VIÊM NỘI TÂM MẠC NHIỄM TRÙNG

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Viện Tim Tp. HCM

Dịch tễ

- Mỹ 2009: 12.7 ca/ 100.000/năm

  50 năm trước: 2-4 ca/100.000 người/năm
- Tần suất mới mắc các nước khác: tương đương USA
- 50% b/n > 50 tuổi
- Nam > 3 nữ

TL: - JAMA 2005; 293 (24): 3022-8
- J. Am Geriatr Soc 2009; 57 (5): 877-81

Phân loại

- Theo cơ địa người bệnh
  - VNTMNT trên van tự nhiên
  - VNTMNT trên van nhân tạo
  - VNTMNT trên người tiêm ma tuý
- Theo tiến triển
  - VNTMNT cấp
  - VNTMNT bán cấp
- Theo tác nhân gây bệnh

  TD : VNTMNT do staphylococcus aureus

Tần suất VNTMNT theo bệnh tim chính ở Mỹ

Tổn thương	Trẻ < 2t %	Trẻ 2-5t %	Người lớn 15-50t %	Người lớn > 50t %	Người lớn tiêm ma tuý %
Không bệnh tim	50-70	10-15	10-20	10	50-60
BTBS	30-50	70-80	25-35	15-25	10
Thấp tim	Hiếm	10	10-15	10-15	10
Bệnh tim thoái hoá	0	0	Hiếm	10-20	Hiếm
Tiền sử phẫu thuật tim	5	10-15	10-20	10-20	10-20
Tiền sử VNTMNT	Hiếm	5	5-10	5-10	10-20

BTBS: Bệnh tim bẩm sinh VNTMNT: Viêm nội tâm mạc nhiễm trùng

TL : Hurst's The Heart, Mc Graw-Hill 10th ed 2001, 2089

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Nguy cơ tương đối VNTMNT thay đổi theo loại tổn thương tim

Nguy cơ cao	Nguy cơ trung bình	Nguy cơ rất thấp (không đáng kể)
Van nhân tạo	Sa van hai lá có hở	Sa 2 lá không hở
Tiền sử VNTMNT	Hẹp 2 lá	Hở van 3 lá nhẹ phát hiện bằng siêu âm
BTBS tím	Bệnh van 3 lá	Thông liên nhĩ lỗ thứ 2
Bệnh van ĐMC	Bệnh van ĐMP	Mảng xơ vữa ĐM
Hở van 2 lá	Phì đại vách thất không đối xứng	Bệnh ĐMV
Hở hẹp 2 lá	Đường truyền đến nhĩ phải	Viêm ĐMC giang mai
Còn ống động mạch	Cấy vật nhân tạo trong tim	Máy tạo nhịp
Hẹp eo ĐMC	(không là van)	
Thông liên thất	Bệnh van thoái hoá người cao tuổi	Tổn thương tim đã mổ (không cấy vật nhân tạo, trên 6 tháng sau mổ)

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TL : Hurst's The Heart, Mc Graw-Hill 10th ed 2001, 2089

Cardiac conditions at highest risk of infective endocarditis for which prophylaxis should be considered when a high-risk procedure is performed

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

CHD = congenital heart disease; IE = infective endocarditis.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

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Vi trùng gây bệnh/ VNTMNT ở người tiêm ma tuý

Organisms	Number of Cases (%) of Endocarditis in Drug Addicts*			
	Right-Sided N = 346	*Left-Sided N = 204*	*Total N = 675*	*Spain (1977-1993)[1] N = 1529*
Streptococci[1]	17 (5)	31 (15)	80 (12)	131 (8.5)
Enterococci	7 (2)	49 (24)	59 (9)	21 (1)
Staphylococcus aureus	267 (77)	47 (23)	396 (57)	1138 (74)
Coagulase-negative staphylococci	–	–		44 (3)
Gram-negative bacilli[3]	7 (5)	26 (13)	45 (7)	23 (1.5)
Fungi (predominantly *Candida* species)	–	25 (12)	26 (4)	18 (1)
Polymicrobia/miscellaneous	28 (8)	20 (10)	49 (7)	48 (3)
Culture negative	10 (3)	6 (3)	20 (3)	106 (7)

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- TL: Karchmer AW. Infective Endocarditis In Braunwald's Heart Disease, ed by Libby, Bonow, Mann, Zipes. Saunders Elsevier 2008, 8th ed, p 1713-1733

Vi trùng gây bệnh trên VNTMNT van nhân tạo 1970-2003

Organisms	Number of Cases (%)* with Time of Onset After Valve Surgery	
	Early (N = 218) <12 mo	*Late (N = 272)* >12 mo
Streptococci†	5 (2)	77 (28)
Pneumococci	–	–
Enterococci	20 (9)	36 (13)
Staphylococcus aureus	42 (19)	45 (17)
Coagulase-negative staphylococci	72 (33)	31 (11)
Fastidious gram-negative coccobacilli (HACEK group)‡	–	11 (4)
Gram-negative bacilli	34 (16)	17 (6)
Fungi, *Candida* species	16 (7)	5 (2)
Polymicrobial/miscellaneous	6 (3)	15 (6)
Diphtheroids	10 (5)	7 (3)
Coxiella burnetii	–	5 (2)
Culture negative	13 (6)	23 (8)

TL: Karchmer AW. Infective Endocarditis In Braunwald's Heart Disease, ed by Libby, Bonow, Mann, Zipes. Saunders Elsevier 2008, 8th ed, p 1713-1733

VNTM do nhiễm trùng bệnh viện

- Đường vào của vi trùng
  - 75% do các đường mạch máu
  - Các đường khác: vết thương, chỗ đặt máy tạo nhịp, ống nội khí quản, ống thông tiểu…
- 2/3 b/n không có bệnh tim trước đó
- Vi trùng thường gặp: staphylococcus; Gram(-); enterococci; candida

VNTM cấy âm nghiệm: nguyên nhân (1)

- B/n đã sử dụng kháng sinh. TD: uống ampicillin
- Vi trùng thuộc loại mọc chậm. TD: nhóm HACEK, vài loại Streptococci
- Một số vi trùng cần môi trường cấy đặc biệt. TD: C. burnetti (sốt Q), Chlamydia, Mycoplasma, Bartonella, Legionella, vài loại Streptococci
- Vi trùng kỵ khí

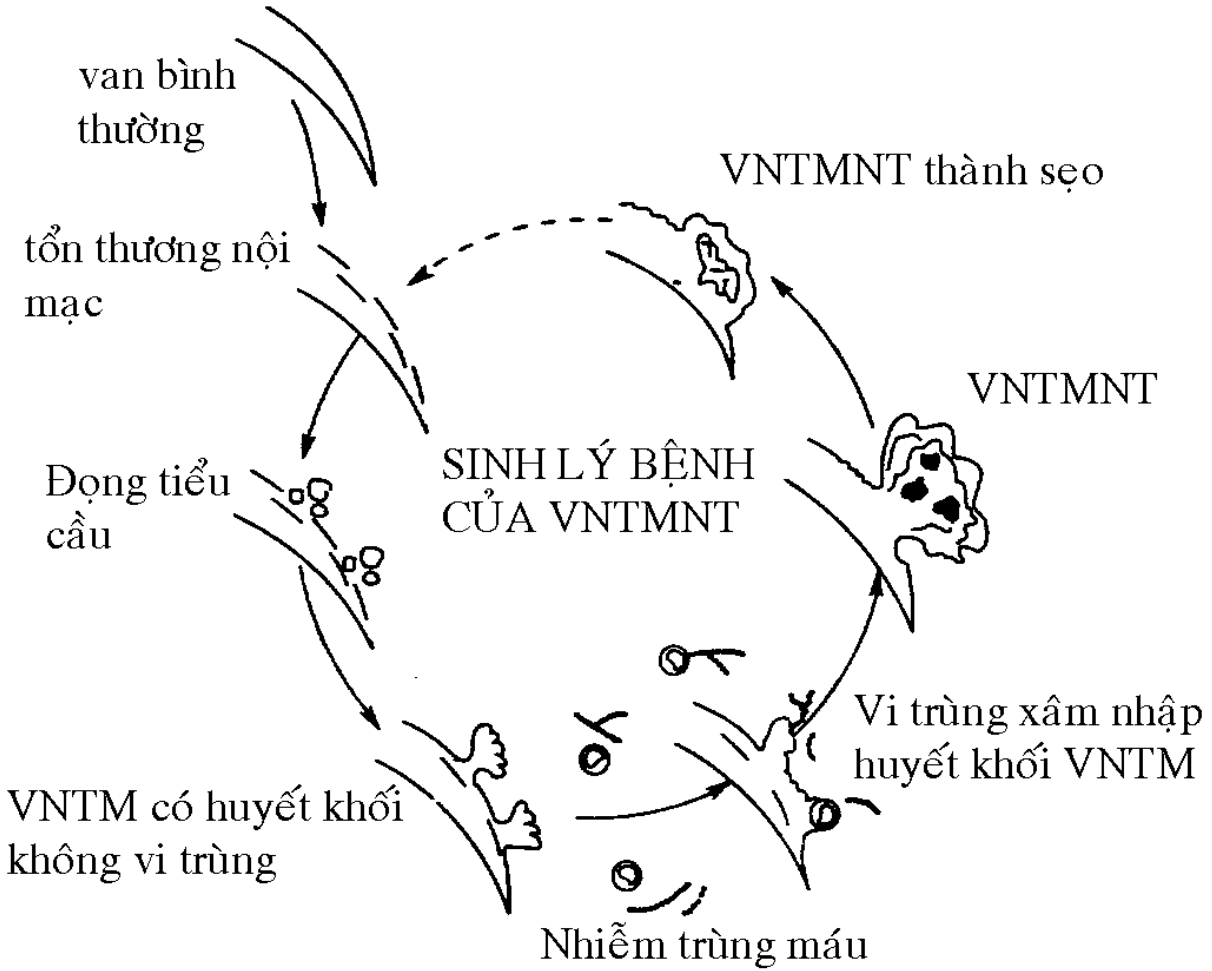
VNTM cấy âm nghiệm: nguyên nhân (2)

- Aspergillus hoặc nấm khác
- Vi trùng không cấy được, chẩn đoán bằng PCR trên mô cơ tim khi phẫu thuật
- Bệnh giống VNTMNT. TD: thấp tim
- Bệnh VNTM huyết khối không có vi trùng/bn lao hoặc ung thư
- VNTM Libman-Sacks/Lupus ban đỏ

Sinh bệnh học

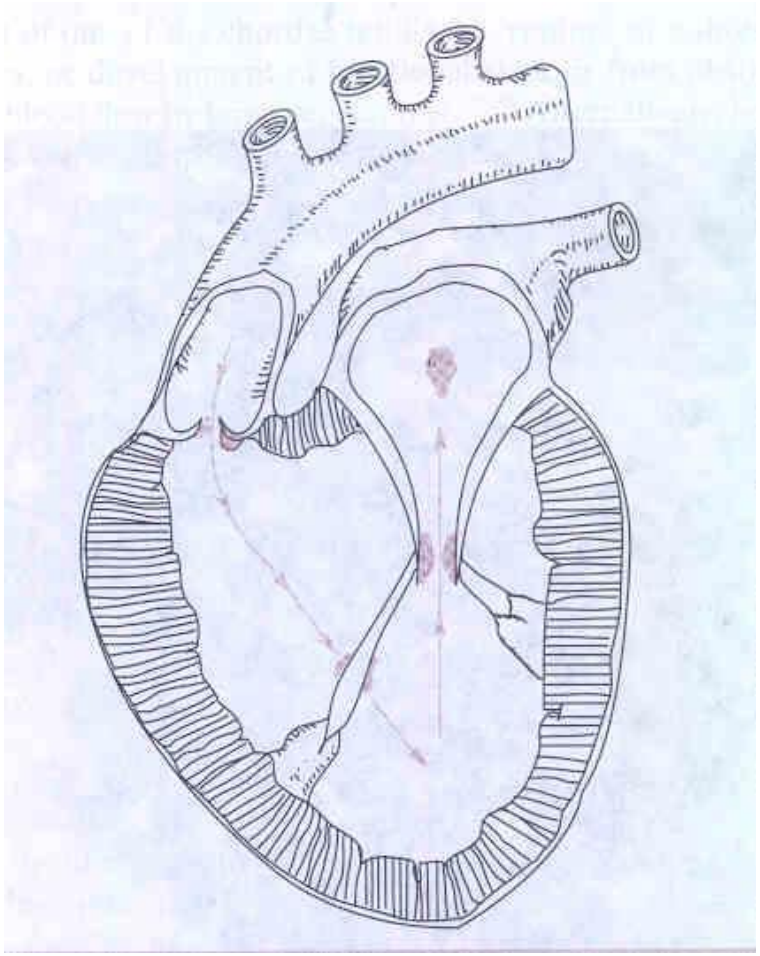
- Các điều kiện:
  - Tình trạng nội mạc
  - Sự lưu thông của máu
  - Sự hiện diện của vi trùng trong máu
- Hiệu quả Venturi
- Mảnh sùi vô trùng → mảnh sùi VNTMNT
- Cấu tạo mảnh sùi VNTMNT:
  - Vi trùng
  - Fibrin
  - Hồng cầu
  - Bạch cầu

