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# VAI TRÒ CỦA CT TRONG VIÊM NỘI TÂM MẠC NHIỄM TRÙNG
# (Role of CT In Infective Endocarditis)

**BS CK II. NGUYỄN XUÂN TRÌNH**

**Khoa Tim mạch- Trung Tâm Chẩn đoán Y Khoa MEDIC**

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# Introduction

- Infective endocarditis (IE) is a major public health challenge.
- Diagnosis and management of infective endocarditis (IE) remains challenging, especially in patients with suspected prosthetic valve endocarditis.
- The estimated incidence of endocarditis is >1 million patients per year worldwide and accounted for approximately 66,300 deaths worldwide.
- Due to the associated high morbidity (1723.59 disability-adjusted life years) and mortality ( 0.87 death cases/100 000 population).

Victoria Delgado et al(2023). 2023 ESC Guidelines for the management of endocarditis. Developed by the task force on the management of endocarditis of the European Society of Cardiology (ESC) Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS) and the European Association of Nuclear Medicine (EANM). European Heart Journal .44, 3948–4042

Eefje M. Dalebout et al( 2024). Computed Tomography in Infectious Endocarditis. Journal of the Society for Cardiovascular Angiography & Interventions 3 . 101292

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# Introduction

→ identification of the best preventive strategies has been the focus of research.

- The incidence rate for endocarditis has increased over the past decades which is related to the increasing number of patients with implanted prosthetic valves and/or cardiac devices

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# Introduction

- Currently, the modified Duke criteria are used for diagnosis, consisting of 2 major and 5 minor diagnostic criteria.
- The 2 major criteria for diagnosis comprise positive blood cultures consistent with IE and signs of IE shown on imaging.
- Thus, imaging is one of the cornerstones of diagnosing IE.

Eefje M. Dalebout et al( 2024). Computed Tomography in Infectious Endocarditis. Journal of the Society for Cardiovascular Angiography & Interventions 3 . 101292

# Imaging Techniques

- Echocardiography is the first-line imaging technique to diagnose IE and to assess the structural and functional damage of cardiac structures.
- However, in the diagnosis of prosthetic valve endocarditis, the accuracy of echocardiography is diminished due to prosthetic shadowing.
- Echocardiographic findings have prognostic implications, and help to guide decision-making and patient follow-up while receiving antibiotic therapy and during the peri-operative and post-operative periods.

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Eefje M. Dalebout et al( 2024). Computed Tomography in Infectious Endocarditis. Journal of the Society for Cardiovascular Angiography & Interventions 3 . 101292

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# Imaging Techniques

- Over the past years, CT has become increasingly important in the diagnosis and management of IE and is currently recommended to be used in both native and prosthetic valve endocarditis.
- CT, nuclear imaging, and MRI, are needed to confirm or exclude the diagnosis of IE, to characterize the extent of the cardiac lesions, and to diagnose extracardiac complications.
- Role of CT is supported by several guidelines and recommendations.

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# Computed tomography

- The role of CT has recently been emphasized in the new 2023 European Society of Cardiology guidelines for the management of endocarditis with a class I recommendation for detecting valvular lesions in case of possible endocarditis and to detect paravalvular and periprosthetic complications in case of inconclusive echocardiography and when symptoms suggest extracardiac complications for suspected or definite native as well as prosthetic valve endocarditis .
- In case of suspected prosthetic valve endocarditis, CT has an important role, not only for evaluation of possible complications, but also because the diagnostic accuracy of echocardiography is limited.

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ESC European Society of Cardiology
European Heart Journal - Cardiovascular Imaging (2018) **19**, 199–207
doi:10.1093/ehjci/jex010

## Demonstration of infective endocarditis by cardiac CT and transoesophageal echocardiography: comparison with intra-operative findings

**Hyun Jung Koo[1], Dong Hyun Yang[1]*, Joon-Won Kang[1], Joo Yeon Lee[1], Dae-Hee Kim[2], Jong-Min Song[2], Duk-Hyun Kang[2], Jae-Kwan Song[2], Joon Bum Kim[3], Sung-Ho Jung[3], Suk Jung Choo[3], Cheol Hyun Chung[3], Jae-Won Lee[3], and Tae-Hwan Lim[1]**

(1) Vegetation: an irregular-shaped soft tissue lesion that is attached to valves or paravalvular structures and distinct from the endocardium; found in more than two different dimensional views (*Figure 1*).

(2) Leaflet perforation: discontinuity of the leaflet of the valve; found in two different dimensional views (*Figure 2*).

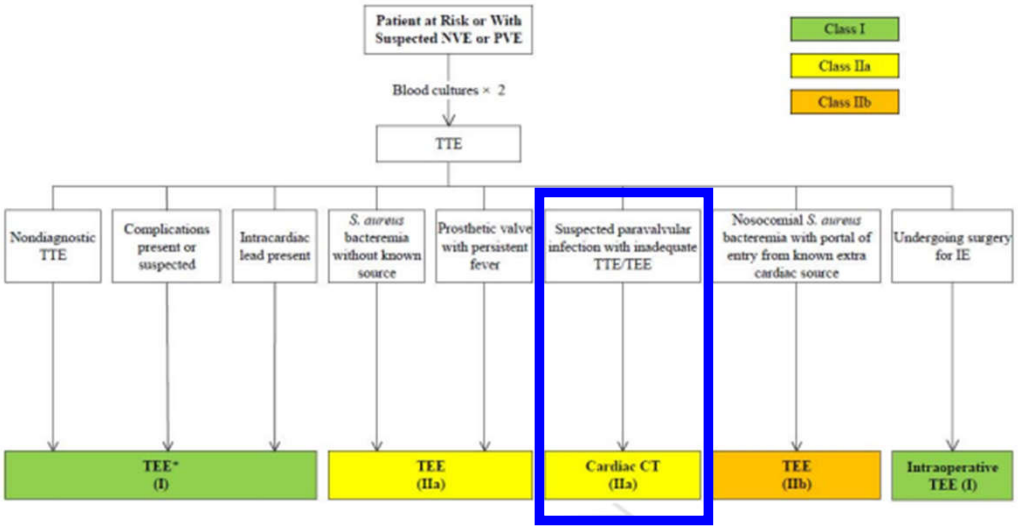
(3) Abscess: perivalvular fluid collection showing 0–40 HU with a layer of thickened inflammatory enhancing tissue or irregular inhomogeneous paravalvular areas surrounding the fluid.[6,15]

(4) Pseudoaneurysm: a space filled with contrast or blood that has communication with cardiac chambers or the aortic root; located near the paravalvular or periannular region, possibly extending to the myocardium or pericardium.[15]

(5) Paravalvular leakage: tearing of any part of the stitch site that has formed a hole connecting two different chambers and shows rocking motion of the involved prosthetic valve of > 15° on echocardiography or cine CT images.

