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Lékařská fakulta
Univerzita Palackého v Olomouci

KOMPLEXNÍ KARDIOVASKULÁRNÍ CENTRUM
FAKULTNÍ NEMOCNICE OLOMOUC

KAZUISTIKA 5

Martin Hutyra

1. interní klinika - kardiologická, Lékařská fakulta a Fakultní nemocnice Olomouc

Cardiac sources of cerebral embolism

ESC European Society of Cardiology
European Heart Journal - Cardiovascular Imaging (2021) 22, e24–e57 doi:10.1093/ehjci/jeab008
EACVI DOCUMENT

EACVI recommendations on cardiovascular imaging for the detection of embolic sources: endorsed by the Canadian Society of Echocardiography

Major sources of stroke risk	Minor or unclear sources of stroke risk
Atrial fibrillation	Mitral valve prolapse
Recent myocardial infarction	Mitral annulus calcification
Previous myocardial infarction (LV aneurysm)	Spontaneous echo contrast
All cardiomyopathies including non-compaction and takotsubo cardiomyopathies	Calcified aortic stenosis
Cardiac masses (except calcifications)	Valvular strands
Intracardiac thrombus	Atrial septal aneurysm without PFO
Intracardiac tumours	
Fibroelastoma	
Marantic vegetations	PFO
Rheumatic valve disease (mitral stenosis)	
Aortic arch atheromatous plaques	Atrial septal pouch
Endocarditis	Giant Lambl's excrescences
Prosthetic valve (mechanical especially)	

Embolic strokes of undetermined source: the case for a new clinical construct

Robert G Hart, Hans-Christoph Diener, Shelagh B Coutts, J Donald Easton, Christopher B Granger, Martin J O'Donnell, Ralph L Sacco, Stuart J Connolly, for the Cryptogenic Stroke/ESUS International Working Group

Panel 1: **Causes of embolic strokes of undetermined source**

Minor-risk potential cardioembolic sources*

Mitral valve
- Myxomatous valvulopathy with prolapse
- Mitral annular calcification

Aortic valve
- Aortic valve stenosis
- Calcific aortic valve

Non-atrial fibrillation atrial dysrhythmias and stasis
- Atrial asystole and sick-sinus syndrome
- Atrial high-rate episodes
- Atrial appendage stasis with reduced flow velocities or spontaneous echodensities

Atrial structural abnormalities
- Atrial septal aneurysm
- Chiari network

Left ventricle
- Moderate systolic or diastolic dysfunction (global or regional)
- Ventricular non-compaction
- Endomyocardial fibrosis

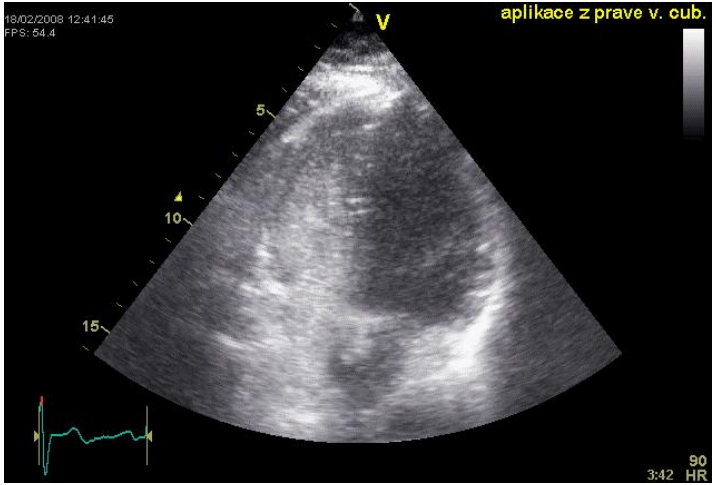
Covert paroxysmal atrial fibrillation

Cancer-associated
- Covert non-bacterial thrombotic endocarditis
- Tumour emboli from occult cancer

Arteriogenic emboli
- Aortic arch atherosclerotic plaques
- Cerebral artery non-stenotic plaques with ulceration

Paradoxical embolism
- Patent foramen ovale
- Atrial septal defect
- Pulmonary arteriovenous fistula