Các biến cố chính trong sinh bệnh học VNTMNT



- *TL : Hurst's The Heart, Mc Graw-Hill 10th ed 2001, 2096*

Vị trí mảnh sùi trên bệnh nhân hở van ĐMC và Hở 2 lá



TL : Circulation 1963 ; 27 : 8

Triệu chứng cơ năng

- Trong vòng 2 tuần sau nhiễm bệnh
- Mệt mỏi
- Sốt nhẹ hay sốt cao
- Nhức khớp
- Viêm khớp

Triệu chứng thực thể

- Âm thổi ở tim: mới xuất hiện hay biến đổi một âm thổi cũ
  Đôi khi: không âm thổi
- Lách
- Lấm tấm xuất huyết dưới da (pétéchia)
- Mảnh vụn xuất huyết
- Vết Roth
- Nốt Osler
- Thương tổn Janeway
- Ngón tay dùi trống
- Dấu thuyên tắc: phổi, não, chi dưới, thận, bụng
- Biểu hiện thần kinh: do thuyên tắc hay áp xe não
- Suy tim

Tần suất xuất hiện các triệu chứng cơ năng bệnh nhân VNTMNT

SYMPTOM	PATIENTS AFFECTED (%)
Fever	80-95
Chills	40-70
Weakness	40-50
Malaise	20-40
Sweats	20-40
Anorexia	20-40
Headache	20-40
Dyspnea	20-40
Cough	20-30
Weight loss	20-30
Myalgia/arthralgia	10-30
Stroke	10-20
Confusion/delirium	10-20
Nausea/vomiting	10-20
Edema	5-15
Chest pain	5-15
Abdominal pain	5-15
Hemoptysis	5-10
Back pain	5-10

TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

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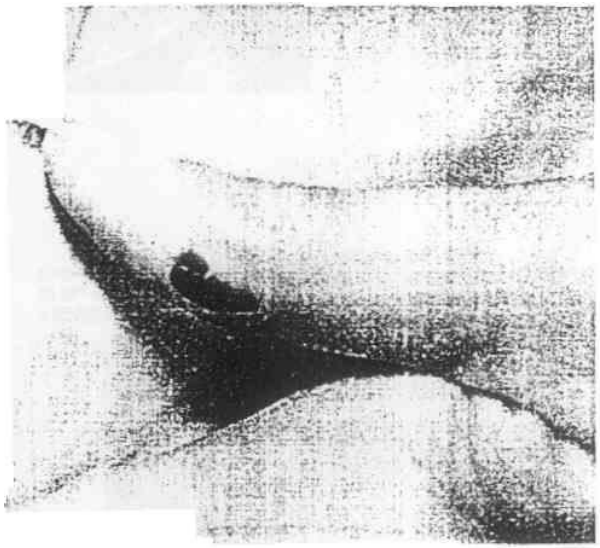
Tần suất xuất hiện các triệu chứng thực thể bệnh nhân VNTMNT

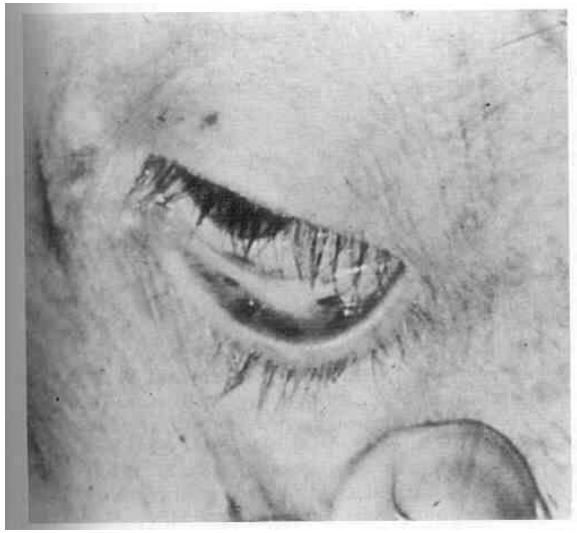
SIGN	PATIENTS AFFECTED (%)
Fever	80-90
Heart murmur	75-85
New murmur	10-50
Changing murmur	5-20
Central neurologic abnormality	20-40
Splenomegaly	10-40
Petechiae/conjunctival hemorrhage	10-40
Splinter hemorrhages	5-15
Janeway lesions	5-10
Osler nodes	3-10
Retinal lesion or Roth spot	2-10

TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

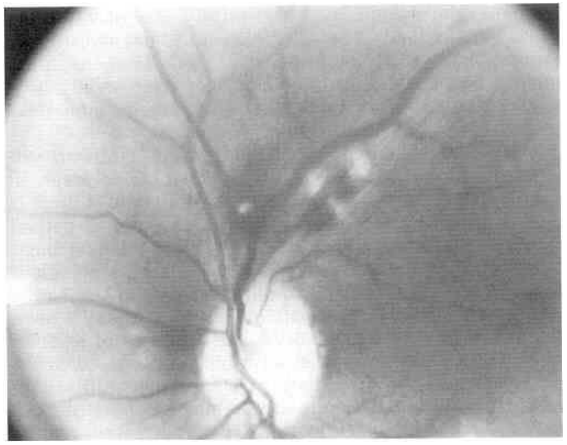
Các triệu chứng thực thể của VNTMNT



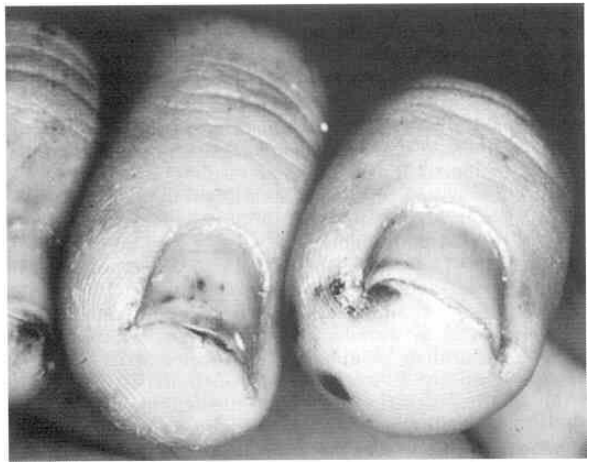
Dấu Janeway ở ngón cái



Ban xuất huyết niêm mạc mặt

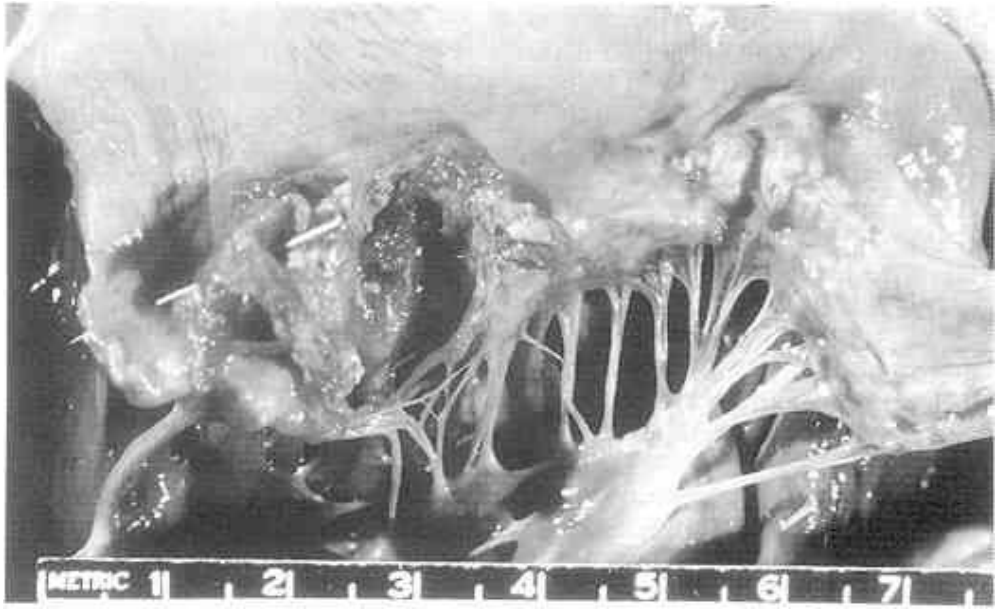


Vết Roth ở đáy mắt

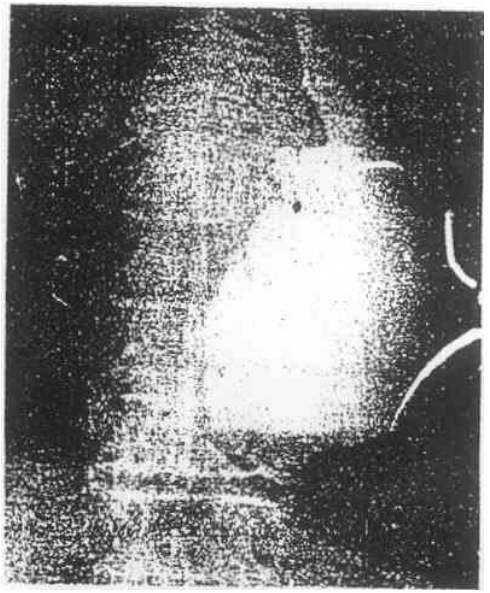


Mảnh vụn xuất huyết dưới móng tay

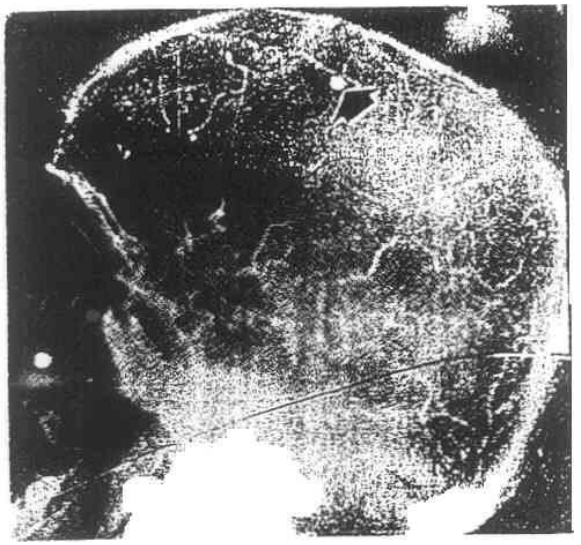
Các triệu chứng thực thể của VNTMNT



Mảnh sùi lớn ở van 2 lá



Túi phình Mycotic ở ĐMC ngực



Túi phình (mũi tên) ở ĐM não

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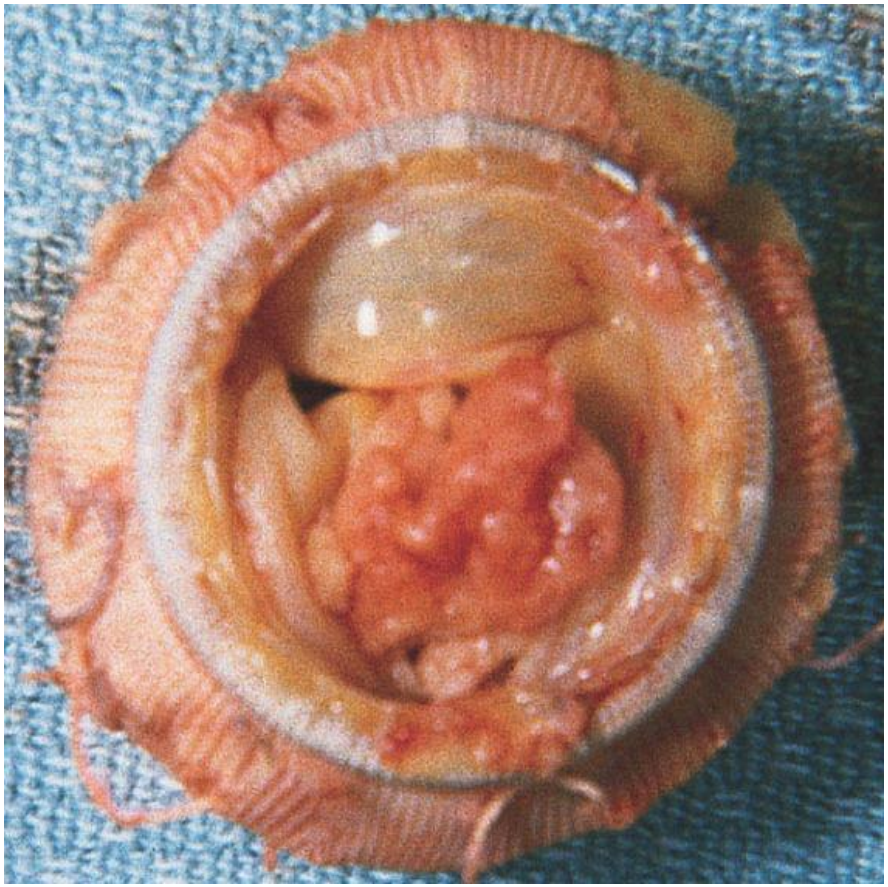
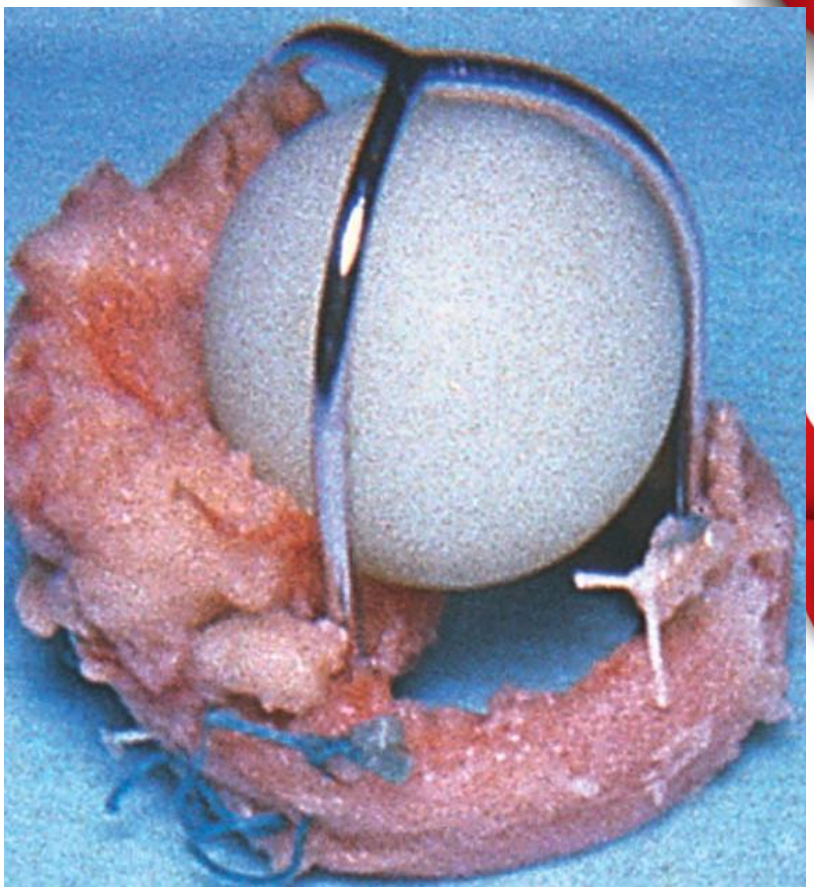
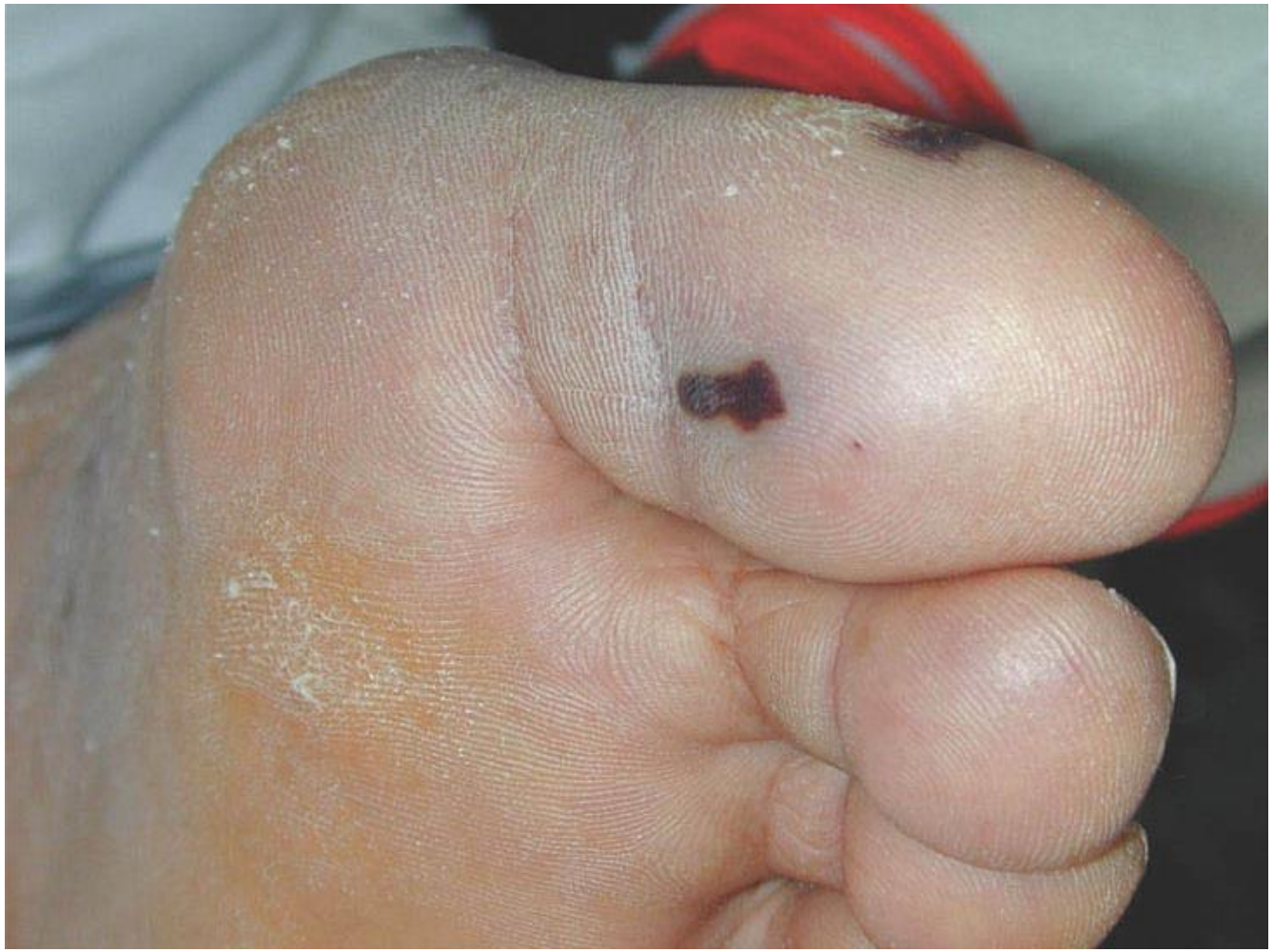
Mảnh sùi lớn trên van tự nhiên do Candida albicaus (A) và mảnh sùi do nấm Aspergillis trên van nhân tạo Starr- Edwards





- TL: Karchmer AW. Infective Endocarditis In Braunwald's Heart Disease, ed by Libby, Bonow, Mann, Zipes. Saunders Elsevier 2008, 8th ed, p 1713-1733

Nhồi máu ngón chân do VNTMNT bởi Staphylococcus aureus

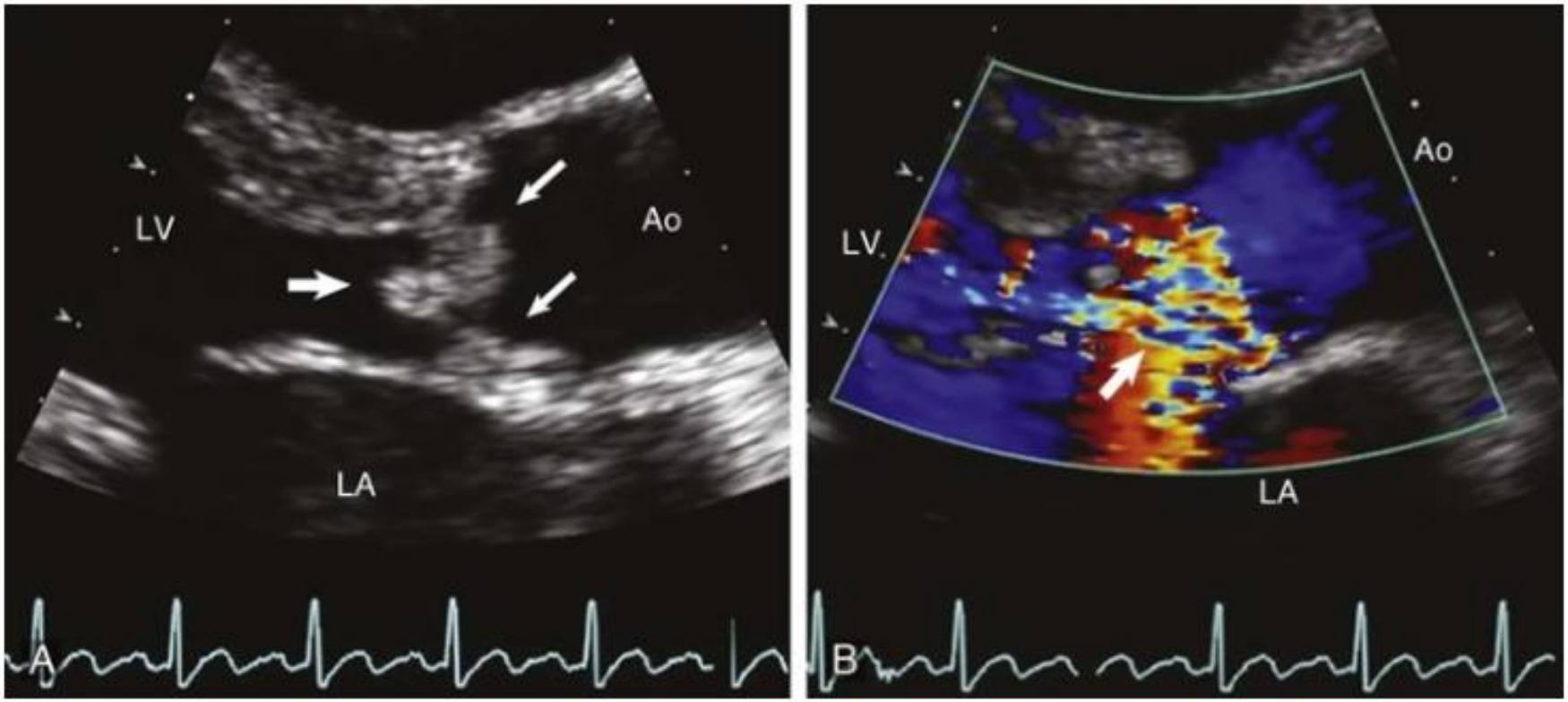


- TL: Karchmer AW. Infective Endocarditis In Braunwald's Heart Disease, ed by Libby, Bonow, Mann, Zipes. Saunders Elsevier 2008, 8th ed, p 1713-1733

Cận lâm sàng

- Thiếu máu đẳng sắc nhẹ
- Bạch cầu có thể bình thường hay tăng
- VS tăng
- Cấy máu:
  - Trước kháng sinh
  - 3 lần, lần 1,2 cách 60 phút – lần 3 cách 12 giờ kỵ khí và ái khí
- Phim lồng ngực
- Điện tâm đồ
- Siêu âm tim qua thành ngực: độ nhậy 50-80%
- Siêu âm tim qua đường thực quản: độ nhậy 90%

Hình ảnh siêu âm tim VNTMNT trên van ĐMC tự nhiên



TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

Vai trò của siêu âm tim/ VNTMNT (1)

Recommendations	Class[a]	Level[b]	Ref.[c]
A. Diagnosis			
• TTE is recommended as the first-line imaging modality in suspected IE.	I	B	64,65
• TOE is recommended in all patients with clinical suspicion of IE and a negative or non-diagnostic TTE.	I	B	64, 68–71
• TOE is recommended in patients with clinical suspicion of IE, when a prosthetic heart valve or an intracardiac device is present.	I	B	64,71
• Repeat TTE and /or TOE within 5–7 days is recommended in case of initially negative examination when clinical suspicion of IE remains high.	I	C	
• Echocardiography should be considered in *Staphylococcus aureus* bacteraemia.	IIa	B	66,67
• TOE should be considered in patients with suspected IE, even in cases with positive TTE, except in isolated right-sided native valve IE with good quality TTE examination and unequivocal echocardiographic findings.	IIa	C	