Hyun Jung Koo et al. Demonstration of infective endocarditis by cardiac CT and transoesophageal echocardiography: comparison with intra-operative findings.European Heart Journal. Cardiovascular Imaging (2016) 19.199-207.

**Nishimura, RA et al.**
**2014 AHA/ACC Valvular Heart Disease Guideline**




| Recommendations for Diagnosis of IE (Continued) | | |
|---|---|---|
| **COR** | **LOE** | **Recommendations** |
| 2a | B-NR | 10. In patients with *Staphylococcus aureus* bacteremia without a known source, TEE is reasonable to diagnose possible IE.[11,36,52–56] |
| 2a | B-NR | 11. In patients with a prosthetic valve in the presence of persistent fever without bacteremia or a new murmur, a TEE is reasonable to aid in the diagnosis of IE.[57–60] |
| 2a | B-NR | 12. In patients in whom the anatomy cannot be clearly delineated by echocardiography in the setting of suspected paravalvular infections, CT imaging is reasonable.[37,61–68] |
| 2a | B-NR | 13. In patients classified by Modified Duke Criteria as having "possible IE," $^{18}$F-fluorodeoxyglucose PET/CT is reasonable as adjunct diagnostic imaging.[69–71] |
| 2b | B-NR | 14. In patients with nosocomial *S. aureus* bacteremia with a known portal of entry from an extracardiac source, TEE might be considered to detect concomitant staphylococcal IE.[22,53,54,72–74] |

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# New recommendations ESC 2023

**Recommendation Table 6 — Recommendations for the role of computed tomography, nuclear imaging, and magnetic resonance in infective endocarditis**

| Recommendations | Class[a] | Level[b] |
|---|---|---|
| Cardiac CTA is recommended in patients with possible NVE to detect valvular lesions and confirm the diagnosis of IE.[33,168,169] | I | B |
| [18F]FDG-PET/CT(A) and cardiac CTA are recommended in possible PVE to detect valvular lesions and confirm the diagnosis of IE.[22,129,209,210,237–239] | I | B |
| Cardiac CTA is recommended in NVE and PVE to diagnose paravalvular or periprosthetic complications if echocardiography is inconclusive.[20,168,169,185,186] | I | B |
| Brain and whole-body imaging (CT, [18F]FDG-PET/CT, and/or MRI) are recommended in symptomatic[c] patients with NVE and PVE to detect peripheral lesions or add minor diagnostic criteria.[22,197–200,210,213,240,241] | I | B |
| WBC SPECT/CT should be considered in patients with high clinical suspicion of PVE when echocardiography is negative or inconclusive and when PET/CT is unavailable.[213–216] | IIa | C |
| [18F]FDG-PET/CT(A) may be considered in possible CIED-related IE to confirm the diagnosis of IE.[22,129,209,210,237,238] | IIb | B |
| Brain and whole-body imaging (CT, [18F]FDG-PET/CT, and MRI) in NVE and PVE may be considered for screening of peripheral lesions in asymptomatic patients.[188,197–201] | IIb | B |

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# New Recommendations ESC 2023

| Section 10. Recommendation Table 16 — Recommendations for pre-operative coronary anatomy assessment in patients requiring surgery for infective endocarditis | | |
|---|---|---|
| In haemodynamically stable patients with aortic valve vegetations who require cardiac surgery and are high risk of CAD, a high-resolution multislice coronary CTA is recommended. | I | B |
| Invasive coronary angiography is recommended in patients requiring heart surgery who are high risk of CAD, in the absence of aortic valve vegetations. | I | C |
| In emergency situations, valvular surgery without pre-operative coronary anatomy assessment regardless of CAD risk should be considered. | IIa | C |
| Invasive coronary angiography may be considered despite the presence of aortic valve vegetations in selected patients with known CAD or at high risk of significant obstructive CAD. | IIb | C |

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**Table 10** **Definitions of the 2023 European Society of Cardiology modified diagnostic criteria of infective endocarditis**

| **Major criteria** |
|---|
| **(i) Blood cultures positive for IE** |
| (a) Typical microorganisms consistent with IE from two separate blood cultures:<br>Oral streptococci, *Streptococcus gallolyticus* (formerly *S. bovis*), HACEK group, *S. aureus*, *E. faecalis* |
| (b) Microorganisms consistent with IE from continuously positive blood cultures:<br>• ≥2 positive blood cultures of blood samples drawn >12 h apart.<br>• All of 3 or a majority of ≥4 separate cultures of blood (with first and last samples drawn ≥1 h apart). |
| (c) Single positive blood culture for *C. burnetii* or phase I IgG antibody titre >1:800. |
| **(ii) Imaging positive for IE:** |
| Valvular, perivalvular/periprosthetic and foreign material anatomic and metabolic lesions characteristic of IE detected by any of the following imaging techniques:<br>• Echocardiography (TTE and TOE).<br>• Cardiac CT.<br>• [18F]-FDG-PET/CT(A).<br>• WBC SPECT/CT. |

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**Minor criteria**

**(i) Predisposing conditions (i.e. predisposing heart condition at high or intermediate risk of IE or PWIDs)**[a]

**(ii) Fever defined as temperature >38°C**

**(iii) Embolic vascular dissemination (including those asymptomatic detected by imaging only):**

- Major systemic and pulmonary emboli/infarcts and abscesses.
- Haematogenous osteoarticular septic complications (i.e. spondylodiscitis).
- Mycotic aneurysms.
- Intracranial ischaemic/haemorrhagic lesions.
- Conjunctival haemorrhages.
- Janeway's lesions.

**(IV) Immunological phenomena:**

- Glomerulonephritis.
- Osler nodes and Roth spots.
- Rheumatoid factor.

**(V) Microbiological evidence:**

- Positive blood culture but does not meet a major criterion as noted above.
- Serological evidence of active infection with organism consistent with IE.