Hart RG, Diener HC, Coutts SB, et al. Embolic strokes of undetermined source: the case for a new clinical construct. Lancet Neurol 2014;13:429-38.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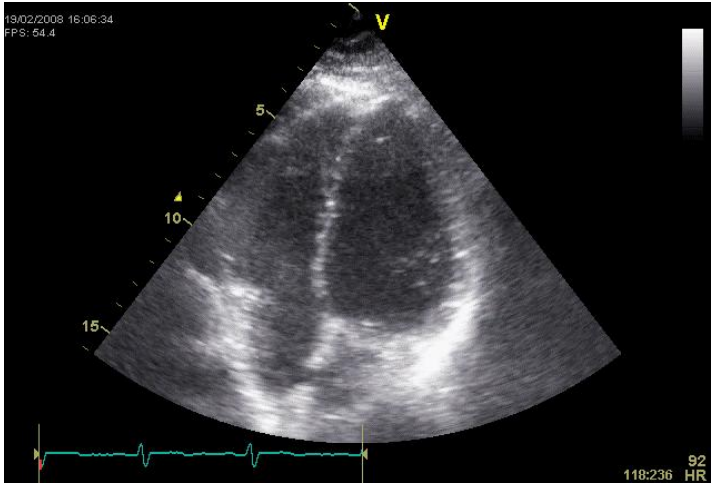
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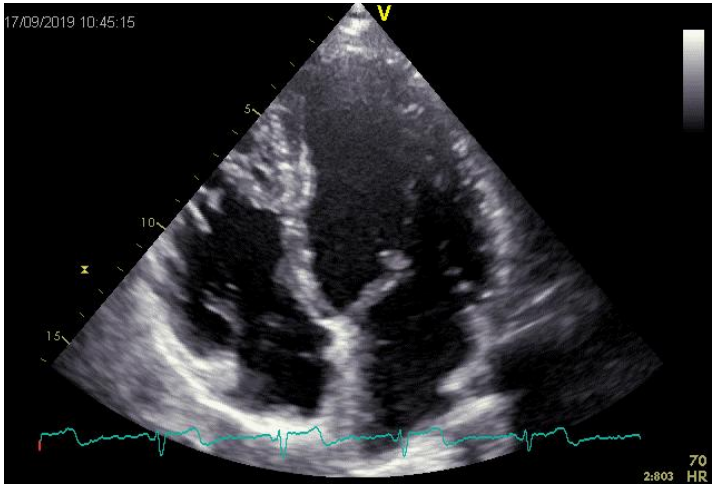
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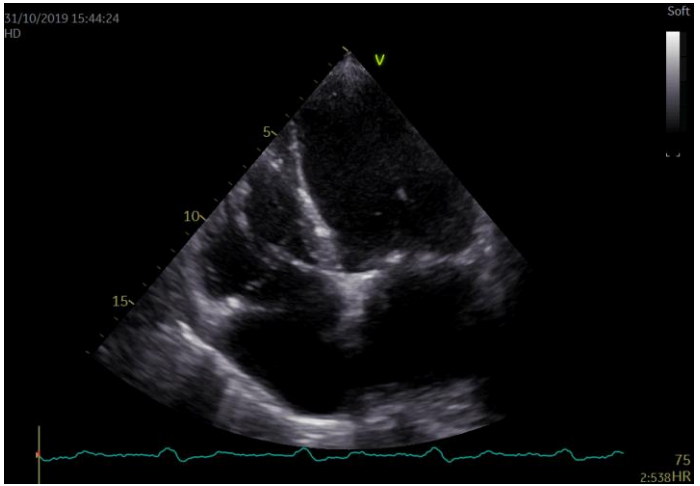
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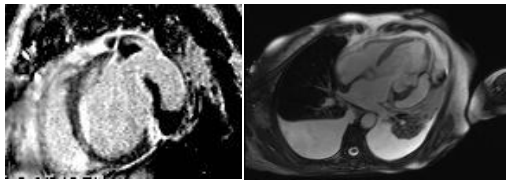
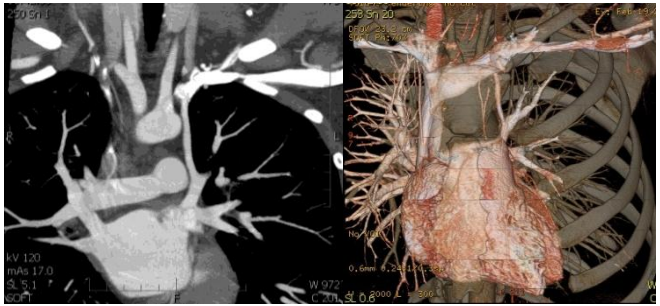
Cardiovascular imaging tools

