent long-wall thickening
at distal ileum, C/W ischemic colitis



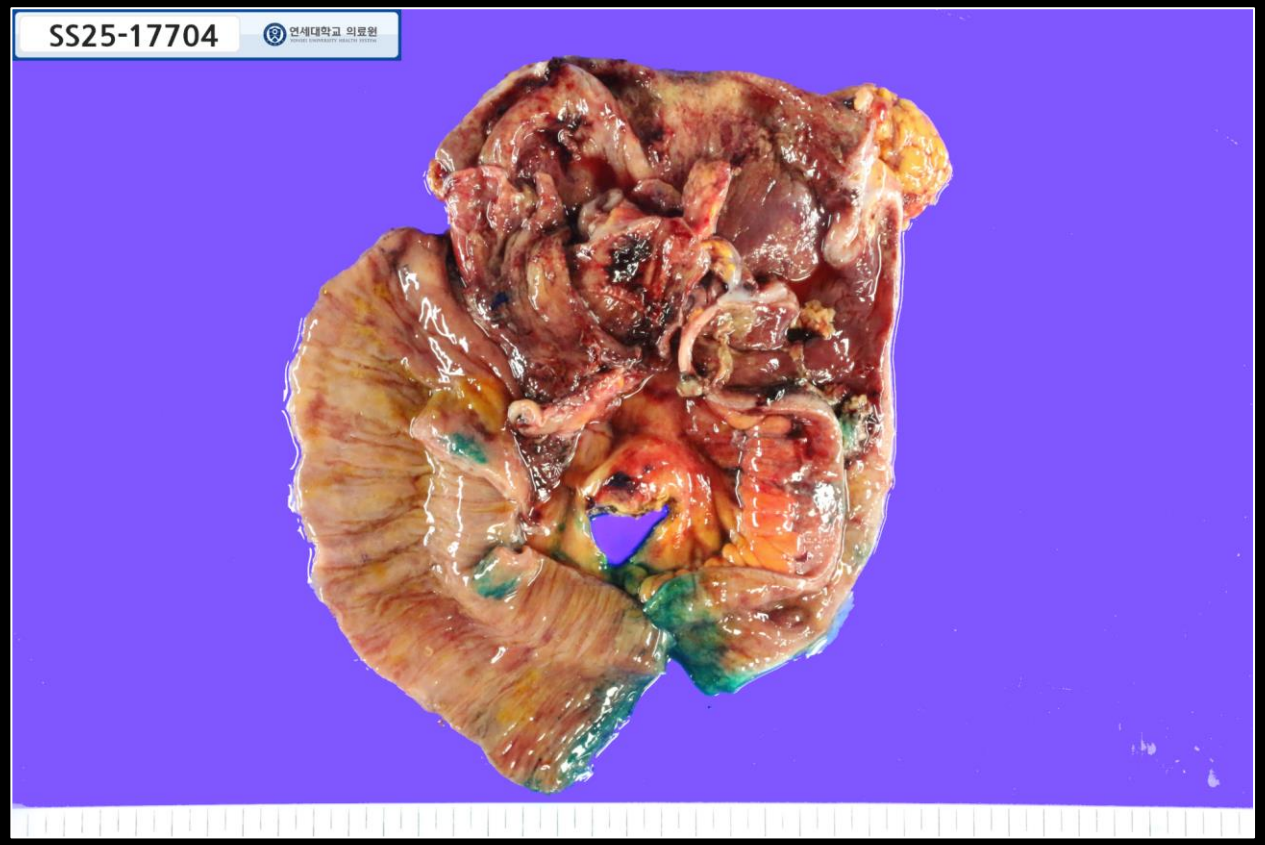
Small active contrast extravasation at distal ileum
Intraluminal hematoma

Embolization for Obscure GI bleeding



No definite bleeding focus
on SMA / IMA angiography

OP Finding (SB resection)



- Adhesion of distal ileum to peritoneal wall, near perforation
- S/P segmental resection, endoscopic capsule removal

Patient summary

- **Infective endocarditis with embolic shower**

  -Kidney, Spleen, Liver infarction

  -Multiple brain infarction with hemorrhagic transformation

  -Left main septic occlusion S/P emergent CAG

  -Lower extremity artery septic occlusion

  -Ischemic enterocolitis

  → Refractory hematochezia, SB resection

Type of Endocarditis in EURO-ENDO

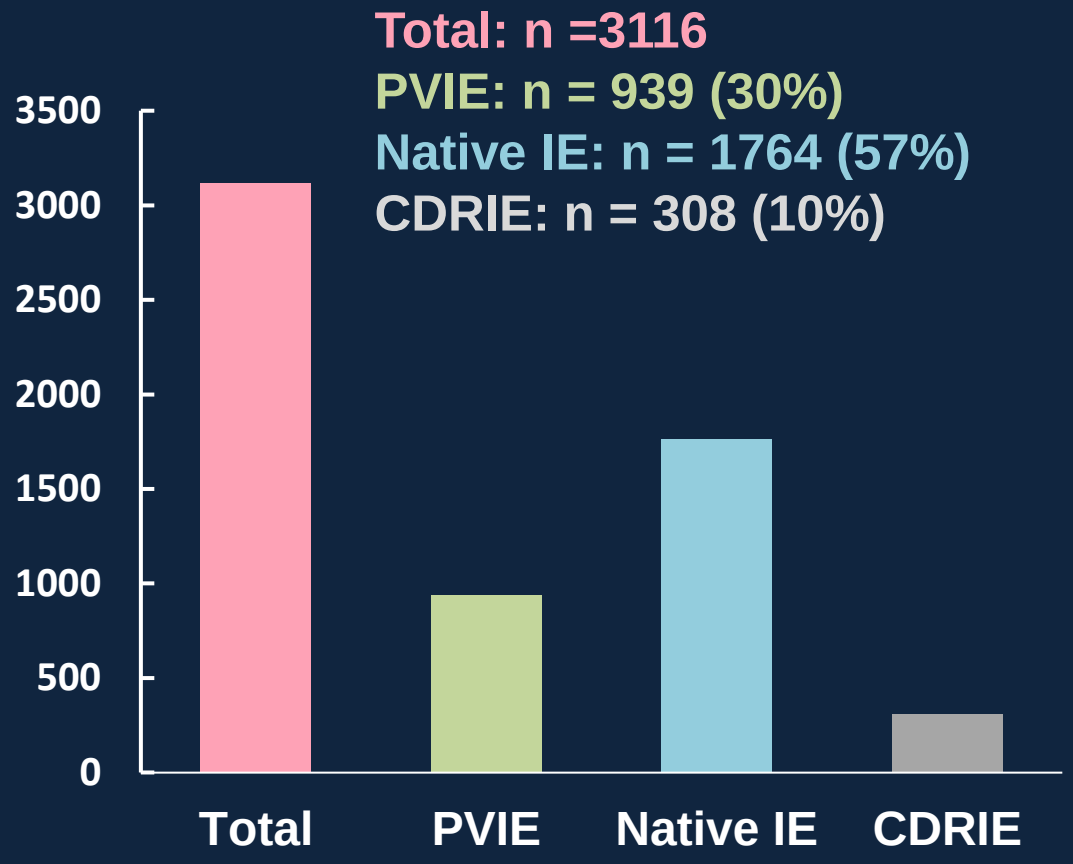
Total: 40 countries, 156 Centers, 3116 Patients (31 March 2018)