**IE Classification (at admission and during follow-up)**

***Definite:***

- 2 major criteria.
- 1 major criterion and at least 3 minor criteria.
- 5 minor criteria.

***Possible:***

- 1 major criterion and 1 or 2 minor criteria.
- 3–4 minor criteria.

***Rejected:***

- Does not meet criteria for definite or possible at admission with or without a firm alternative diagnosis.

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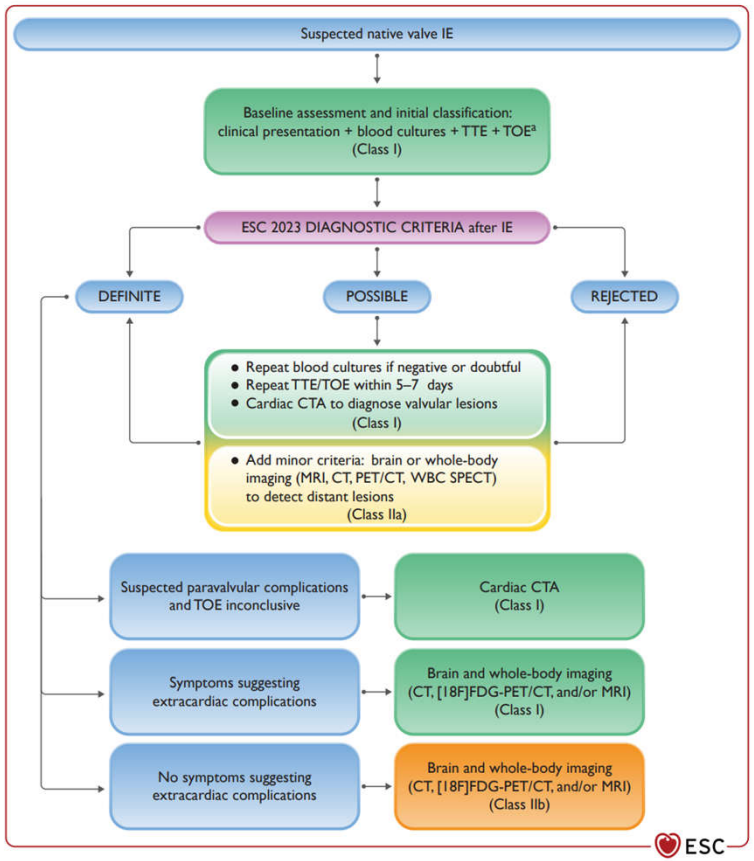


**Figure 5** European Society of Cardiology 2023 algorithm for diagnosis of native valve infective endocarditis. [18F]FDG, $^{18}$F-fluorodeoxyglucose; CT, computed tomography; CTA, computed tomography angiography; ESC, European Society of Cardiology; IE, infective endocarditis; MRI, magnetic resonance imaging; NVE, native valve endocarditis; PET, photon emission tomography; TOE, transoesophageal echocardiography; TTE, transthoracic echocardiography; WBC SPECT, white blood cell single photon emission tomography. [a]TOE for diagnosis and to detect perivalvular complications in all cases (unless right-sided NVE when TTE is good quality and conclusive).

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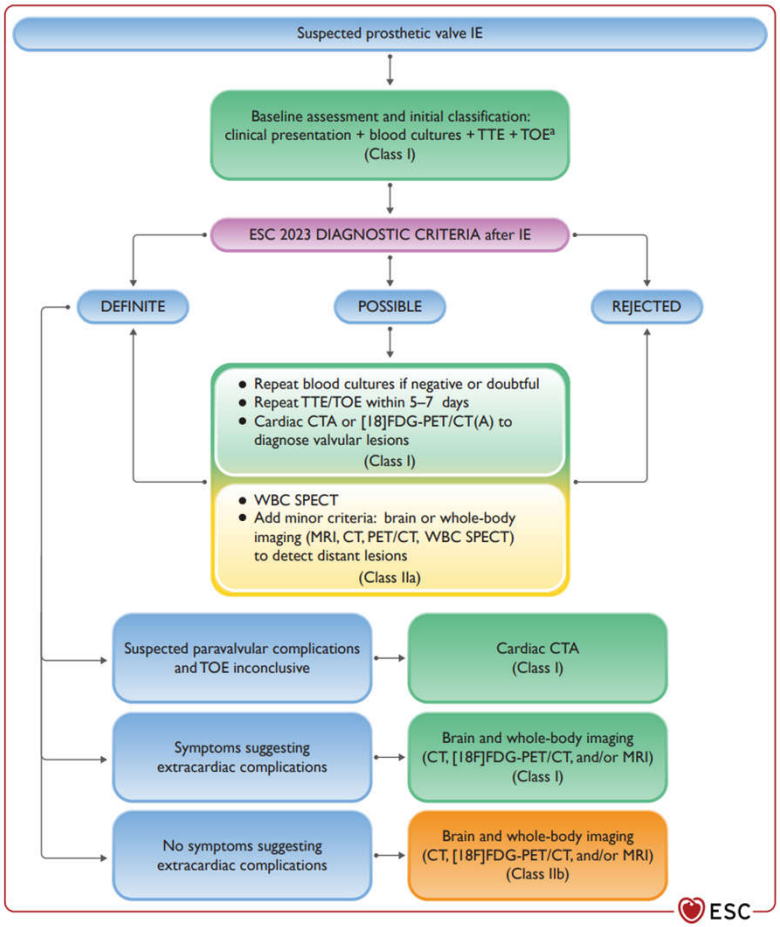


**Figure 6** European Society of Cardiology 2023 algorithm for diagnosis of prosthetic valve infective endocarditis. [18F]FDG, $^{18}$F-fluorodeoxyglucose; CT, computed tomography; CTA, computed tomography angiography; ESC, European Society of Cardiology; IE, infective endocarditis; MRI, magnetic resonance imaging; PET, positron emission tomography; TOE, transoesophageal echocardiography; TTE, transthoracic echocardiography; WBC SPECT, white blood cell single photon emission tomography. [a]TOE for diagnosis and to detect perivalvular complications in all cases (unless right-sided NVE when TTE is good quality and conclusive).