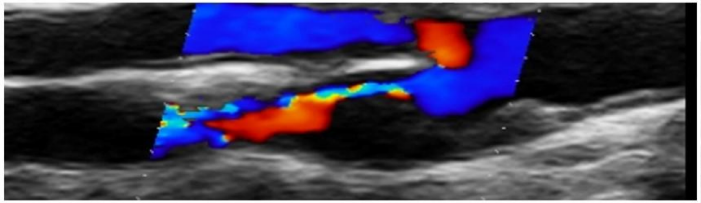
1. Transthoracic and transoesophageal echocardiography

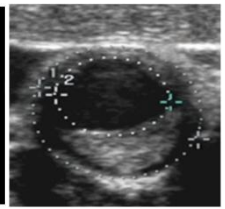
2. Computed tomography and magnetic resonance imaging



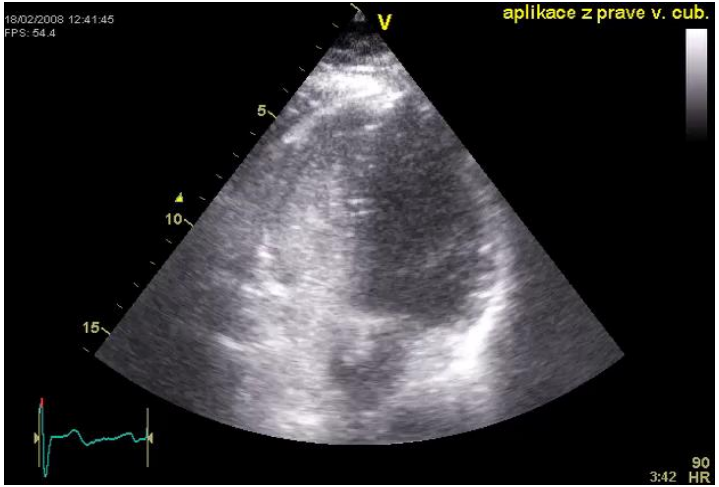


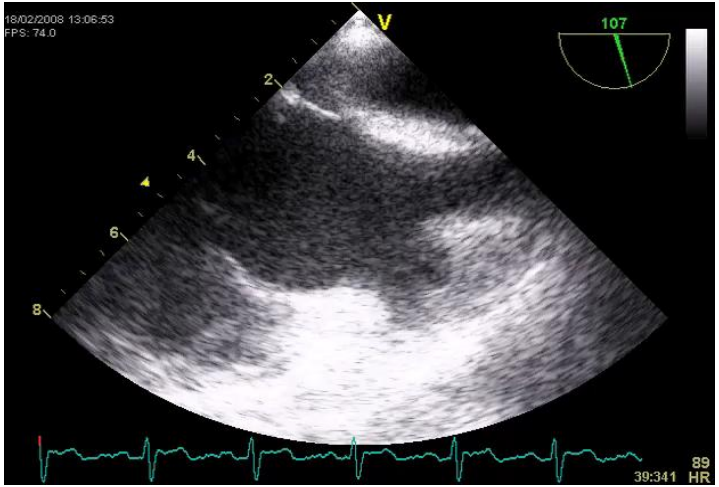
3. Vascular imaging

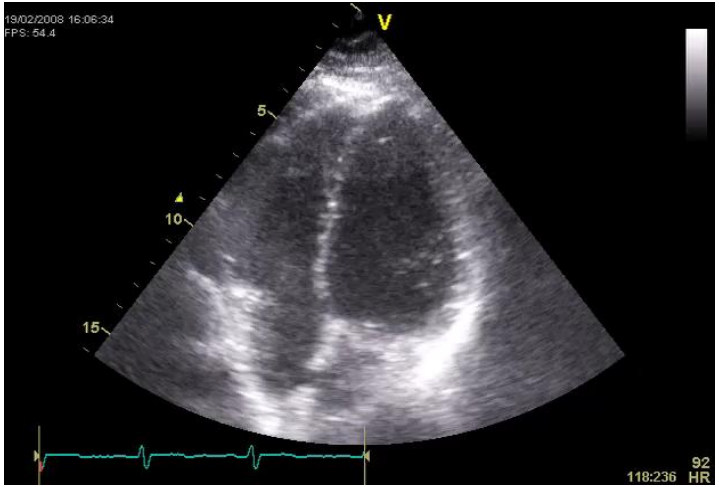


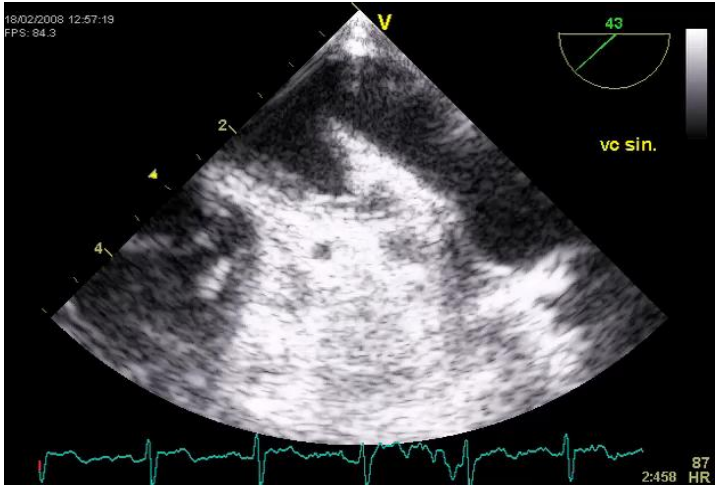


Eur Heart J Cardiovasc Imaging, Volume 22, Issue 6, June 2021, Pages e24–e57, https://doi.org/10.1093/ehjci/jeab008

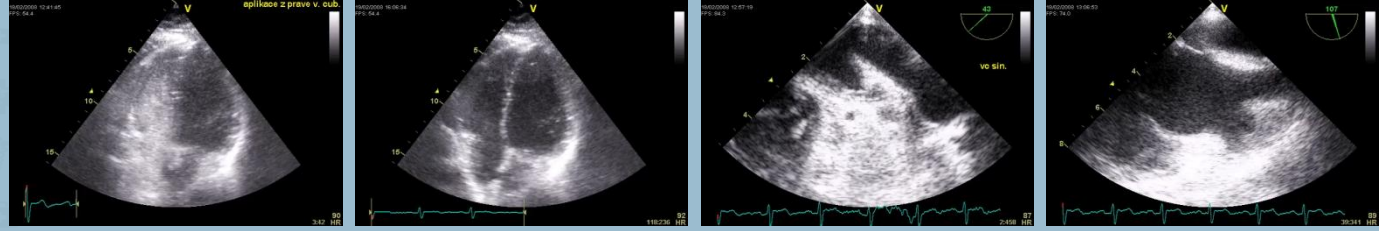








Eur J Echocardiogr, Volume 11, Issue 9, October 2010, Page E35, https://doi.org/10.1093/ejechocard/jeq079



Otázka 1