ESC European Society of Cardiology
European Heart Journal (2019) **40**, 3222–3233
doi:10.1093/eurheartj/ehz620

FASTTRACK CLINICAL RESEARCH
Valvular heart disease

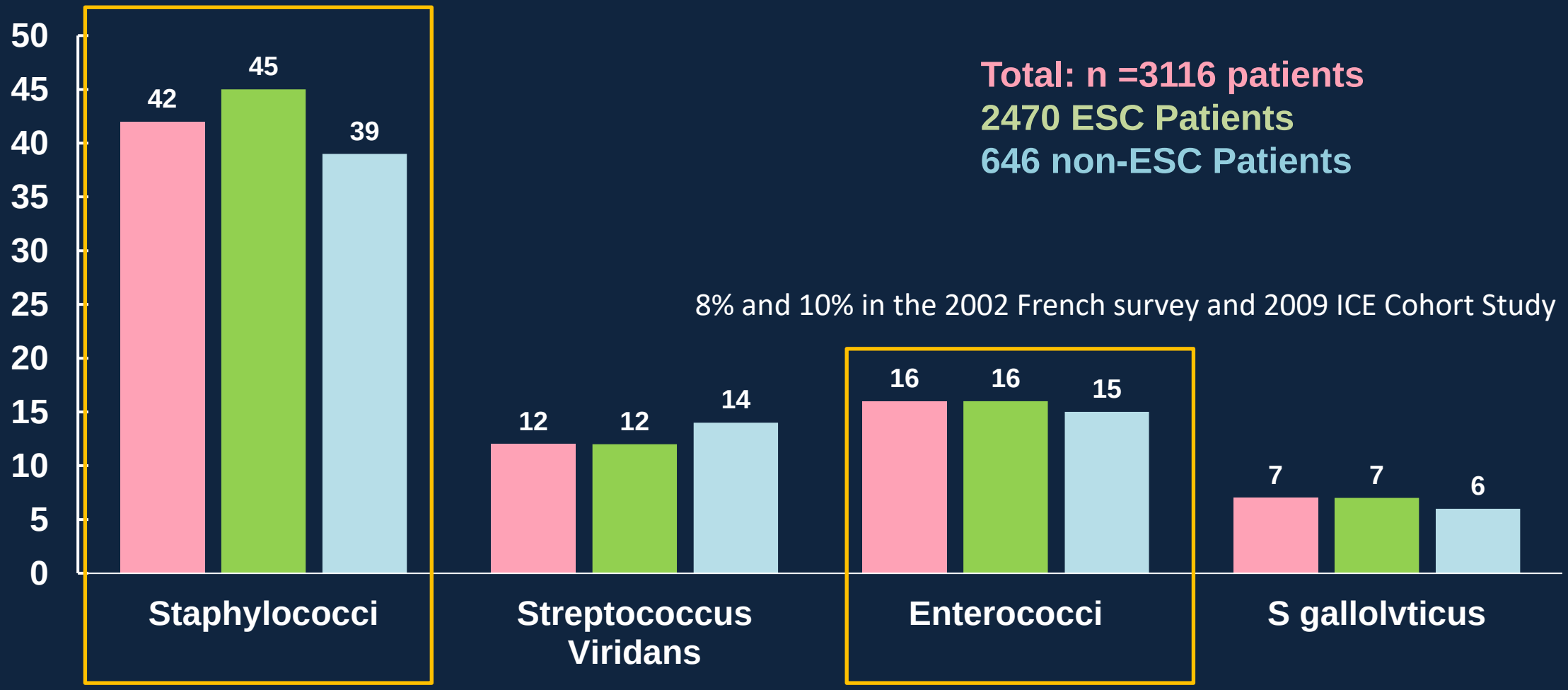
Clinical presentation, aetiology and outcome of infective endocarditis. Results of the ESC-EORP EURO-ENDO (European infective endocarditis) registry: a prospective cohort study

Gilbert Habib [1,2]*, Paola Anna Erba [3,4], Bernard Iung [5], Erwan Donal[6], Bernard Cosyns [7], Cécile Laroche[8], Bogdan A. Popescu[9], Bernard Prendergast[10], Pilar Tornos[11], Anita Sadeghpour[12], Leopold Oliver[13], Jolanta-Justina Vaskelyte[14], Rouguiatou Sow [15], Olivier Axler[16], Aldo P. Maggioni[17], and Patrizio Lancellotti[18,19,20]; on behalf of the EURO-ENDO Investigators†



European Heart Journal 2019; 40:3222-3233.