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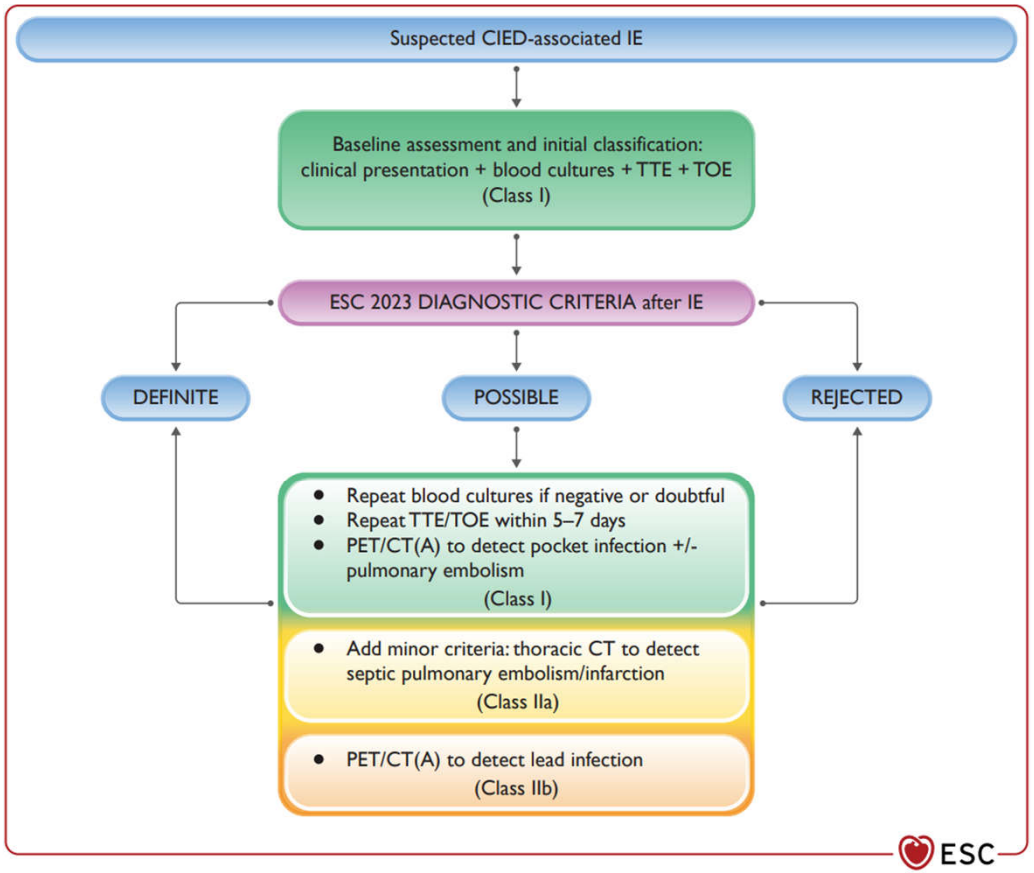


**Figure 7** European Society of Cardiology 2023 algorithm for diagnosis of cardiac device-related infective endocarditis. CIED, cardiovascular implanted electronic device; CT, computed tomography; CTA, computed tomography angiography; ESC, European Society of Cardiology; IE, infective endocarditis; PET, positron emission tomography; TOE, transoesophageal echocardiography; TTE, transthoracic echocardiography; WBC SPECT, white blood cell single

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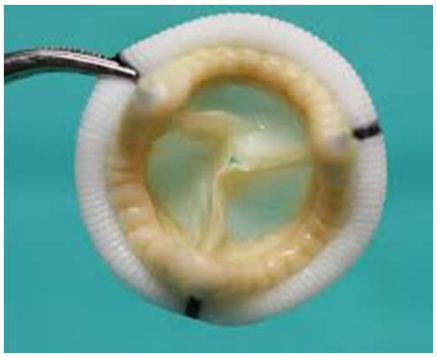
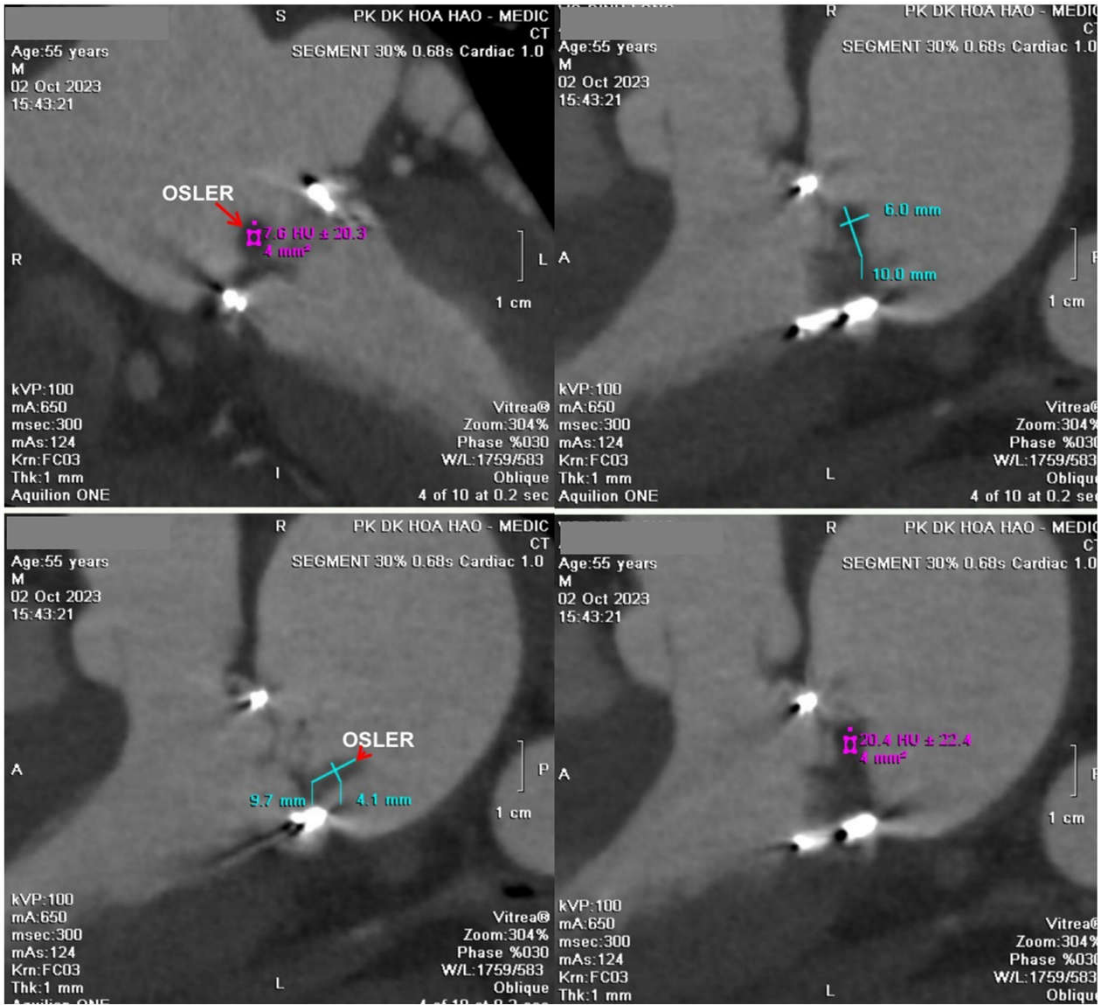
# NỐT SÙI VÀ ÁP XE CẠNH VAN- THAY VAN 2 LÁ SINH HỌC / MSCT tim