TTE: siêu âm tim qua thành ngực
TOE: SAT qua thực quản

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

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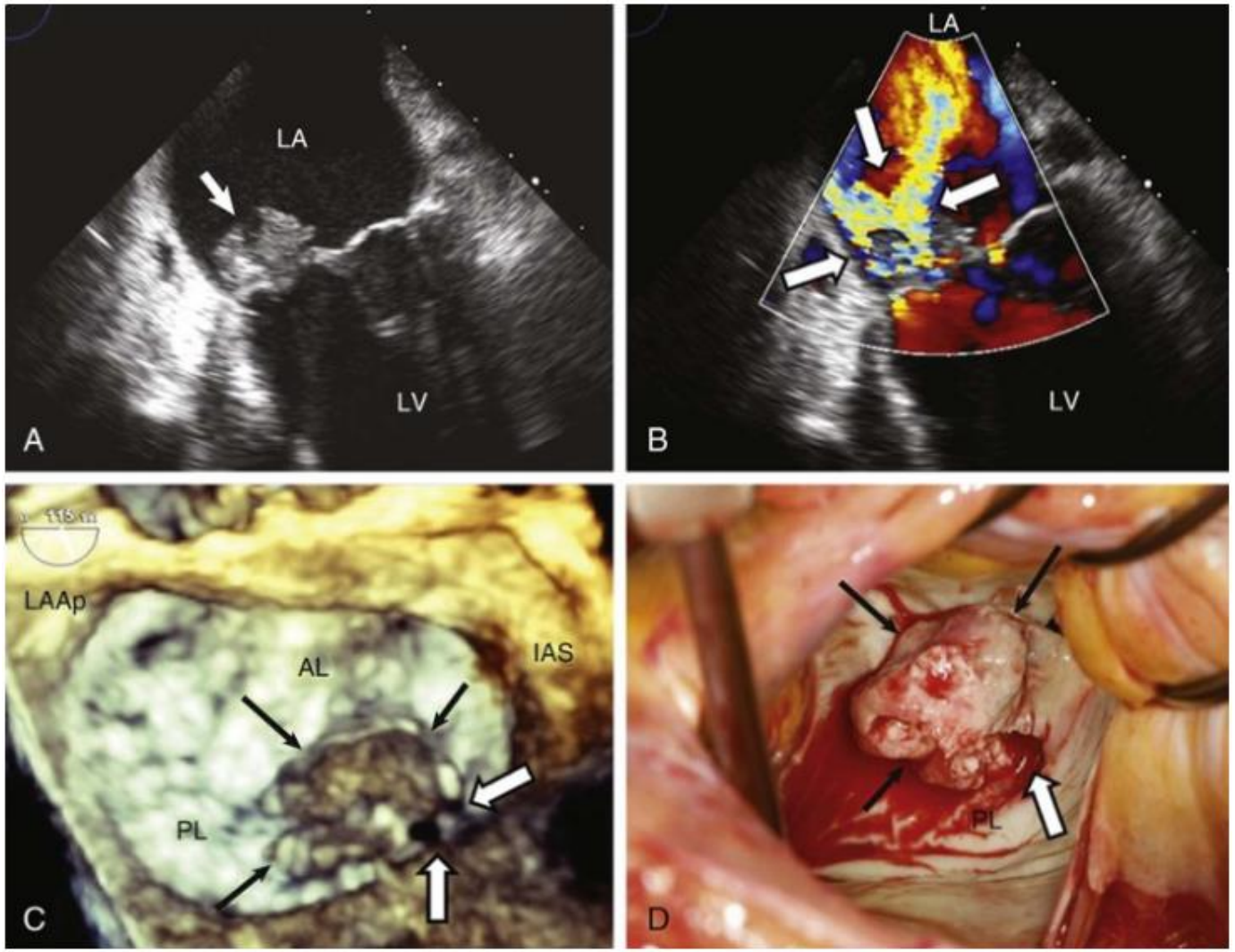
Vai trò của siêu âm tim/ VNTMNT (2)

Recommendations	Class[a]	Level[b]	Ref.[c]
B. Follow-up under medical therapy			
• Repeat TTE and/or TOE are recommended as soon as a new complication of IE is suspected (new murmur, embolism, persisting fever, HF, abscess, atrioventricular block).	I	B	64,72
• Repeat TTE and/or TOE should be considered during follow-up of uncomplicated IE in order to detect new silent complications and monitor vegetation size. The timing and mode (TTE or TOE) of repeat examination depend on the initial findings, type of microorganism, and initial response to therapy.	IIa	B	64,72
C. Intraoperative echocardiography			
• Intraoperative echocardiography is recommended in all cases of IE requiring surgery.	I	B	64,73
D. Following completion of therapy			
• TTE is recommended at completion of antibiotic therapy for evaluation of cardiac and valve morphology and function.	I	C	

HF = heart failure; IE = infective endocarditis; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.

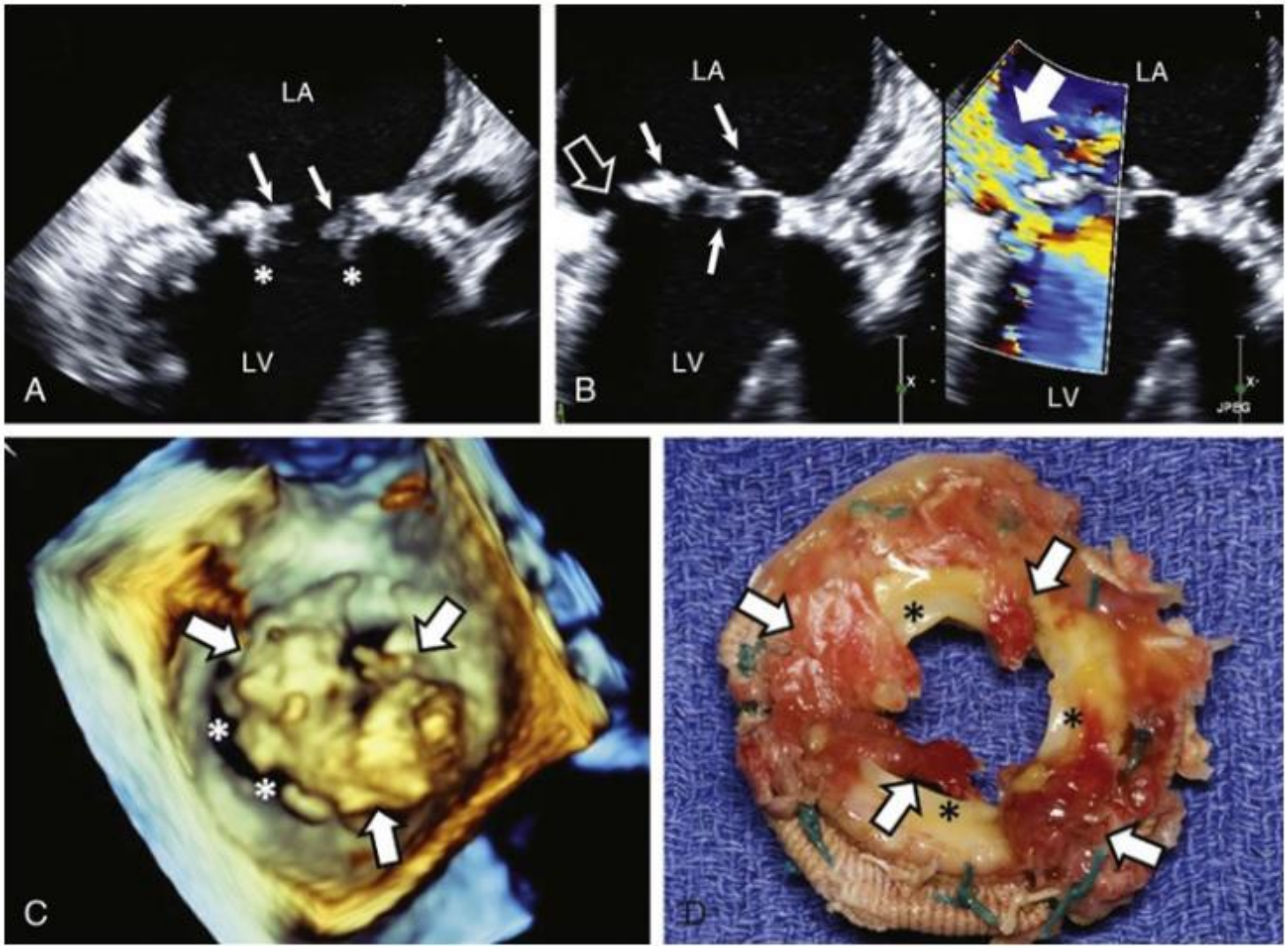
TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

VNTMNT/van 2 lá



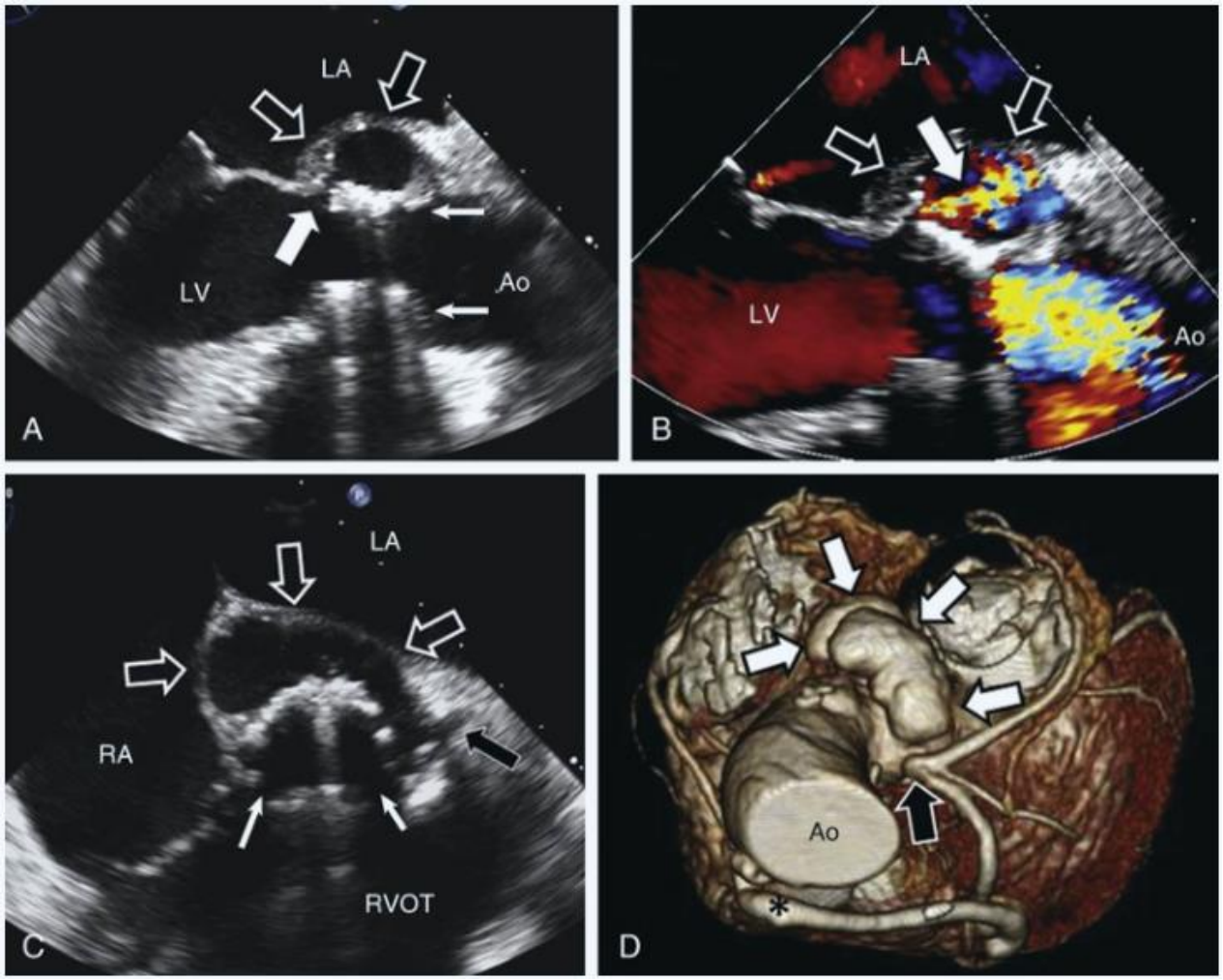
TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

VNTMNT/ van sinh học nhân tạo



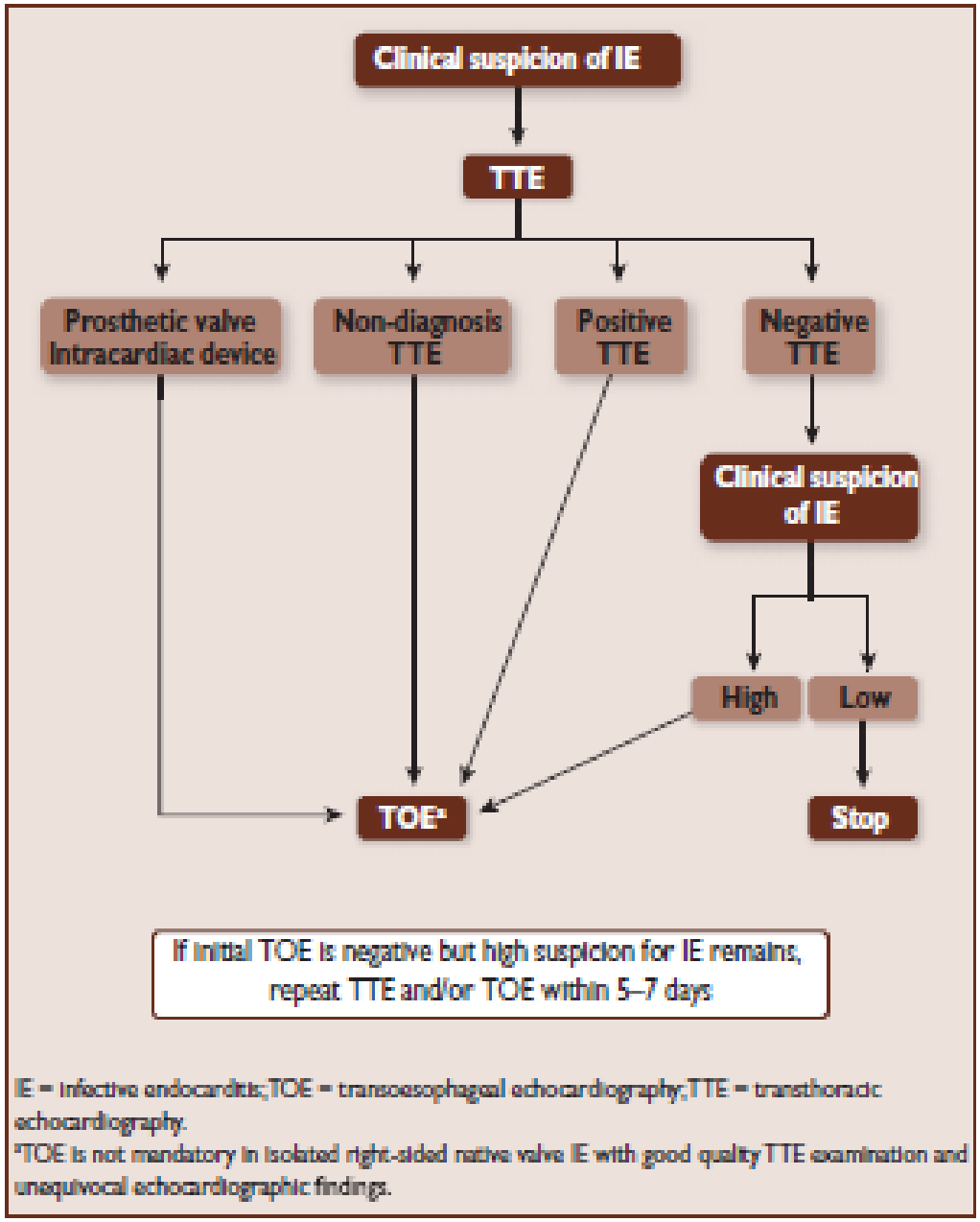
TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