Blood Culture Results in EURO-ENDO

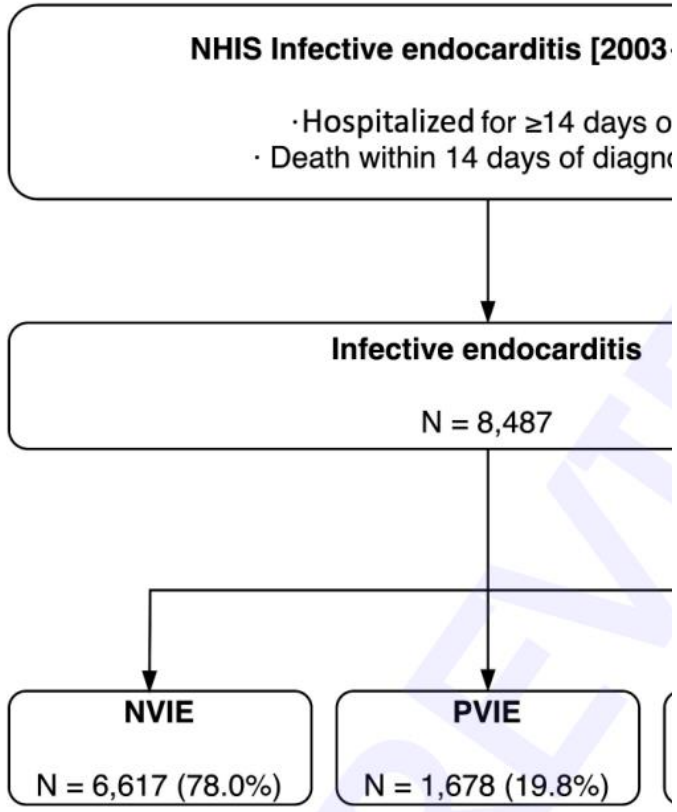


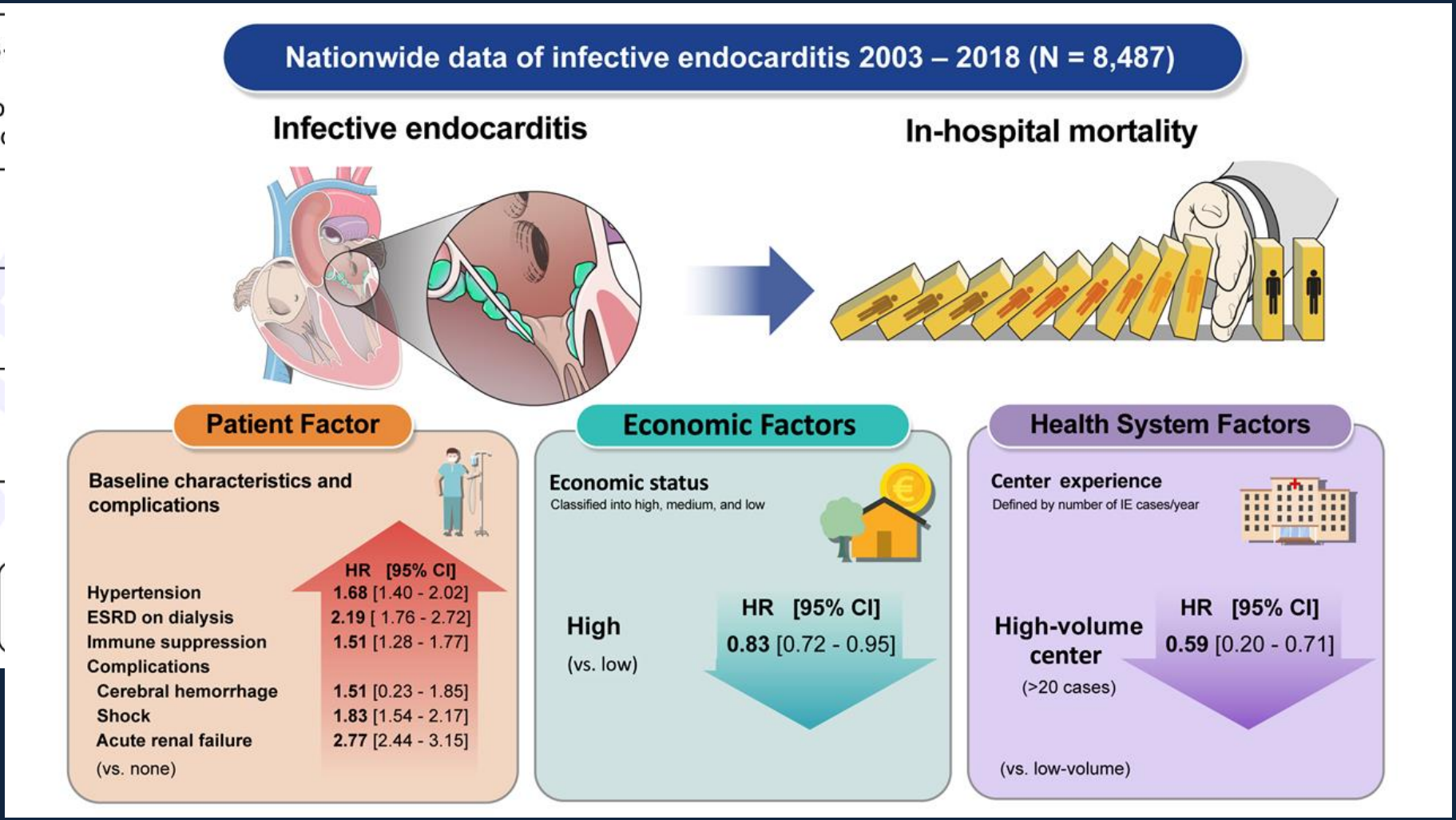
Total: n =3116 patients
2470 ESC Patients
646 non-ESC Patients

8% and 10% in the 2002 French survey and 2009 ICE Cohort Study

European Heart Journal 2019; 40:3222-3233.

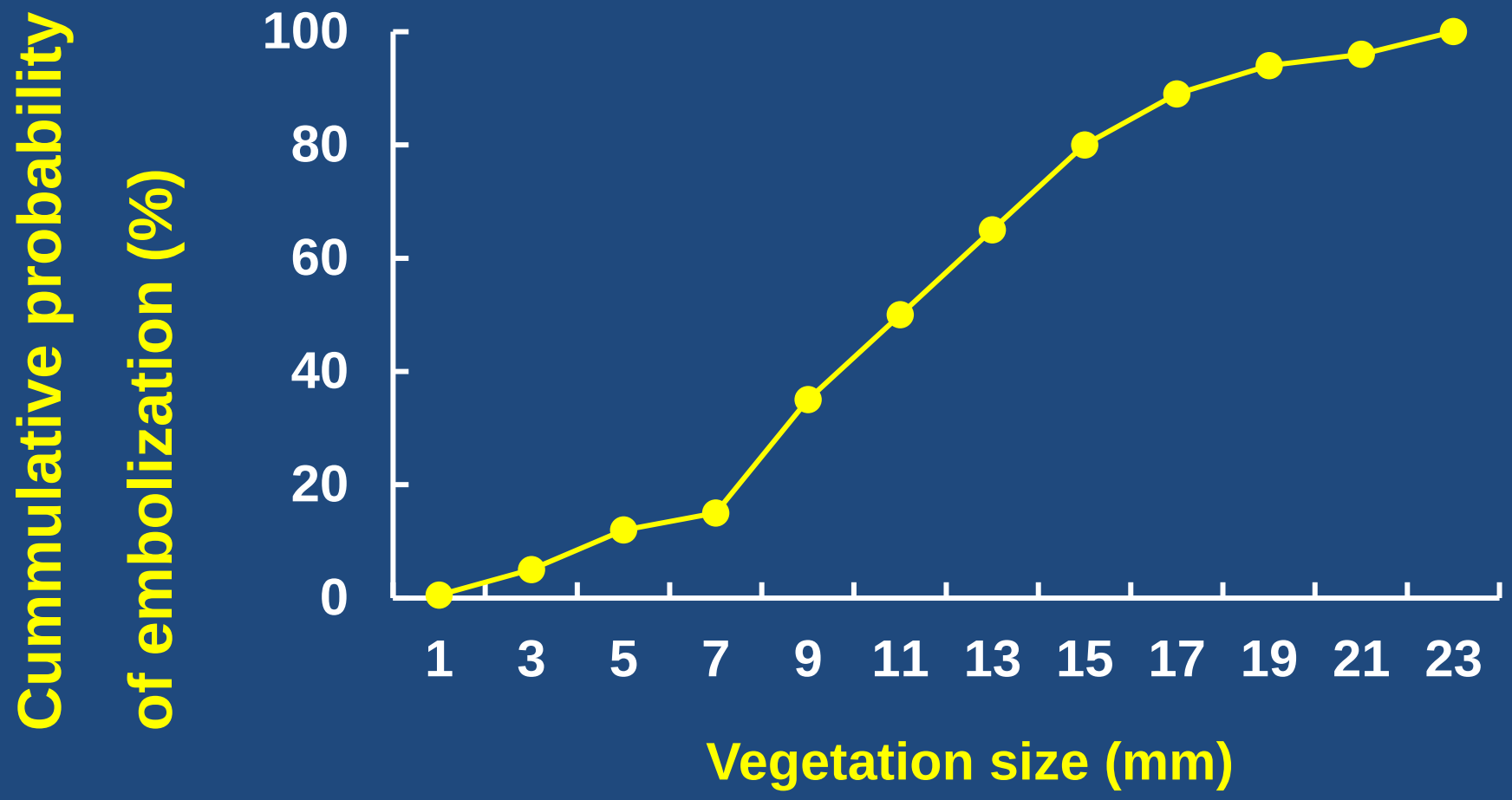
How About Infective Endocarditis in Korea?