-55M
- Tiền căn : ĐTĐ 2, VNTMNT( 2020)- Thay van 2 lá sinh học 2020
-Vào viện với bệnh cảnh lâm sàng: VNMNT do Staphylococus Aureus- Van 2 lá sinh học(2020), Áp xe vòng van 2 lá, BAV II, Nhồi máu não bán cấp ổ nhỏ.





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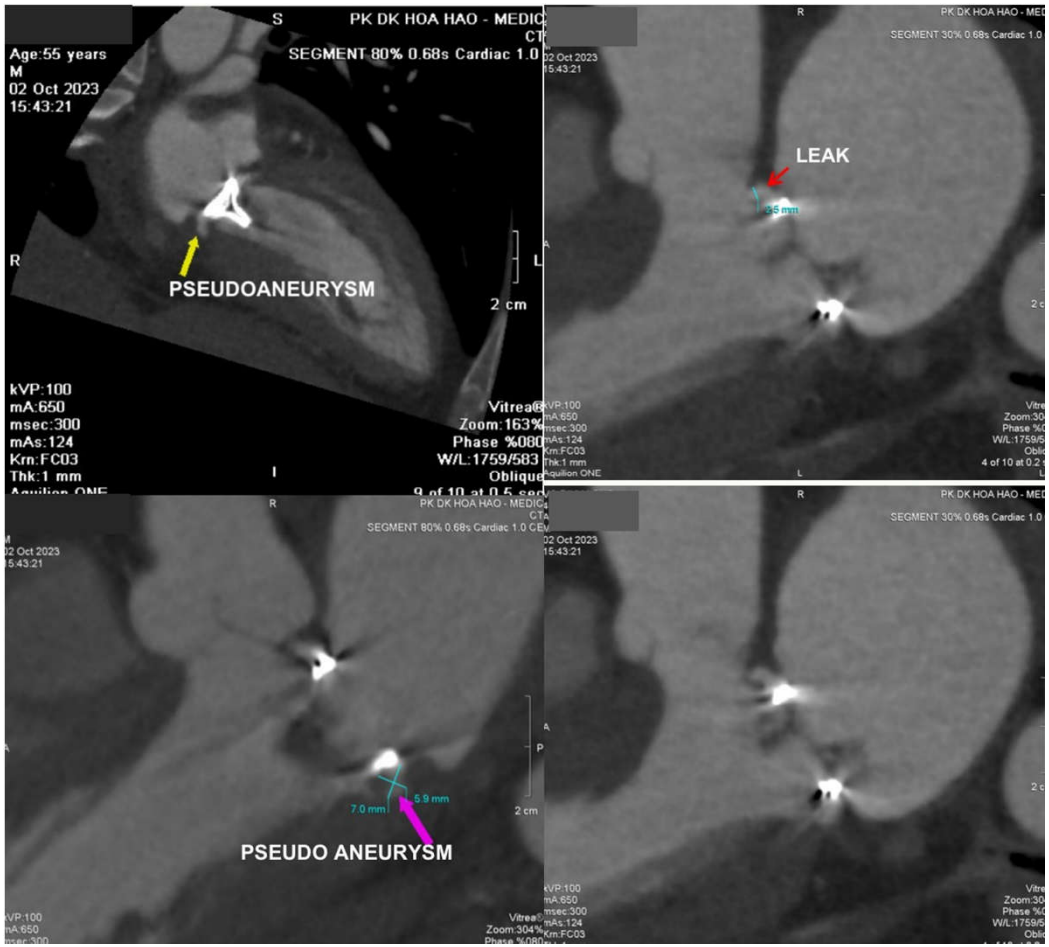