VNTMNT van ĐMC nhân tạo biến chứng lan quanh vòng van



TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

Chỉ định siêu âm tim trên b/n nghi ngờ VNTMNT



TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Các định nghĩa về cơ thể học và siêu âm tim

	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.

TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

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Chẩn đoán

- ✓Sốt trên 1 tuần + âm thổi + không tìm thấy nguyên nhân sốt: nghi ngờ VNTMNT
- ✓Tiêm ma tuý + sốt kéo dài không rõ nguyên nhân: VNTMNT?

Chẩn đoán bệnh VNTMNT (1)

Chẩn đoán xác định:

Hai tiêu chuẩn chính hoặc một tiêu chuẩn chính kèm 3 tiêu chuẩn phụ, hoặc 5 tiêu chuẩn phụ

Tiêu chuẩn chính:

1. Phân lập được Streptococcus viridans, S. bovis, nhóm HACEK, hoặc (khi không thấy ổ nhiễm trùng) phân lập được S. aureus, Enterococcus trong 2 mẫu máu riêng biệt hoặc phân lập được vi trùng phù hợp với VNTM ở 2 mẫu máu cách ≥ 12 giờ hoặc cả 3 hay trên 3 mẫu máu, mẫu đầu và mẫu cuối cách ít nhất 1 giờ.
2. Siêu âm tim thấy mảnh sùi lắc (di động) hoặc áp xe, hoặc mới hở một phần van nhân tạo hoặc hở van tự nhiên mới có.

Chẩn đoán bệnh VNTMNT (2)

Chẩn đoán xác định:

Tiêu chuẩn phụ:

1. Có tổn thương dễ gây VNTMNT hoặc người nghiện ma tuý
2. Sốt $\geq 38^oC$
3. Thuyên tắc động mạch lớn, nhồi máu phổi nhiễm trùng, túi phình mycotic, xuất huyết nội sọ, xuất huyết niêm mạc mắt, tổn thương Janeway
4. Viêm vi cầu thận, nốt Osler, nốt Roth, yếu tố thấp
5. Cấy máu dương nghiệm nhưng không đạt tiêu chuẩn chính (loại trừ cấy máu dương nghiệm chỉ một lần các vi khuẩn không đặc hiệu của VNTMNT) hoặc phản ứng huyết thanh dương của nhiễm trùng đang xảy ra với vi khuẩn thường gây VNTMNT
6. Siêu âm phù hợp với VNTMNT nhưng không đạt tiêu chuẩn chính

Chẩn đoán bệnh VNTMNT (3)

Có thể VNTMNT

- Không đủ tiêu chuẩn xác định, nhưng cũng không thuộc vào nhóm loại trừ

Loại trừ

- Có chẩn đoán khác hoặc triệu chứng biến mất hoặc không có chứng cơ của VNTMNT khi mổ hoặc phẫu nghiệm tử thi, với chỉ dưới hay bằng 4 ngày kháng sinh

Definition of infective endocarditis according to the modified Duke criteria (adapted from Li et al[87])

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

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Definitions of the terms used in the European Society of Cardiology 2015 modified criteria for the diagnosis of infective endocarditis (1)

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.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Definitions of the terms used in the European Society of Cardiology 2015 modified criteria for the diagnosis of infective endocarditis (2)

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.

CT = computed tomography; FDG = fluorodeoxyglucose; HACEK = Haemophilus parainfluenzae, H. aphrophilus, H. paraphrophilus, H. influenzae, Actinobacillus actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens, Kingella kingae, and K. denitrificans; IE = infective endocarditis; Ig = immunoglobulin; PET = positron emission tomography; SPECT = single photon emission computerized tomography. Adapted from Li et al.[87]

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

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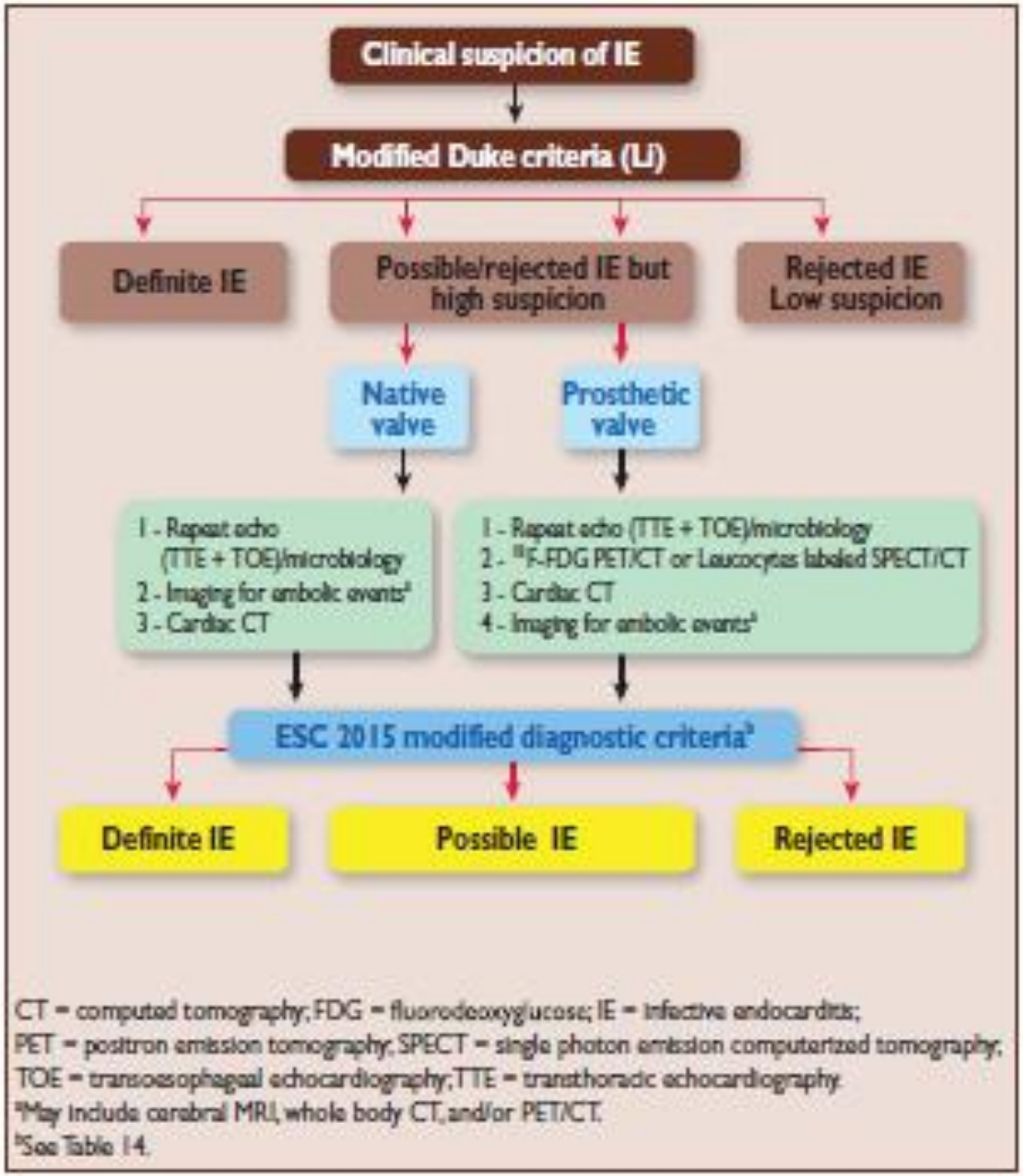
European Society of Cardiology 2015 algorithm for diagnosis of infective endocarditis



TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

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Chẩn đoán phân biệt

- Nhiễm trùng huyết
- Viêm phổi
- Viêm màng não
- Áp xe não
- Sốt rét
- VMNT cấp
- Viêm mạch máu
- Thấp tim
- Lao phổi
- U nhầy nhĩ trái

Các biến chứng của VNTMNT

- Suy tim
- Thuyên tắc
- Rối loạn dẫn truyền
- Biểu hiện thần kinh
- Túi phình mycotic (mycotic aneurysm)

Điều trị

- Nguyên tắc điều trị:
  - Kháng sinh diệt khuẩn
  - Liều cao
  - Dài ngày (4-6 tuần)

- Lựa chọn kháng sinh theo :
  - Loại vi trùng
  - Cơ địa người bệnh (có tiêm ma tuý? Van nhân tạo?)
  - Cấp hay bán cấp

Antibiotic treatment of infective endocarditis due to oral streptococci and Streptococcis bovis group[a] (1)

Antibiotic	Dosage and route	Duration (weeks)	Class[b]	Level[c]	Ref.[d]	Comments
Strains penicillin-susceptible (MIC ≤ 0.125 mg/L) oral and digestive streptococci						
Standard treatment: 4-week duration						
Penicillin G *or* Amoxicillin[e] *or* Ceftriaxone[f]	12–18 million U/day i.v. either in 4–6 doses or continuously 100–200 mg/kg/day i.v. in 4–6 doses 2 g/day i.v. or i.m. in 1 dose	4 4 4	I I I	B B B	6,8, 135–139	Preferred in patients > 65 years or with impaired renal or VIII (vestibulocochlear) cranial nerve functions. 6-week therapy recommended for patients with PVE
	Paediatric doses:[g] Penicillin G 200,000 U/kg/day i.v. in 4–6 divided doses Amoxicillin 300 mg/kg/day i.v. in 4–6 equally divided doses Ceftriaxone 100 mg/kg/day i.v. or i.m. in 1 dose					

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of infective endocarditis due to oral streptococci and Streptococcis bovis group[a] (2)

Standard treatment: 2-week duration						
Penicillin G or Amoxicillin[e] or Ceftriaxone[f] combined with Gentamicin[h] or Netilmicin	12–18 million U/day i.v. either in 4–6 doses or continuously 100–200 mg/kg/day i.v. in 4–6 doses 2 g/day i.v. or i.m. in 1 dose 3 mg/kg/day i.v. or i.m. in 1 dose 4–5 mg/kg/day i.v. in 1 dose	2 2 2 2 2	I I I I I	B B B B B	6,8, 127, 135–138	Only recommended in patients with non-complicated NVE with normal renal function. Netilmicin is not available in all European countries.
	Paediatric doses:[g] Penicillin G, amoxicillin, and ceftriaxone as above Gentamicin 3 mg/kg/day i.v. or i.m. in 1 dose or 3 equally divided doses					
In beta-lactam allergic patients[i]						
Vancomycin[i]	30 mg/kg/day i.v. in 2 doses	4	I	C		6-week therapy recommended for patients with PVE
	Paediatric doses:[g] Vancomycin 40 mg/kg/day i.v. in 2 or 3 equally divided doses					

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TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of infective endocarditis due to oral streptococci and Streptococcis bovis group[a] (3)

Strains relatively resistant to penicillin (MIC 0.250–2 mg/l)[k]						
Standard treatment						
Penicillin G *or* Amoxicillin[e] *or* Ceftriaxone[f] combined with Gentamicin[h]	24 million U/day i.v. either in 4–6 doses or continuously 200 mg/kg/day i.v. in 4–6 doses 2 g/day i.v. or i.m. in 1 dose 3 mg/kg/day i.v. or i.m. in 1 dose	4 4 4 2	I I I I	B B B B	6,8, 135, 136	6-week therapy recommended for patients with PVE
In beta-lactam allergic patients[j]						
Vancomycin[i] with Gentamicin[k]	30 mg/kg/day i.v. in 2 doses 3 mg/kg/day i.v. or i.m. in 1 dose	4 2	I I	C C		6-week therapy recommended for patients with PVE
	Paediatric doses:[g] As above					

C_{min} = minimum concentration; IE = infective endocarditis; i.m. = intramuscular; i.v. = intravenous; MIC = minimum inhibitory concentration; NVE = native valve endocarditis; PVE = prosthetic valve endocarditis; U = units.