Kim W, Cho I, Hong GR et al. YMJ 2025

Risk of Systemic Embolization



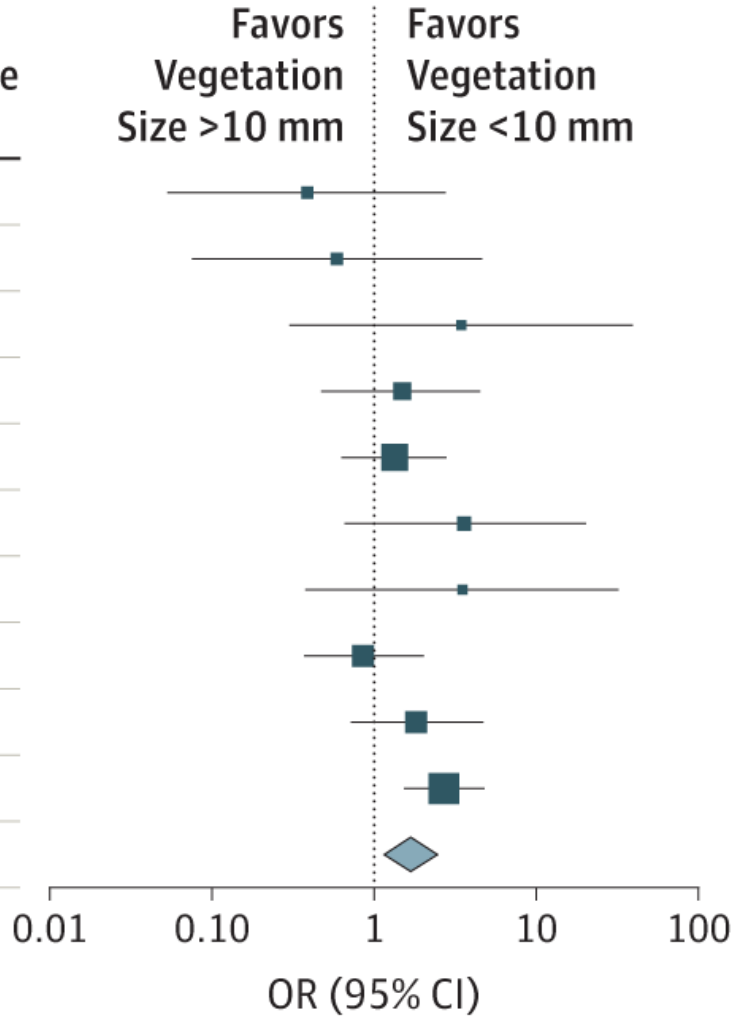
Adapted from Sanfilippo AJ et al. J Am Coll Cardiol 1991

Why is size important ?

Source	OR (95% CI)	No. of Deaths/No. of Patients: Vegetation Size >10 mm	No. of Deaths/No. of Patients: Vegetation Size <10 mm	Relative Weight
Wong et al,[12] 1983	0.38 (0.05-2.78)	2/16	3/11	3.28
Lutas et al,[14] 1986	0.58 (0.07-4.61)	2/26	2/16	3.05
Buda et al,[7] 1986	3.43 (0.30-39.64)	4/11	1/7	2.20
Erbel et al,[15] 1988	1.47 (0.47-4.61)	8/47	6/49	9.24
Vilacosta et al,[21] 2002	1.31 (0.61-2.80)	40/124	12/45	18.50
Deprèle et al,[22] 2004	3.58 (0.65-19.71)	5/35	2/45	4.41
Gotsman et al,[23] 2007	3.46 (0.37-32.18)	5/31	1/19	2.63
Pepin et al,[24] 2009	0.85 (0.36-2.01)	15/65	13/50	15.27
Leitman et al,[25] 2012	1.81 (0.71-4.63)	13/46	10/56	13.09
Hajihossainlou et al,[26] 2013	2.69 (1.52-4.75)	33/96	31/190	28.33
Overall	1.63 (1.13-2.35)			

Test for heterogeneity: $I^2 = 11\%$; $Q = 10.12$, $P = .34$

Test for overall effect: $Z = 2.60$, $P = .009$



- **Vegetation > 10mm : Increased risk of embolism & mortality.**

Mohananey, Divyanshu et al. JAMA internal medicine vol. 178,4(2018): 502-510

Why is size important ?

8.4.3. Indications and timing of surgery to prevent embolism in infective endocarditis

Surgical removal of potentially embolic material from the heart may prevent new or additional embolic events. Given the imminent risk and high rates of embolization in patients with mobile and large vegetations,[5,451,455–457,460,471] surgery should be considered urgently (within 3–5 days) in such patients. A prospective randomized trial in young,

tality.[474,475] However, prosthetic dehiscence has also been associated with early surgery in patients with *S. aureus* IE.[429] Individualized decision-making is required to balance the risk of surgery, which is also influenced by pre-operative neurological events or other co-morbidities.[5,453]

9.1. Neurological complications

S. aureus IE is more frequently associated with neurological complications compared with IE caused by other microorganisms. Vegetation size and mobility also correlate with embolic risk.

(iii) Prevention of embolism		
Urgent[d] surgery is recommended in aortic or mitral NVE or PVE with persistent vegetations ≥10 mm after one or more embolic episodes despite appropriate antibiotic therapy.[451,455,457,471,478]	I	B
Urgent[d] surgery is recommended in IE with vegetation ≥10 mm and other indications for surgery.[5,460,465,466,471,478]	I	C
Urgent[d] surgery may be considered in aortic or mitral IE with vegetation ≥10 mm and without severe valve dysfunction or without clinical evidence of embolism and low surgical risk.[460,463,465,473,478]	IIb	B

Delgado, Victoria et al. EHJ vol. 44,39 (2020): 3948-4042

Comparison of Cardiac Computed Tomography With Transesophageal Echocardiography for Identifying Vegetation and Intracardiac Complications in Patients With Infective Endocarditis in the Era of 3-Dimensional Images

In-Cheol Kim, MD, PhD*; Suyon Chang, MD*; Geu-Ru Hong, MD, PhD; Seung Hyun Lee, MD, PhD; Sak Lee, MD, PhD; Jong-Won Ha, MD, PhD; Byung-Chul Chang, MD, PhD; Young Jin Kim, MD, PhD; Chi Young Shim, MD, PhD

Background—Recent evolution of cardiac computed tomography (CT) provides useful information about valvular and perivalvular structures. We compared the diagnostic performance of CT and transesophageal echocardiography (TEE) with applications of 3-dimensional reconstruction in detecting vegetation and intracardiac complications in patients with infective endocarditis (IE).