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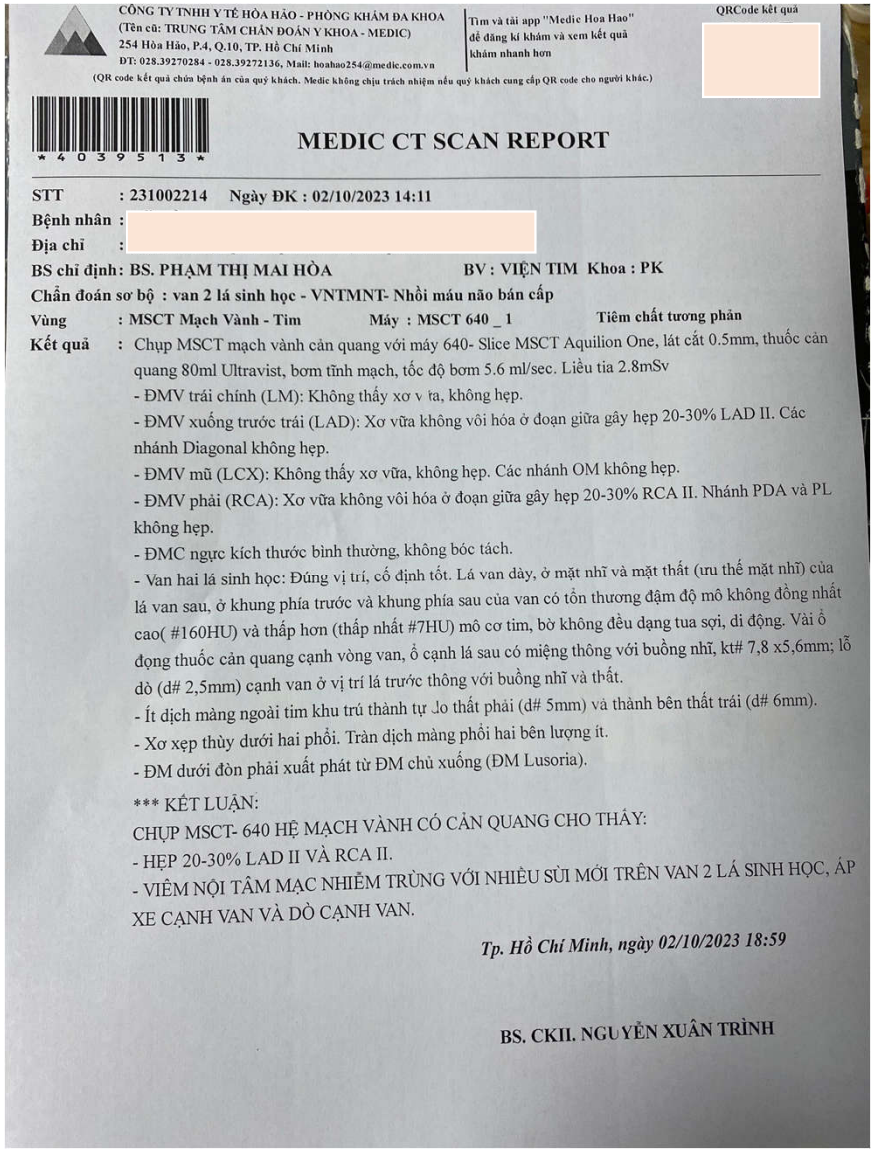
# KẾT QUẢ CT TIM



CÔNG TY TNHH Y TẾ HÒA HẢO - PHÒNG KHÁM ĐA KHOA
(Tên cũ: TRUNG TÂM CHẨN ĐOÁN Y KHOA - MEDIC)
254 Hòa Hảo, P.4, Q.10, TP. Hồ Chí Minh
ĐT: 028.39270284 - 028.39272136, Mail: hoahao254@medic.com.vn
(QR code kết quả chứa bệnh án của quý khách. Medic không chịu trách nhiệm nếu quý khách cung cấp QR code cho người khác.)

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QRCode kết quả

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## MEDIC CT SCAN REPORT

**STT** : 231002214 **Ngày ĐK : 02/10/2023 14:11**
**Bệnh nhân** :
**Địa chỉ** :
**BS chỉ định: BS. PHẠM THỊ MAI HÒA** **BV : VIỆN TIM Khoa : PK**
**Chẩn đoán sơ bộ : van 2 lá sinh học - VNTMNT- Nhồi máu não bán cấp**
**Vùng : MSCT Mạch Vành - Tim** **Máy : MSCT 640 _ 1** **Tiêm chất tương phản**
**Kết quả** :

Chụp MSCT mạch vành cản quang với máy 640- Slice MSCT Aquilion One, lát cắt 0.5mm, thuốc cản quang 80ml Ultravist, bơm tĩnh mạch, tốc độ bơm 5.6 ml/sec. Liều tia 2.8mSv

- ĐMV trái chính (LM): Không thấy xơ vữa, không hẹp.
- ĐMV xuống trước trái (LAD): Xơ vữa không vôi hóa ở đoạn giữa gây hẹp 20-30% LAD II. Các nhánh Diagonal không hẹp.
- ĐMV mũ (LCX): Không thấy xơ vữa, không hẹp. Các nhánh OM không hẹp.
- ĐMV phải (RCA): Xơ vữa không vôi hóa ở đoạn giữa gây hẹp 20-30% RCA II. Nhánh PDA và PL không hẹp.
- ĐMC ngực kích thước bình thường, không bóc tách.
- Van hai lá sinh học: Đúng vị trí, cố định tốt. Lá van dày, ở mặt nhĩ và mặt thất (ưu thế mặt nhĩ) của lá van sau, ở khung phía trước và khung phía sau của van có tổn thương đậm độ mô không đồng nhất cao( #160HU) và thấp hơn (thấp nhất #7HU) mô cơ tim, bờ không đều dạng tua sợi, di động. Vài ổ đọng thuốc cản quang cạnh vòng van, ổ cạnh lá sau có miệng thông với buồng nhĩ, kt# 7,8 x5,6mm; lỗ dò (d# 2,5mm) cạnh van ở vị trí lá trước thông với buồng nhĩ và thất.
- Ít dịch màng ngoài tim khu trú thành tự do thất phải (d# 5mm) và thành bên thất trái (d# 6mm).
- Xơ xẹp thùy dưới hai phổi. Tràn dịch màng phổi hai bên lượng ít.
- ĐM dưới đòn phải xuất phát từ ĐM chủ xuống (ĐM Lusoria).

*** KẾT LUẬN:
CHỤP MSCT- 640 HỆ MẠCH VÀNH CÓ CẢN QUANG CHO THẤY:
- HẸP 20-30% LAD II VÀ RCA II.
- VIÊM NỘI TÂM MẠC NHIỄM TRÙNG VỚI NHIỀU SÙI MỚI TRÊN VAN 2 LÁ SINH HỌC, ÁP XE CẠNH VAN VÀ DÒ CẠNH VAN.