[a]Refer to text for other streptococcal species; [b]Class of recommendation; [c]Level of evidence; [d]Reference(s) supporting recommendations; [e]Or ampicillin, same dosages as amoxicillin; [f]Preferred for outpatient therapy; [g]Paediatric doses should not exceed adult doses; [h]Renal function and serum gentamicin concentrations should be monitored once a week. When given in a single daily dose, pre-dose (trough) concentrations should be < 1 mg/L and post-dose (peak; 1 hours after injection) serum concentrations should be ~10–12 mg/L.[148]; [i]Penicillin desensitization can be attempted in stable patients; [j]Serum vancomycin concentrations should achieve 10–15 mg/L at pre-dose (trough) level, although some experts recommend to increase the dose of vancomycin to 45–60 mg/kg/day i.v. in 2 or 3 divided doses to reach serum trough vancomycin levels (C_{min}) of 15–20 mg/L as in staphylococcal endocarditis. However, vancomycin dose should not exceed 2 g/d unless serum levels are monitored and can be adjusted to obtain a peak plasma concentration of 30–45 µg/mL 1 hour after completion of the i.v. infusion of the antibiotic; [k]Patients with penicillin-resistant strains (MIC > 2 mg/L) should be treated as enterococcal endocarditis (see *Table 18*).

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TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of infective endocarditis due to Staphylococcus spp (1)

Antibiotic	Dosage and route	Duration (weeks)	Class[i]	Level[j]	Ref.[k]	Comments
Native valves						
Methicillin-susceptible staphylococci						
(Flu)cloxacillin *or* oxacillin	12 g/day i.v. in 4–6 doses	4–6	I	B	6,8, 128, 135, 136, 158	Gentamicin addition is not recommended because clinical benefit has not been demonstrated and there is increased renal toxicity
	Paediatric doses:[g] 200–300 mg/kg/day i.v. in 4–6 equally divided doses					
Alternative therapy* Cotrimoxazole[a]	Sulfamethoxazole 4800 mg/day and Trimethoprim 960 mg/day (i.v. in 4–6 doses)	1 i.v. + 5 oral intake	IIb	C		*for *Stahylococcus aureus*
with Clindamycin	1800mg/day i.v. in 3 doses	1	IIb	C		
	Paediatric doses:[g] Sulfamethoxazole 60 mg/kg/day and Trimethoprim 12 mg/kg/day (i.v. in 2 doses) Clindamycin 40 mg/kg/day (i.v. in 3 doses)					

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TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of infective endocarditis due to Staphylococcus spp (2)

Penicillin-allergic patients[h] or methicillin-resistant staphylococci						
Vancomycin[b] **	30–60 mg/kg/day i.v. in 2–3 doses	4–6	I	B	6,8, 135, 136	**Cephalosporins** (cefazolin 6 g/day or cefotaxime 6 g/day i.v. in 3 doses) are recommended for penicillin-allergic patients with non-anaphylactic reactions with methicillin-susceptible endocarditis
	Paediatric doses:[g] 40 mg/kg/day i.v. in 2–3 equally divided doses					
Alternative therapy:** Daptomycin[c,d]	10 mg/kg/day i.v. once daily	4–6	IIa	C		**Daptomycin** is superior to vancomycin for MSSA and MRSA bacteraemia with vancomycin MIC > 1 mg/L
	Paediatric doses:[g] 10 mg/kg/day i.v. once daily					
Alternative therapy* Cotrimoxazole[a]	Sulfamethoxazole 4800 mg/day and Trimethoprim 960 mg/day (i.v. in 4–6 doses)	1 i.v. + 5 oral intake	IIb	C		*for *Stahylococcus aureus*
with Clindamycin	1800mg/day IV in 3 doses	1	IIb	C		

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of infective endocarditis due to Staphylococcus spp (3)

Prosthetic valves						
Methicillin-susceptible staphylococci						
(Flu)cloxacillin or oxacillin with Rifampin[e] and Gentamicin[f]	12 g/day i.v. in 4–6 doses	≥ 6	I	B	6,8, 135, 136	
	900–1200 mg i.v. or orally in 2 or 3 divided doses	≥ 6	I	B		Starting rifampin 3–5 days later than vancomycin and gentamicin has been suggested by some experts.
	3 mg/kg/day i.v. or i.m. in 1 or 2 doses	2	I	B		Gentamicin can be given in a single daily dose in order to reduce renal toxicity
	Paediatric doses:[g] Oxacillin and (flu)cloxacillin as above Rifampin 20 mg/kg/day i.v. or orally in 3 equally divided doses					

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TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of infective endocarditis due to Staphylococcus spp (4)

Penicillin-allergic patients[h] and methicillin-resistant staphylococci						
Vancomycin[b] with Rifampin* and Gentamicin[f]	30–60 mg/kg/day i.v. in 2–3 doses 900–1200 mg i.v. or orally in 2 or 3 divided doses 3 mg/kg/day i.v. or i.m. in 1 or 2 doses **Paediatric dosing:**[g] As above	≥ 6 ≥ 6 2	I I I	B B B	6,8, 135, 136	**Cephalosporins** (cefazolin 6 g/day or cefotaxime 6 g/day i.v. in 3 doses) are recommended for penicillin-allergic patients with non-anaphylactic reactions with methicillin-susceptible endocarditis. Starting rifampin 3–5 days later than vancomycin and gentamicin has been suggested by some experts. Gentamicin can be given in a single daily dose in order to reduce renal toxicity

AUC = area under the curve; C_{min} = minimum concentration; IE = infective endocarditis; MIC = minimum inhibitory concentration; MRSA = methicillin-resistant *Staphylococcus aureus*; MSSA = methicillin-susceptible *S. aureus*; PVE = prosthetic valve endocarditis.
[a]Renal function, serum Cotrimoxazole concentrations should be monitored once/week (twice/week in patients with renal failure); [b]Serum trough vancomycin levels (C_{min}) should be ≥ 20 mg/L. A vancomycin AUC/MIC >400 is recommended for MRSA infections; [c]Monitor plasma CPK levels at least once a week. Some experts recommend adding cloxacillin (2 g/4 h i.v.) or fosfomycin (2 g/6 h i.v.) to daptomycin in order to increase activity and avoid the development of daptomycin resistance; [d]Daptomycin and fosfomycin are not available in some European countries; [e]Rifampin is believed to play a special role in prosthetic device infection because it helps eradicate bacteria attached to foreign material.[157] The sole use of rifampin is associated with a high frequency of microbial resistance and is not recommended. Rifampin increases the hepatic metabolism of warfarin and other drugs; [f]Renal function and serum gentamicin concentrations should be monitored once/week (twice/week in patients with renal failure); [g]Paediatric doses should not exceed adult doses; [h]Penicillin desensitization can be attempted in stable patients; [i]Class of recommendation; [j]Level of evidence; [k]Reference(s) supporting recommendations.
** No clinical benefit of adding rifampicin or gentamicin

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TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of infective endocarditis due to Enterococcus spp

Antibiotic	Dosage and route	Duration, weeks	Class[g]	Level[h]	Ref.[i]	Comments
Beta-lactam and gentamicin-susceptible strains (for resistant isolates see [a,b,c])						
Amoxicillin* with Gentamicin[d]	200 mg/kg/day i.v. in 4–6 doses 3 mg/kg/day i.v. or i.m. in 1 dose	4–6 2–6**	I I	B B	6,8, 129, 135, 136, 186	6-week therapy recommended for patients with >3 months symptoms or PVE
	Paediatric doses:[e] Ampicillin 300 mg/kg/day i.v. in 4–6 equally divided doses Gentamicin 3 mg/kg/day i.v. or i.m. in 3 equally divided doses					
Ampicillin with Ceftriaxone	200 mg/kg/day i.v. in 4–6 doses 4 g/day i.v. or i.m. in 2 doses	6 6	I I	B B	183–185	This combination is active against *Enterococcus faecalis* strains with and without HLAR, being the combination of choice in patients with HLAR *E. faecalis* endocarditis. This combination is not active against *E. faecium*
	Paediatric doses:[e] Amoxicillin as above Ceftriaxone 100 mg/kg/12 h i.v. or i.m.					
Vancomycin[f] with Gentamicin[d]	30 mg/kg/day i.v. in 2 doses 3 mg/kg/day i.v. or i.m. in 1 dose	6 6	I I	C C		
	Paediatric doses:[e] Vancomycin 40 mg/kg/day i.v. in 2–3 equally divided doses. Gentamicin as above					

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Antibiotic treatment of blood culture – negative infective endocarditis (adapted from Brouqui et al [193])

Pathogens	Proposed therapy[a]	Treatment outcome
Brucella spp.	Doxycycline (200 mg/24 h) plus cotrimoxazole (960 mg/12 h) plus rifampin (300–600/24 h) for ≥3–6 months[b] orally	Treatment success defined as an antibody titre <1:60. Some authors recommend adding gentamicin for the first 3 weeks.
C. burnetii (agent of Q fever)	Doxycycline (200 mg/24 h) plus hydroxychloroquine (200–600 mg/24 h)[c] orally (>18 months of treatment)	Treatment success defined as anti-phase I IgG titre <1:200, and IgA and IgM titres <1:50.
Bartonella spp.[d]	Doxycycline 100 mg/12 h orally for 4 weeks plus gentamicin (3 mg/24 h) i.v. for 2 weeks	Treatment success expected in ≥90%.
Legionella spp.	Levofloxacin (500 mg/12 h) i.v. or orally for ≥6 weeks or clarithromycin (500 mg/12 h) i.v. for 2 weeks, then orally for 4 weeks plus rifampin (300–1200 mg/24 h)	Optimal treatment unknown.
Mycoplasma spp.	Levofloxacin (500 mg/12 h) i.v. or orally for ≥6 months[e]	Optimal treatment unknown.
T. whipplei (agent of Whipple's disease)[f]	Doxycycline (200 mg/24 h) plus hydroxychloroquine (200–600 mg/24 h)[c] orally for ≥18 months	Long-term treatment, optimal duration unknown.

ID = infectious disease; IE = infective endocarditis; Ig = immunoglobulin; i.v. = intravenous; U = units.

[a]Owing to the lack of large series, the optimal duration of treatment of IE due to these pathogens is unknown. The presented durations are based on selected case reports. Consultation with an ID specialist is recommended.

[b]Addition of streptomycin (15 mg/kg/24 h in 2 doses) for the first few weeks is optional.

[c]Doxycycline plus hydroxychloroquine (with monitoring of serum hydroxychloroquine levels) is significantly superior to doxycycline.[194]

[d]Several therapeutic regimens have been reported, including aminopenicillins (ampicillin or amoxicillin, 12 g/24 h i.v.) or cephalosporins (ceftriaxone, 2 g/24 h i.v.) combined with aminoglycosides (gentamicin or netilmicin).[195] Dosages are as for streptococcal and enterococcal IE (*Tables 16* and *18*).[196,197]

[e]Newer fluoroquinolones (levofloxacin, moxifloxacin) are more potent than ciprofloxacin against intracellular pathogens such as *Mycoplasma spp., Legionella spp., and Chlamydia spp.*

[f]Treatment of Whipple's IE remains highly empirical. In the case of central nervous system involvement, sulfadiazine 1.5 g/6 h orally must be added to doxycycline. An alternative therapy is ceftriaxone (2 g/24 h i.v.) for 2–4 weeks or penicillin G (2 million U/4 h) and streptomycin (1 g/24 h) i.v. for 2–4 weeks followed by cotrimoxazole (800 mg/12 h) orally. Trimethoprim is not active against *T. whipplei*. Successes have been reported with long-term therapy (>1 year).