Methods and Results—Seventy-five patients (53 men; age, 58±15 years) with definite IE who underwent TEE and CT with 3-dimensional reconstruction within 3 days were analyzed. The diagnostic performances of the 2 modalities for vegetation and IE-related intracardiac complications (valve perforation, valve aneurysm, perivalvular abscess, pseudoaneurysm, fistula, and prosthetic valve dehiscence) were compared. The detection rate of vegetation in TEE and CT was 97.3% and 72.0%, respectively. The maximum sizes of vegetation identified by TEE and CT were well correlated (r=0.593; P<0.001), especially in patients with large vegetation (≥10 mm), suggestive of a
However, small vegetation (<10 mm) was underdiagnosed by CT (
of the 2 modalities were poorly correlated (r=0.187; P=0.445). Both
detecting IE-related intracardiac complications with excellent agre
perforation and intracardiac fistula, whereas CT was better for diagn

Conclusions—Cardiac CT shows a comparable diagnostic performance
complications. TEE is better for detecting small vegetation, valve
more useful for detecting perivalvular abscess and coronary artery dise

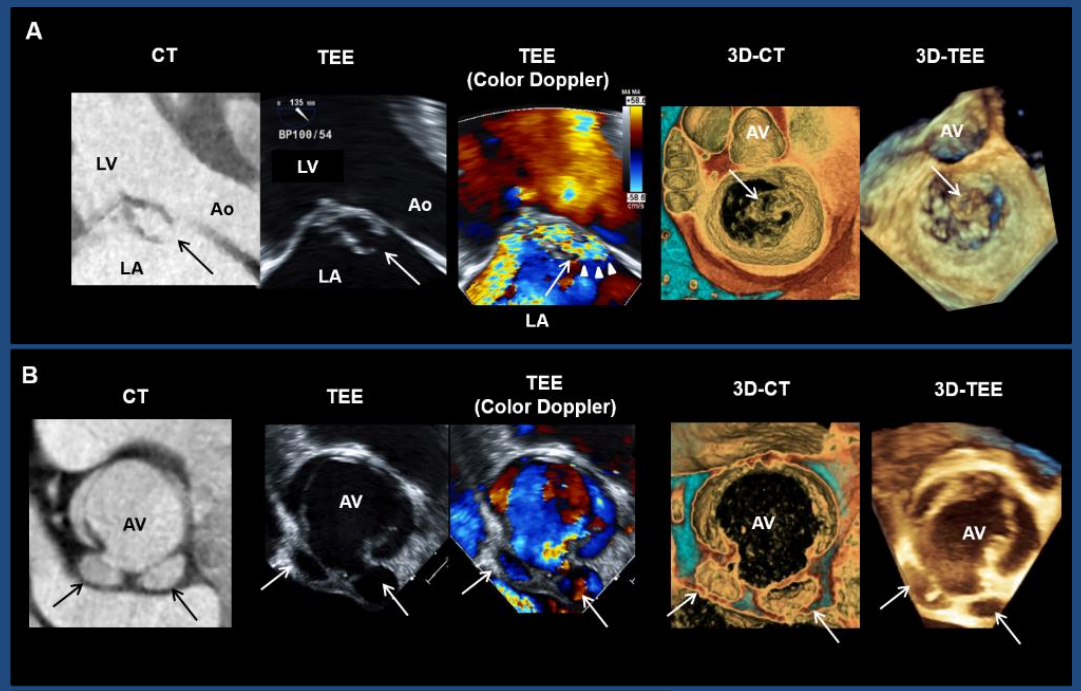
DOI: 10.1161/CIRCIMAGING.117.006986.)

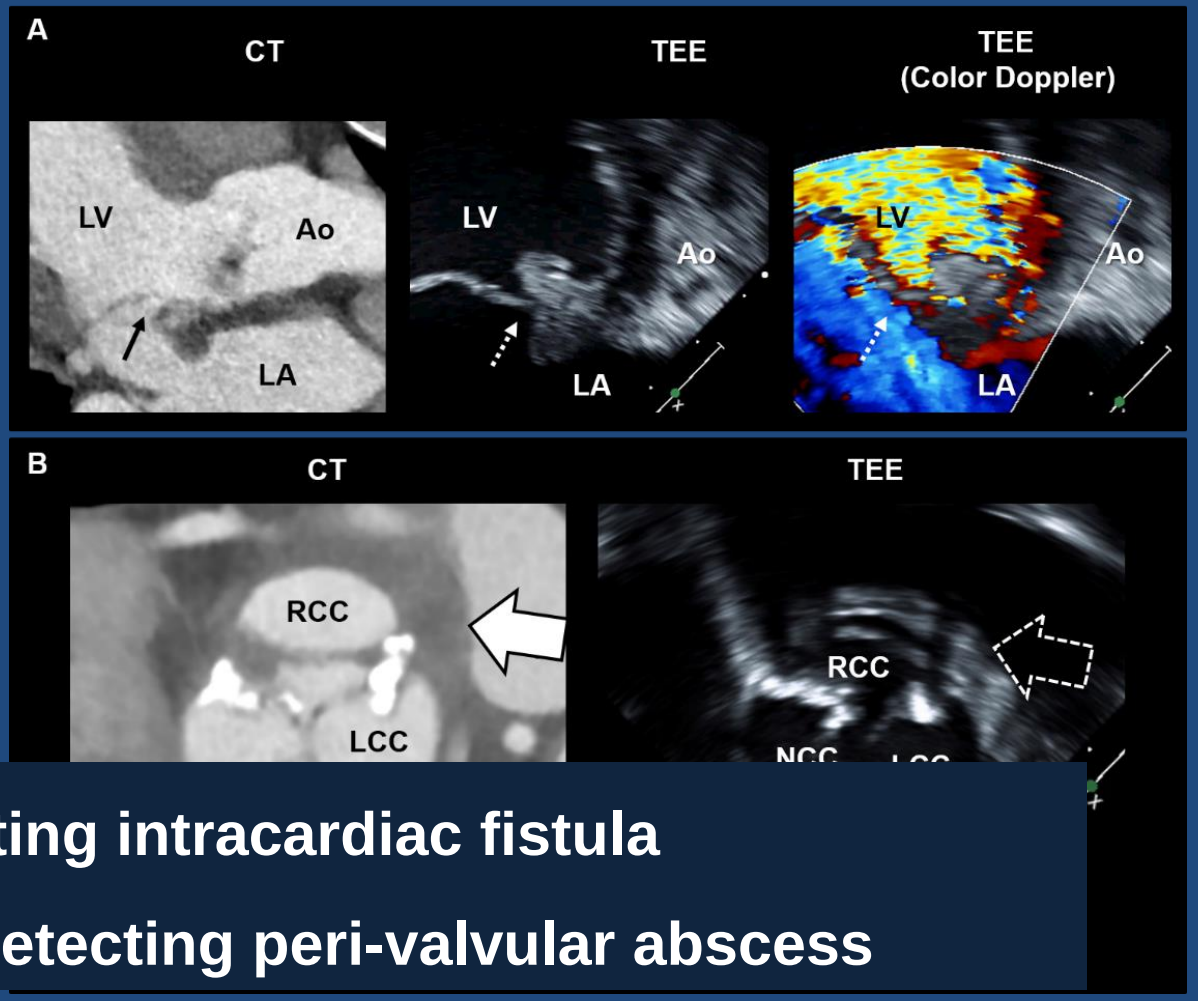
Key Words: echocardiography ■ endocarditis ■ humans ■ imaging, three-dimensional

- **Cardiac CT shows a comparable diagnostic performance with TEE for large vegetation and several IE-related complications.**

Kim IC, Shim CY, Hong GR et al. Circ CV Imaging 2018.