*Tp. Hồ Chí Minh, ngày 02/10/2023 18:59*

**BS. CKII. NGUYỄN XUÂN TRÌNH**

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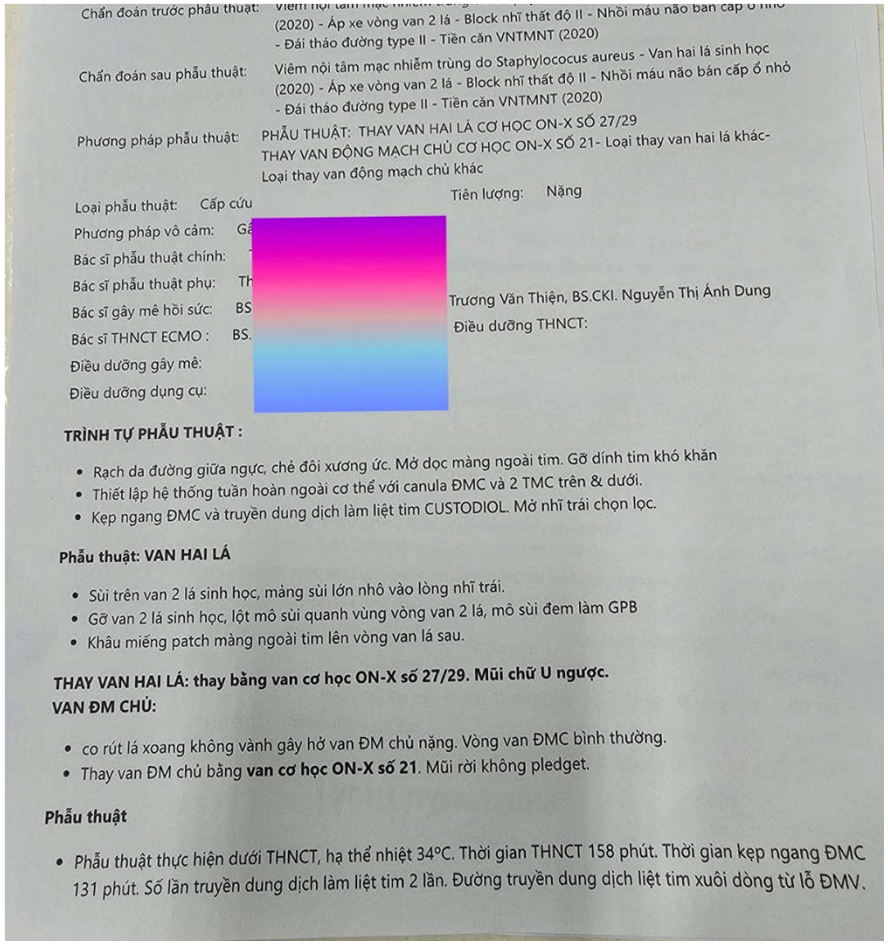
# KẾT QUẢ PHẪU THUẬT TIM LẦN 1

-55M
- Tiền căn : ĐTĐ 2, VNTMNT( 2020)- Thay van 2 lá sinh học 2020
-Vào viện với bệnh cảnh lâm sàng: VNMNT do Staphylococus Aureus- Van 2 lá sinh học(2020), Áp xe vòng van 2 lá, BAV II, Nhồi máu não bán cấp ổ nhỏ.



Chẩn đoán trước phẫu thuật: (2020) - Áp xe vòng van 2 lá - Block nhĩ thất độ II - Nhồi máu não bán cấp ổ nhỏ - Đái tháo đường type II - Tiền căn VNTMNT (2020)

Chẩn đoán sau phẫu thuật: Viêm nội tâm mạc nhiễm trùng do Staphylococus aureus - Van hai lá sinh học (2020) - Áp xe vòng van 2 lá - Block nhĩ thất độ II - Nhồi máu não bán cấp ổ nhỏ - Đái tháo đường type II - Tiền căn VNTMNT (2020)

Phương pháp phẫu thuật: PHẪU THUẬT: THAY VAN HAI LÁ CƠ HỌC ON-X SỐ 27/29 THAY VAN ĐỘNG MẠCH CHỦ CƠ HỌC ON-X SỐ 21- Loại thay van hai lá khác- Loại thay van động mạch chủ khác

Loại phẫu thuật: Cấp cứu Tiên lượng: Nặng

Phương pháp vô cảm: Gâ

Bác sĩ phẫu thuật chính:

Bác sĩ phẫu thuật phụ: Th

Bác sĩ gây mê hồi sức: BS Trương Văn Thiện, BS.CKI. Nguyễn Thị Ánh Dung

Bác sĩ THNCT ECMO : BS. Điều dưỡng THNCT:

Điều dưỡng gây mê:

Điều dưỡng dụng cụ:

**TRÌNH TỰ PHẪU THUẬT :**

- Rạch da đường giữa ngực, chẻ đôi xương ức. Mở dọc màng ngoài tim. Gỡ dính tim khó khăn
- Thiết lập hệ thống tuần hoàn ngoài cơ thể với canula ĐMC và 2 TMC trên & dưới.
- Kẹp ngang ĐMC và truyền dung dịch làm liệt tim CUSTODIOL. Mở nhĩ trái chọn lọc.

**Phẫu thuật: VAN HAI LÁ**

- Sùi trên van 2 lá sinh học, màng sùi lớn nhô vào lòng nhĩ trái.
- Gỡ van 2 lá sinh học, lột mô sùi quanh vùng vòng van 2 lá, mô sùi đem làm GPB
- Khâu miếng patch màng ngoài tim lên vòng van lá sau.

**THAY VAN HAI LÁ: thay bằng van cơ học ON-X số 27/29. Mũi chữ U ngược.**
**VAN ĐM CHỦ:**

- co rút lá xoang không vành gây hở van ĐM chủ nặng. Vòng van ĐMC bình thường.
- Thay van ĐM chủ bằng **van cơ học ON-X số 21**. Mũi rời không pledget.

***Phẫu thuật***

- *Phẫu thuật thực hiện dưới THNCT, hạ thể nhiệt 34°C. Thời gian THNCT 158 phút. Thời gian kẹp ngang ĐMC 131 phút. Số lần truyền dung dịch làm liệt tim 2 lần. Đường truyền dung dịch liệt tim xuôi dòng từ lỗ ĐMV.*

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# KẾT QUẢ PHẪU THUẬT TIM LẦN 2

Chẩn đoán trước phẫu thuật: Viêm nội tâm mạc nhiễm trùng do Staphylococus aureus - Van hai lá sinh học (2020) - Áp xe vòng van 2 lá - Block nhĩ thất độ II - Nhồi máu não bán cấp ổ nhỏ - Đái tháo đường type II - Tiền căn VNTMNT (2020)

Chẩn đoán sau phẫu thuật: Viêm nội tâm mạc nhiễm trùng do Staphylococus aureus - Van hai lá sinh học (2020) - Áp xe vòng van 2 lá - Block nhĩ thất độ II - Nhồi máu não bán cấp ổ nhỏ - Đái tháo đường type II - Tiền căn VNTMNT (2020)

Phương pháp phẫu thuật: PHẪU THUẬT: THAY VAN HAI LÁ CƠ HỌC ON-X SỐ 27/29 THAY VAN ĐỘNG MẠCH CHỦ CƠ HỌC ON-X SỐ 21- Loại thay van hai lá khác- Loại thay van động mạch chủ khác