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Proposed antibiotic regimens for initial empirical treatment of infective endocarditis in acute severely ill patients (before pathogen indentification)[a] (1)

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	IIb	C	For penicillin-allergic patients

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TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Proposed antibiotic regimens for initial empirical treatment of infective endocarditis in acute severely ill patients (before pathogen indentification) [a] (2)

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 S. aureus identification

BCNIE = blood culture-negative infective endocarditis; ID = infectious disease; i.m. = intramuscular; i.v. = intravenous; PVE = prosthetic valve endocarditis.
[a]If initial blood cultures are negative and there is no clinical response, consider BCNIE aetiology (see Section 7.10) and maybe surgery for molecular diagnosis and treatment, and extension of the antibiotic spectrum to blood culture-negative pathogens (doxycycline, quinolones) must be considered.
[b]Class of recommendation.
[c]Level of evidence.
[d]Monitoring of gentamicin or vancomycin dosages is as described in *Tables 16* and *17*.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Điều trị VNTMNT do nhóm HACEK

Antibiotic	Dosage and Route†	Duration (wk)
Ceftriaxone‡	2 gm once daily IV or IM	4
Ampicillin/Sulbactam	12 gm/24 hr IV given every 4 hr in six equally divided doses	4

- TL: Karchmer AW. Infective Endocarditis In Braunwald's Heart Disease, ed by Libby, Bonow, Mann, Zipes. Saunders Elsevier 2008, 8th ed, p 1713-1733

Các dấu hiệu siêu âm tim, gợi ý b/n VNTMNT cần phẫu thuật

Vegetation
Persistent vegetation after systemic embolization
Anterior mitral valve leaflet vegetation, particularly if it is highly mobilewith size > 10 mm*
One or more embolic events during the first 2 weeks of antimicrobial therapy*
Increase in vegetation size despite appropriate antimicrobial therapy*†
Valvular Dysfunction
Acute aortic or mitral insufficiency with signs of ventricular failure†
Heart failure unresponsive to medical therapy†
Valve perforation or rupture†
Perivalvular Extension
Valvular dehiscence, rupture, or fistula†
New heart block†‡
Large abscess or extension of abscess despite appropriate antimicrobial therapy†
See text for more complete discussion of indications for surgery based on vegetation characterizations.

TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

Indications and timing of surgery in left sided valve infective endocarditis (native valve endocarditis and prosthetic valve endocarditis) (1)

Indications for surgery	Timing[a]	Class[b]	Level[c]	Ref.[d]
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	111,115, 213,216
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	37,115, 209,216, 220,221

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Indications and timing of surgery in left sided valve infective endocarditis (native valve endocarditis and prosthetic valve endocarditis) (2)

2. Uncontrolled infection				
Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation)	Urgent	I	B	37,209, 216
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	123
PVE caused by staphylococci or non-HACEK gram-negative bacteria	Urgent/ elective	IIa	C	

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Indications and timing of surgery in left sided valve infective endocarditis (native valve endocarditis and prosthetic valve endocarditis) (3)

3. Prevention of embolism				
Aortic or mitral NVE or PVE with persistent vegetation(s) >10 mm after one or more embolic episode despite appropriate antibiotic therapy	Urgent	I	B	9,58,72, 113,222
Aortic or mitral NVE with vegetations >10 mm, associated with severe valve stenosis or regurgitation, and low operative risk	Urgent	IIa	B	9
Aortic or mitral NVE or PVE with isolated very large vegetations (>30 mm)	Urgent	IIa	B	113
Aortic or mitral NVE or PVE with isolated large vegetations (>15 mm) and no other indication for surgery[e]	Urgent	IIb	C	

HACEK = *Haemophilus parainfluenzae, Haemophilus aphrophilus, Haemophilus paraphrophilus, Haemophilus influenzae, Actinobacillus actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens, Kingella kingae* and *Kingella denitrificans*; HF = heart failure; IE = infective endocarditis; NVE = native valve endocarditis; PVE = prosthetic valve endocarditis.
[a]Emergency surgery: surgery performed within 24 h; urgent surgery: within a few days; elective surgery: after at least 1–2 weeks of antibiotic therapy.
[b]Class of recommendation.
[c]Level of evidence.
[d]Reference(s) supporting recommendations.
[e]Surgery may be preferred if a procedure preserving the native valve is feasible.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Management of neurological complications of infective endocarditis (1)

Recommendations	Class[a]	Level[b]	Ref.[c]
After a silent embolism or transient ischaemic attack, cardiac surgery, if indicated, is recommended without delay	I	B	105, 263
Neurosurgery or endovascular therapy is recommended for very large, enlarging or ruptured intracranial infectious aneurysms	I	C	
Following intracranial haemorrhage, surgery should generally be postponed for ≥1 month	IIa	B	264–266

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

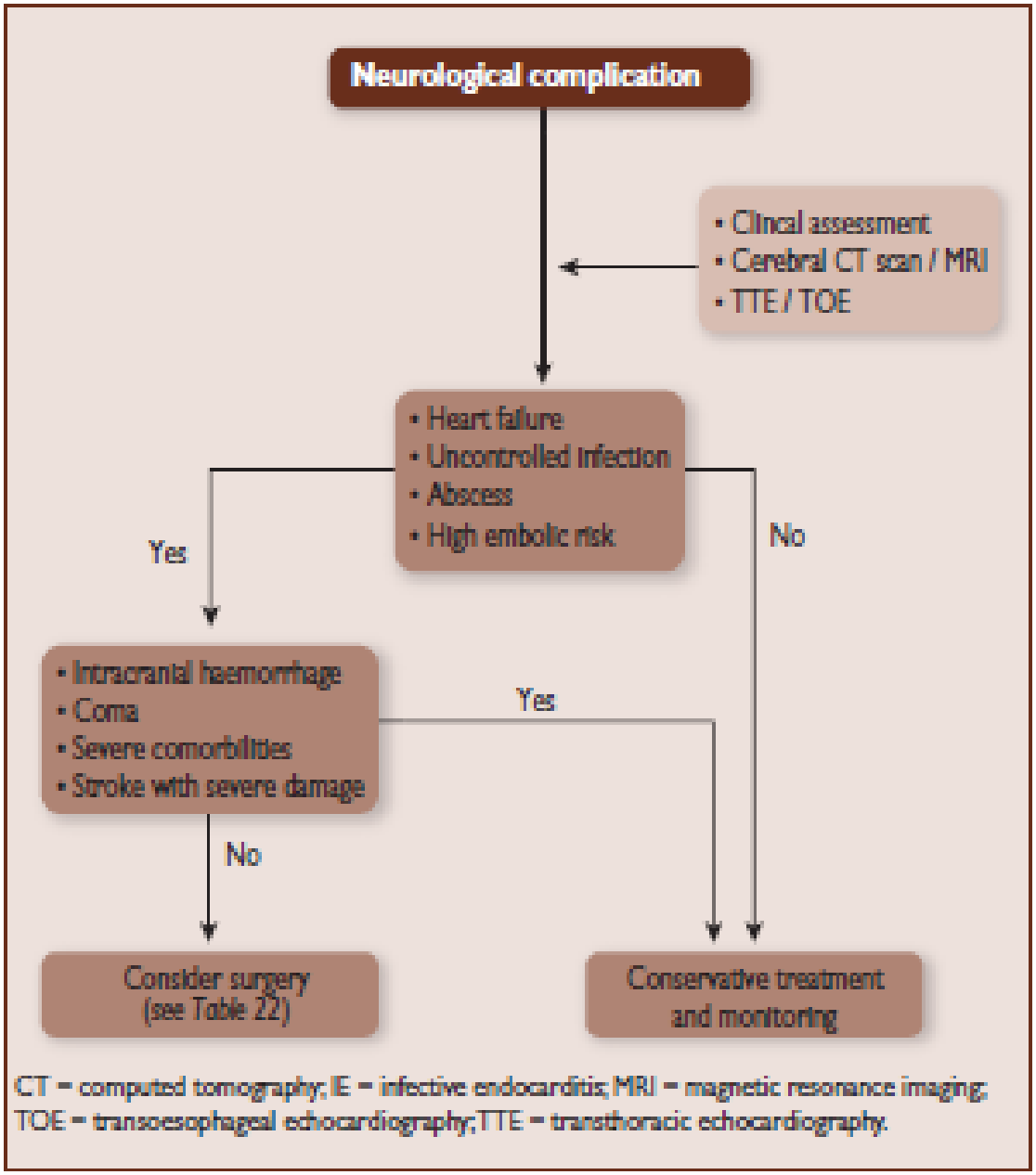
Management of neurological complications of infective endocarditis (2)

After a stroke, surgery indicated for HF, uncontrolled infection, abscess, or persistent high embolic risk should be considered without any delay as long as coma is absent and the presence of cerebral haemorrhage has been excluded by cranial CT or MRI	IIa	B	9,263
Intracranial infectious aneurysms should be looked for in patients with IE and neurological symptoms. CT or MR angiography should be considered for diagnosis. If non-invasive techniques are negative and the suspicion of intracranial aneurysm remains, conventional angiography should be considered	IIa	B	267, 268

CT = computed tomography; HF = heart failure; IE = infective endocarditis; MR = magnetic resonance; MRI = magnetic resonance imaging.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Therapeutic strategies of patients with infective endocarditis and neurological complications



TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Factors associated with an increased rate of relapse

• Inadequate antibiotic treatment (agent, dose, duration)
• Resistant microorganisms, i.e. *Brucella spp.*, *Legionella spp.*, *Chlamydia spp.*, *Mycoplasma spp.*, *Mycobacterium spp.*, *Bartonella spp.*, *Coxiella Burnetii*, *fungi*
• Polymicrobial infection in an IVDA
• Empirical antimicrobial therapy for BCNIE
• Periannular extension
• Prosthetic valve IE
• Persistent metastatic foci of infection (abscesses)
• Resistance to conventional antibiotic regimens
• Positive valve culture
• Persistence of fever at the seventh postoperative day
• Chronic dialysis

BCNIE = blood culture-negative infective endocarditis; IE = infective endocarditis; IVDA = intravenous drug abuser.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Cardiac device related infective endocarditis: diagnosis, treatment and prevention (1)

Recommendations	Class[a]	Level[b]	Ref.[c]
A. Diagnosis			
1. Three or more sets of blood cultures are recommended before prompt initiation of antimicrobial therapy for CIED infection	I	C	
2. Lead-tip culture is indicated when the CIED is explanted	I	C	
3. TOE is recommended in patients with suspected CDRIE with positive or negative blood cultures, independent of the results of TTE, to evaluate lead-related endocarditis and heart valve infection	I	C	
4. Intracardiac echocardiography may be considered in patients with suspected CDRIE, positive blood cultures and negative TTE and TOE results	IIb	C	
5. Radiolabelled leucocyte scintigraphy and ^{18}F-FDG PET/CT scanning may be considered additive tools in patients with suspected CDRIE, positive blood cultures and negative echocardiography	IIb	C	

CIED: cardiovascular Implantable Electronic Device
CDRIE: Cardiac device related infective endocarditis

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Cardiac device related infective endocarditis: diagnosis, treatment and prevention (2)

B. Principles of treatment			
1. Prolonged (i.e. before and after extraction) antibiotic therapy and complete hardware (device and leads) removal are recommended in definite CDRIE, as well as in presumably isolated pocket infection	I	C	
2. Complete hardware removal should be considered on the basis of occult infection without another apparent source of infection	IIa	C	
3. In patients with NVE or PVE and an intracardiac device with no evidence of associated device infection, complete hardware extraction may be considered	IIb	C	
C. Mode of device removal			
1. Percutaneous extraction is recommended in most patients with CDRIE, even those with vegetations >10 mm	I	B	382, 391, 405

Continued

CIED: cardiovascular Implantable Electronic Device
CDRIE: Cardiac device related infective endocarditis

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Cardiac device related infective endocarditis: diagnosis, treatment and prevention (3)

Recommendations	Class[a]	Level[b]	Ref.[c]
2. Surgical extraction should be considered if percutaneous extraction is incomplete or impossible or when there is associated severe destructive tricuspid IE	IIa	C	
3. Surgical extraction may be considered in patients with large vegetations (>20 mm)	IIb	C	
D. Reimplantation			
1. After device extraction, reassessment of the need for reimplantation is recommended	I	C	
2. When indicated, definite reimplantation should be postponed if possible, to allow a few days or weeks of antibiotic therapy	IIa	C	
3. A 'temporary' ipsilateral active fixation strategy may be considered in pacemaker-dependent patients requiring appropriate antibiotic treatment before reimplantation	IIb	C	
4. Temporary pacing is not routinely recommended	III	C	

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Pham Nguyen Vinh

Cardiac device related infective endocarditis: diagnosis, treatment and prevention (4)

E. Prophylaxis			
1. Routine antibiotic prophylaxis is recommended before device implantation	I	B	367, 368, 373
2. Potential sources of sepsis should be eliminated ≥2 weeks before implantation of an intravascular/ cardiac foreign material, except in urgent procedures	IIa	C	

CDRIE = cardiac device-related infective endocarditis; CIED = cardiac implantable electronic device; FDG = fluorodeoxyglucose; IE = infective endocarditis; NVE = native valve endocarditis; PET = positron emission tomography; PVE = prosthetic valve endocarditis; TOE = transoesophageal echocardiography; TTE = transthoracic echocardiography.

[a]Class of recommendation.