Intracardiac Complications in Infective Endocarditis





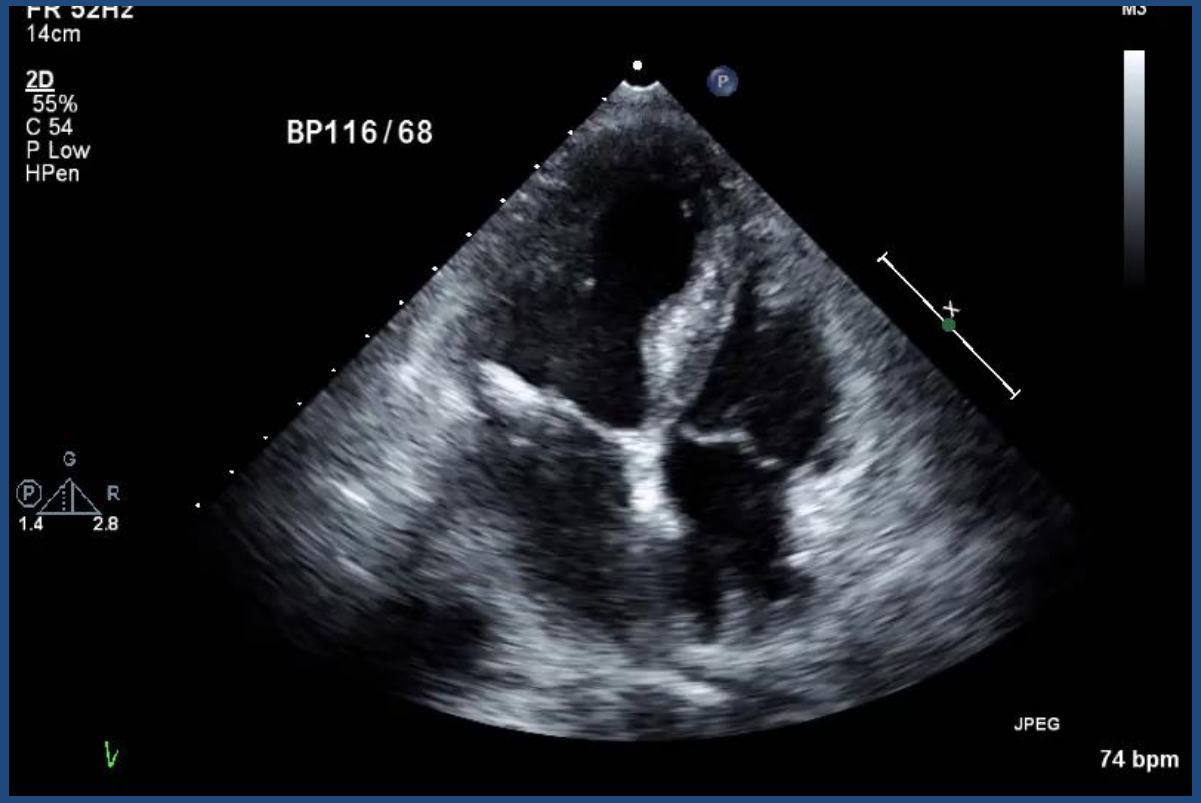
- TEE is better for detecting intracardiac fistula
- Valve CT is better for detecting peri-valvular abscess