Loại phẫu thuật: Cấp cứu Tiên lượng: Nặng

Phương pháp vô cảm: Gâ

Bác sĩ phẫu thuật chính:

Bác sĩ phẫu thuật phụ: Th

Bác sĩ gây mê hồi sức: BS Trương Văn Thiện, BS.CKI. Nguyễn Thị Ánh Dung

Bác sĩ THNCT ECMO : BS. Điều dưỡng THNCT:

Điều dưỡng gây mê:

Điều dưỡng dụng cụ:

**TRÌNH TỰ PHẪU THUẬT :**

- Rạch da đường giữa ngực, chẻ đôi xương ức. Mở dọc màng ngoài tim. Gỡ dính tim khó khăn
- Thiết lập hệ thống tuần hoàn ngoài cơ thể với canula ĐMC và 2 TMC trên & dưới.
- Kẹp ngang ĐMC và truyền dung dịch làm liệt tim CUSTODIOL. Mở nhĩ trái chọn lọc.

**Phẫu thuật: VAN HAI LÁ**

- Sùi trên van 2 lá sinh học, mảng sùi lớn nhô vào lòng nhĩ trái.
- Gỡ van 2 lá sinh học, lột mô sùi quanh vùng vòng van 2 lá, mô sùi đem làm GPB
- Khâu miếng patch màng ngoài tim lên vòng van lá sau.

**THAY VAN HAI LÁ: thay bằng van cơ học ON-X số 27/29. Mũi chữ U ngược.**
**VAN ĐM CHỦ:**

- co rút lá xoang không vành gây hở van ĐM chủ nặng. Vòng van ĐMC bình thường.
- Thay van ĐM chủ bằng **van cơ học ON-X số 21**. Mũi rời không pledget.

***Phẫu thuật***

- *Phẫu thuật thực hiện dưới THNCT, hạ thể nhiệt 34°C. Thời gian THNCT 158 phút. Thời gian kẹp ngang ĐMC 131 phút. Số lần truyền dung dịch làm liệt tim 2 lần. Đường truyền dung dịch liệt tim xuôi dòng từ lỗ ĐMV.*

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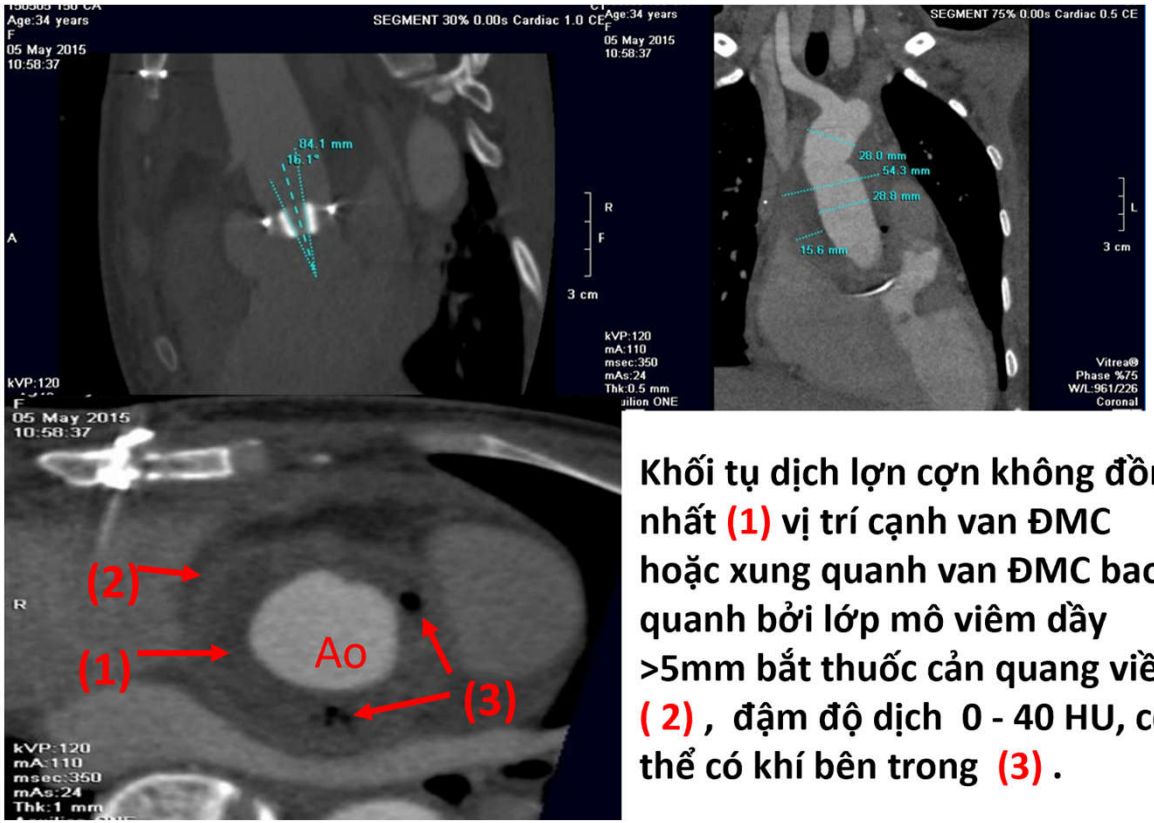
# ÁP XE CẠNH VAN




Khối tụ dịch lợn cợn không đồng nhất (1) vị trí cạnh van ĐMC hoặc xung quanh van ĐMC bao quanh bởi lớp mô viêm dầy >5mm bắt thuốc cản quang viền ( 2) , đậm độ dịch 0 - 40 HU, có thể có khí bên trong (3) .

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# Conclusion

- Imaging remains one of the cornerstones of the diagnosis and management of IE.
- Although echocardiography is the first-line imaging tool, the role of CT is emerging in both native and prosthetic valve endocarditis and its use is strongly recommended in current guidelines.
- Echocardiography is better at detecting valvular lesions, however, CT surpasses echocardiography in detecting paravalvular lesions.

Eefje M. Dalebout et al( 2024). Computed Tomography in Infectious Endocarditis. Journal of the Society for Cardiovascular Angiography & Interventions 3 . 101292

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# XIN CẢM ƠN