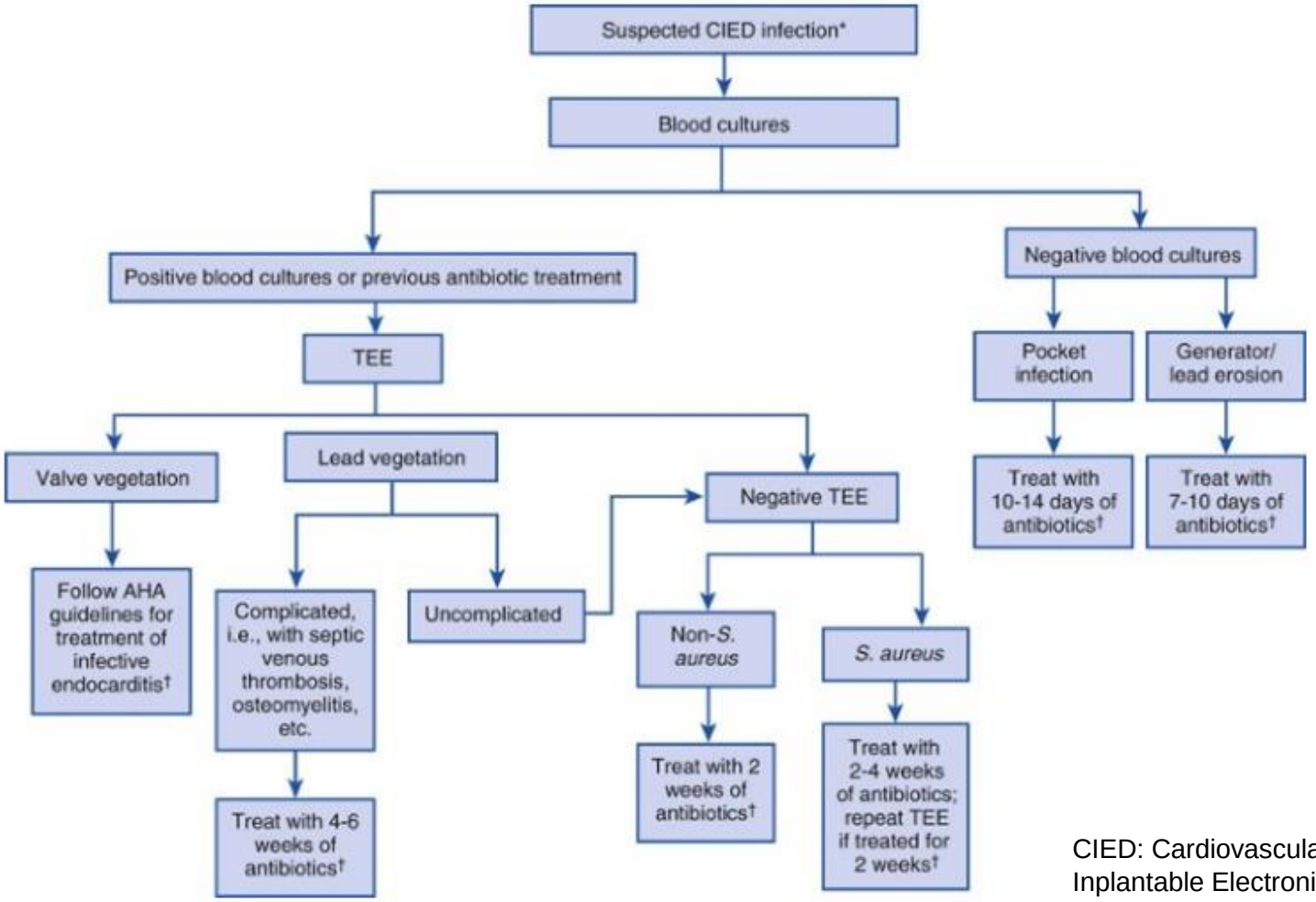
[b]Level of evidence.

[c]Reference(s) supporting recommendations.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Pham Nguyen Vinh

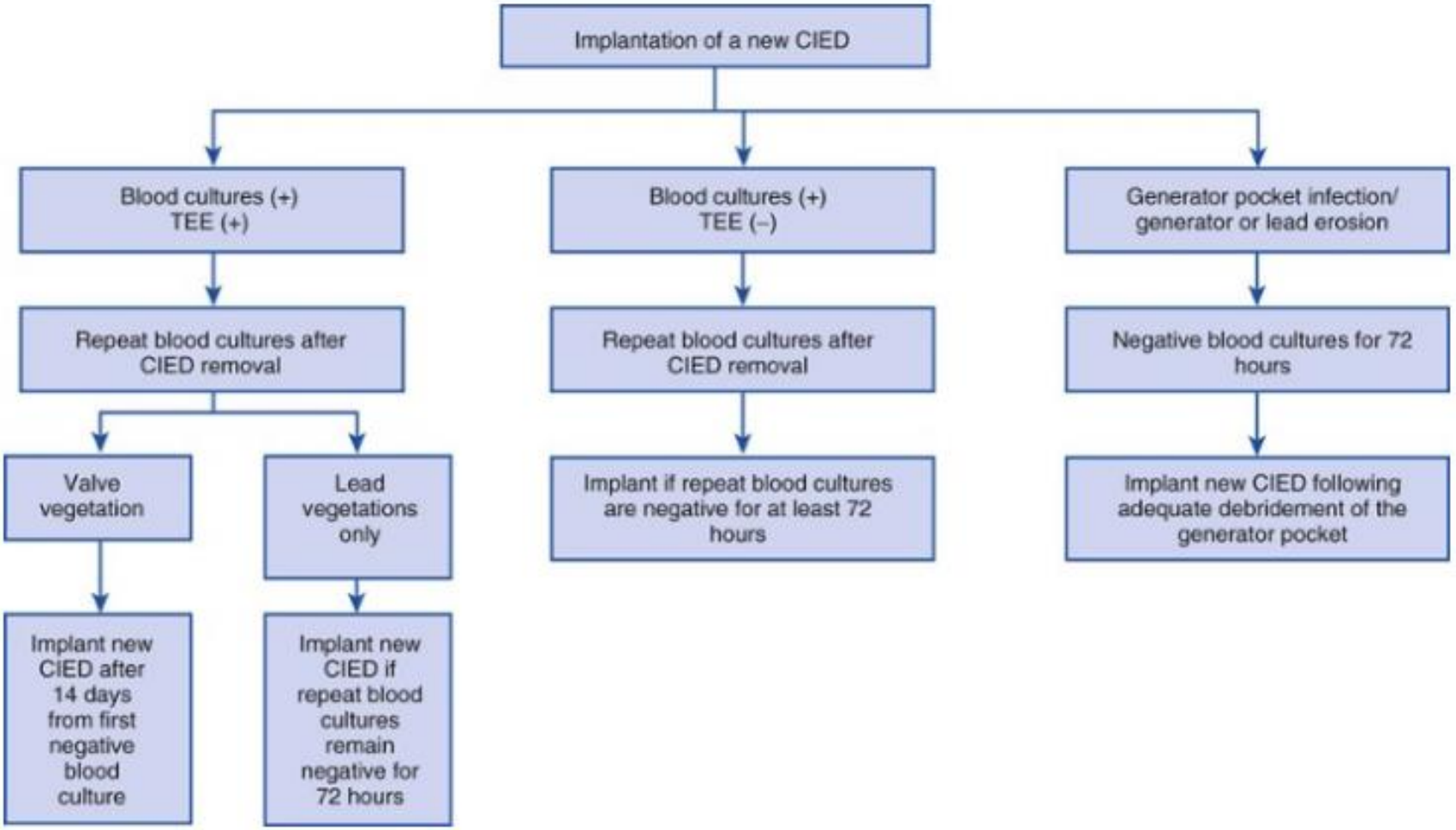
Tiếp cận điều trị bệnh nhân người lớn bị nhiễm CIED



CIED: Cardiovascular Inplantable Electronic Device

TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

Tiếp cận cấy dụng cụ mới sau gỡ bỏ CIED nhiễm trùng



TL: Baddour LM et al. Braunwald's Heart Disease 2015, 10th ed, Elsevier, p. 1524-1543

Indications for surgical treatment of right sided infective endocarditis

Recommendation	Class[a]	Level[b]
Surgical treatment should be considered in the following scenarios: • Microorganisms difficult to eradicate (e.g. persistent fungi) or bacteraemia for > 7 days (e.g. *S. aureus*, *P. aeruginosa*) despite adequate antimicrobial therapy or • Persistent tricuspid valve vegetations > 20 mm after recurrent pulmonary emboli with or without concomitant right heart failure or • Right HF secondary to severe tricuspid regurgitation with poor response to diuretic therapy	IIa	C

HF = heart failure.
[a]Class of recommendation.
[b]Level of evidence.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Recommendations for the use of antithrombotic therapy (1)

Recommendations	Class[a]	Level[b]	Ref.[c]
Interruption of antiplatelet therapy is recommended in the presence of major bleeding	I	B	257
In intracranial haemorrhage, interruption of all anticoagulation is recommended	I	C	
In ischaemic stroke without haemorrhage, replacement of oral anticoagulant (anti-vitamin K) therapy by unfractionated or low molecular weight heparin for 1–2 weeks should be considered under close monitoring[d]	IIa	C	

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Recommendations for the use of antithrombotic therapy (2)

In patients with intracranial haemorrhage and a mechanical valve, unfractionated or low molecular weight heparin should be reinitiated as soon as possible following multidisciplinary discussion	IIa	C	
In the absence of stroke, replacement of oral anticoagulant therapy by unfractionated or low molecular weight heparin for 1–2 weeks should be considered in the case of *Staphylococcus aureus* IE under close monitoring	IIa	C	
Thrombolytic therapy is not recommended in patients with IE	III	C	

IE = infective endocarditis.
[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.
[d]There is very limited experience with new oral anticoagulant treatment in the field of IE.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Recommendations for the use of antithrombotic therapy (3)

Recommendations	Class[a]	Level[b]
1. Prophylaxis/prevention		
Antibiotic prophylaxis should be considered for patients at highest risk for IE a. Patients with any prosthetic valve, including transcatheter valve, or those in whom any prosthetic material was used for cardiac valve repair b. Patients with a previous episode of IE c. Patients with congenital heart disease (i.e. any type of cyanotic congenital heart disease or any type of congenital heart disease repaired with a prosthetic material)	IIa	C
Antibiotic prophylaxis is not recommended in other forms of valvular or congenital heart disease	III	C

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Recommendations for the use of antithrombotic therapy (4)

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
Other procedures		
Antibiotic prophylaxis is not recommended for respiratory tract procedures, including bronchoscopy or laryngoscopy, transnasal or endotracheal intubation, gastroscopy, colonoscopy, cystoscopy, vaginal or caesarean delivery, TOE or skin and soft tissue procedures	III	C

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Cheá ñoä phoøng ngöøa VNTMNT treân beänh nhaân coù laøm thuû thuaät ôû raêng, mieäng vaø ñöôøng hoâ haáp treân

Setting	Regimen Administered 30-60 Min before Procedure*
Standard regimen†	Amoxicillin 2.0 gm PO
Amoxicillin/penicillin-allergic patients	Cephalixin 2 gm PO† *or* Azithromycin or clarithromycin 500 mg PO *or* Clindamycin 600 mg PO
Patients unable to take oral medications	Ampicillin 2.0 gm IM or IV *or* Cefazolin or ceftriaxone 1 gm IV†
Ampicillin/amoxicillin/penicillin-allergic patients unable to take oral medications	Clindamycin 300 mg IV 30 min before procedure, then 150 mg 6 hr after initial dose

- Wilson W et al. Recommendations of the American Heart Association 2007

Các trường hợp bệnh có nguy cơ cao VNTMNT cần phòng ngừa bệnh khi làm thủ thuật về răng/ khuyến cáo AHA 2007

- Proschetic cardiac valve
- Previous infectve endocarditis
- Congenital heart disease
- Unrepaired cyanotic congenital heart disease, including those with paliative shunts and conduits
- Completely repaired congenital heart disease with prosthetic material or device either by surgery or catheter intervention during the first 6 months after the procedure
- Repaired congenital heart disease with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)
- Cardiac transplantation recipients who develop cardiac valvulopathy

Wilson W et al. Recommendations of the American Heart Association 2007

Tiên lượng

- Yếu tố tiên lượng xấu:
  - Tác nhân gây bệnh không phải là Streptococci
  - Xuất hiện suy tim
  - Tổn thương van ĐMC
  - Van nhân tạo
  - Tuổi già
  - Có áp xe cơ tim hay vòng van
- VNTMNT do Staphylococcus aureus trên người không nghiên ma tuý # 40% tử vong
- Mảnh sùi lớn: tiên lượng xấu
- VNTMNT sớm/van nhân tạo xấu hơn
- VNTMNT chậm/van nhân tạo

Predictors of poor outcome in patients with infective endocarditis (1)

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

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Predictors of poor outcome in patients with infective endocarditis (2)

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

HACEK = Haemophilus parainfluenzae, H. aphrophilus, H. paraphrophilus, H. influenzae, Actinobacillus actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens, Kingella kingae, and K. denitrificans; IE = infective endocarditis.

TL: Habib G et al. Eur. H. J 2015. doi/10.1093/eurheartf/ ehv 319

Đặc điểm về chẩn đoán và điều trị VNTMNT/người cao tuổi

- Triệu chứng cơ năng và thực thể không rầm rộ, khó phát hiện do có bệnh nội khoa kèm theo (TD: Phế khí thũng, bệnh phổi mạn tắc nghẽn…)
- Cấy máu sớm và SAT qua thành ngực, nhất là SATQTQ rất cần thiết
- Trắc nghiệm PCR trên DNA của vi trùng cần thiết/ một số trường hợp
- Sử dụng thuốc theo phác đồ không khác người trẻ: chỉnh liều theo độ lọc cầu thận và chức năng gan
- Theo dõi sát các biến chứng bằng lâm sàng và siêu âm tim