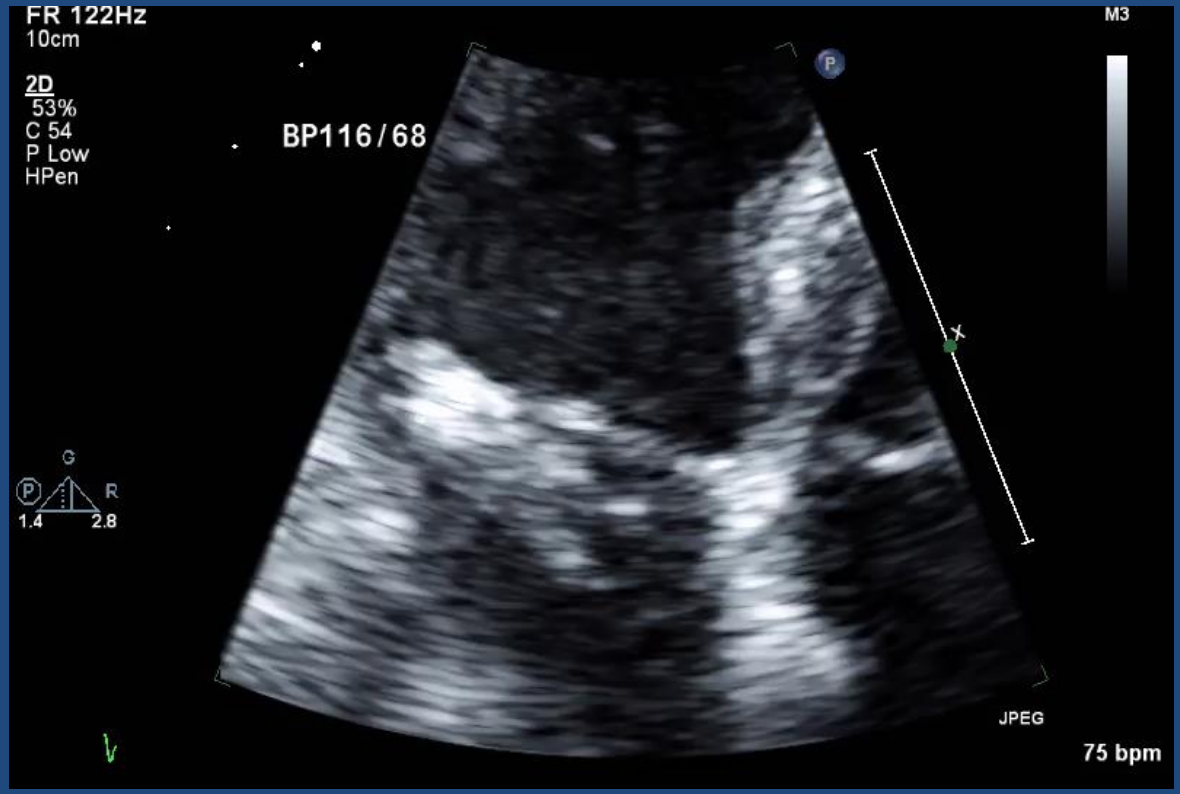
Agreement cases

Disagreement cases

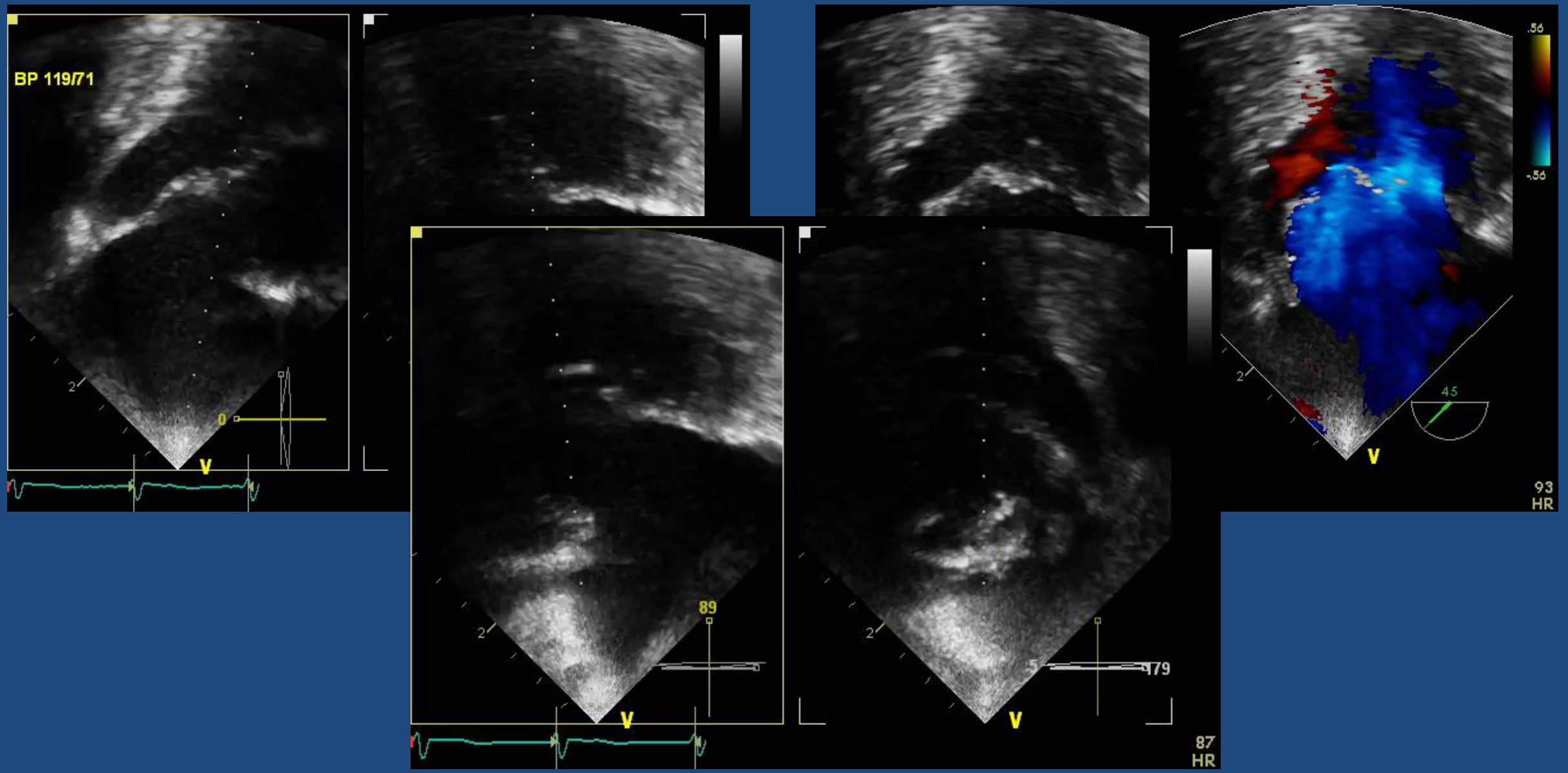
Kim IC, Shim CY, Hong GR et al. Circulation CV Imaging 2018.

A 88-Year-Old Woman with Fever

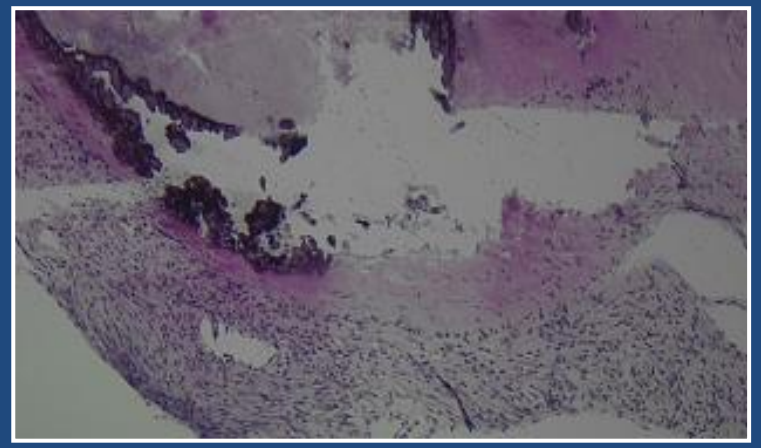


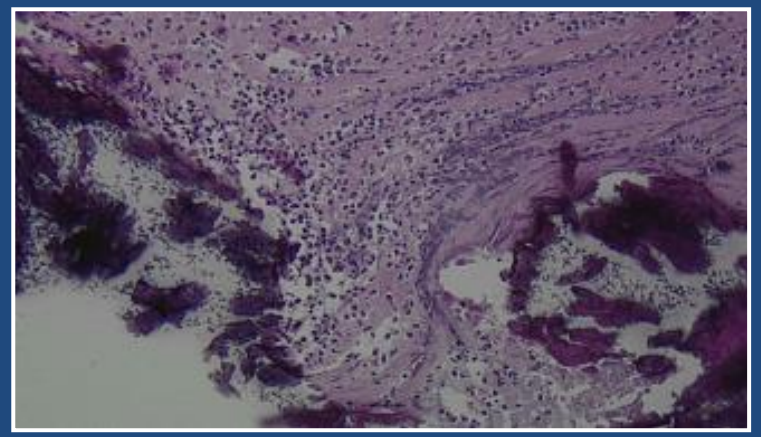


TEE



Mitral Annular Calcification (MAC)
Possible Nidus for Endocarditis





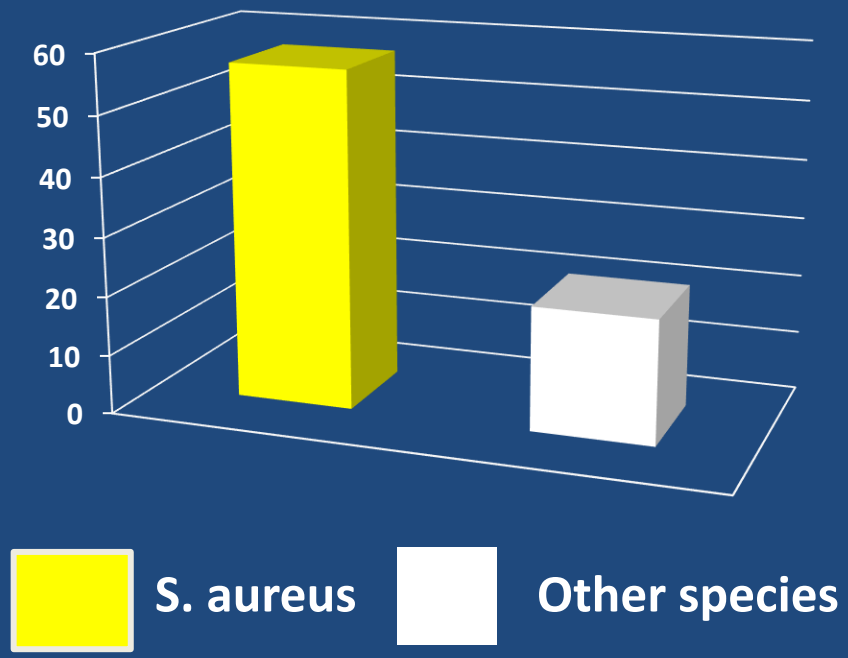
Possible Mechanisms

- Endocardial inflammation and ulceration is associated with MAC
  → platelet aggregation & thrombus formation
- Large calcific deposits can distort the annulus and potentially alter streamlines of flow

Ann Thorac Surg 2006;81:1881–2.

MAC Associated IE

- Annular calcification is common in the elderly
- MAC related infection appears to be frequently due to S. aureus and is associated with high rates of annular complication and high mortality



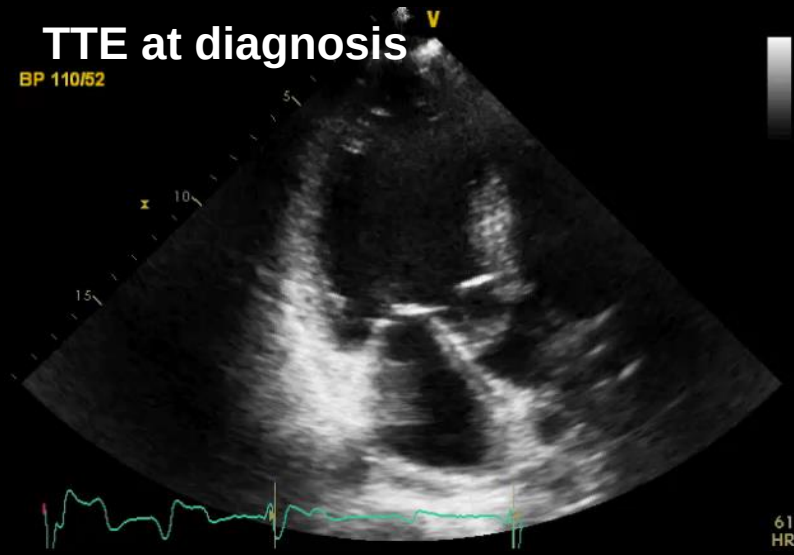
Pressman et al. J Am Soc Echocardiogr 2017;30:572-8

Thank you for listening!

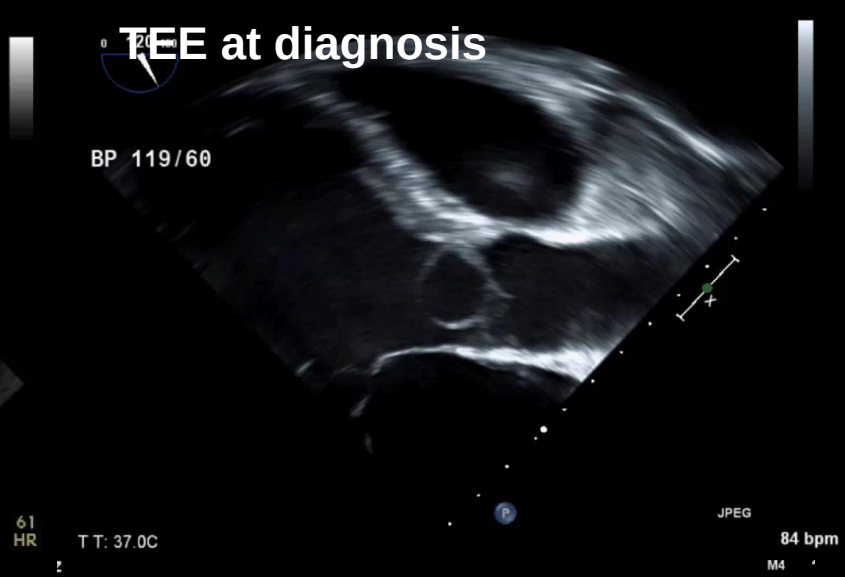
Infective Endocarditis Mimicker

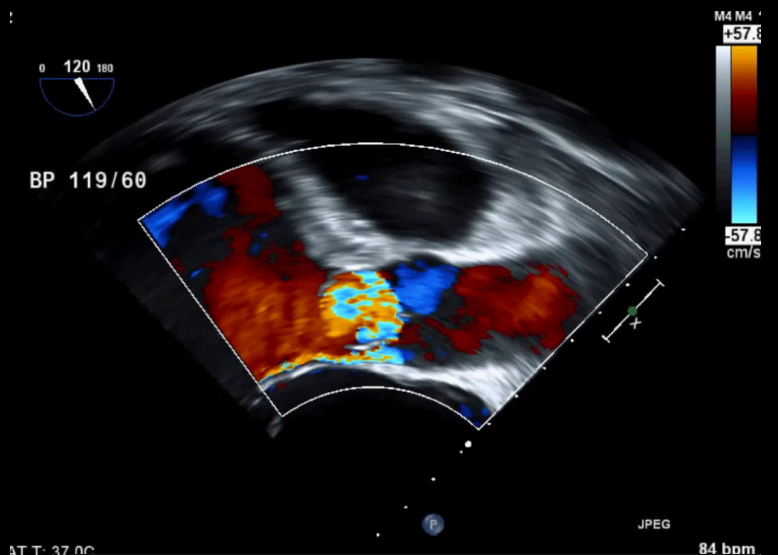
M/49, Inflammatory bowel disease S/P hemicolectomy, Complete AV block

TTE at diagnosis

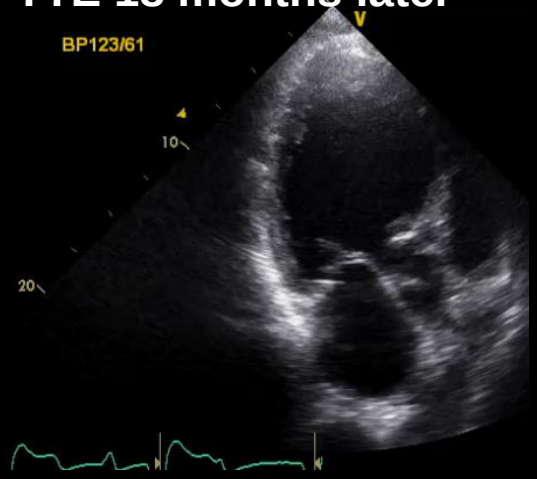


TEE at diagnosis

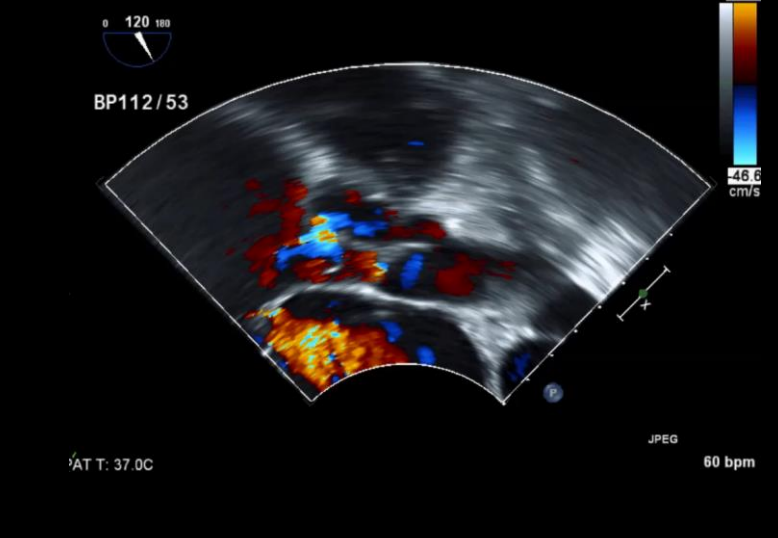




TTE 18 months later



TEE 18 months later



Multimodality Imaging for Cardiac Behçet Disease

Contemporary Multimodality Imaging for Cardiovascular Behçet Disease

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Seo J, Shim CY, Hong GR et al. JACC: Cardiovascular Imaging 2020 May 14:S1936-878X(2030265-5.