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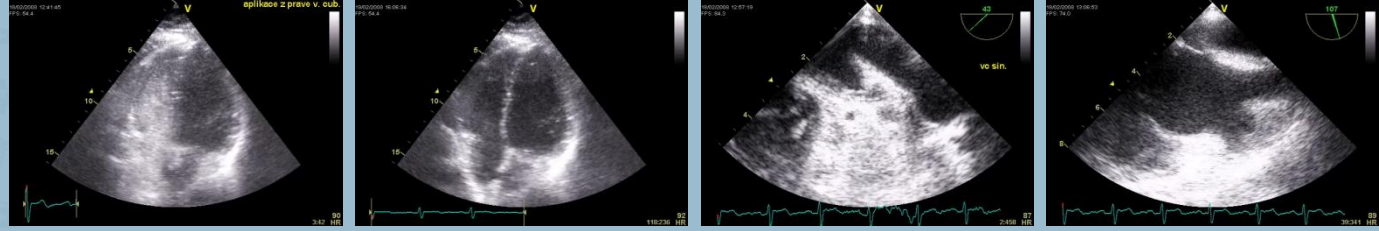
Sekvence plnění srdce kontrastní látkou je následující?

1. po podání do pravé a do levé kubitální žíly se vždy nejdříve plní pravá síň
2. vtok po podání do levé kubitální žíly je do levé síně přes RUPV
3. po podání do levé kubitální žíly se simultánně plní pravá a levá síň
4. po podání do pravé kubitální žíly se nejdříve plní levá síň



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Otázka 2

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Jaké další vyšetření budete indikovat?

1. CTA
2. MRA
3. Angiografie
4. Radionuklidová angiokardiografie

Otázka 2

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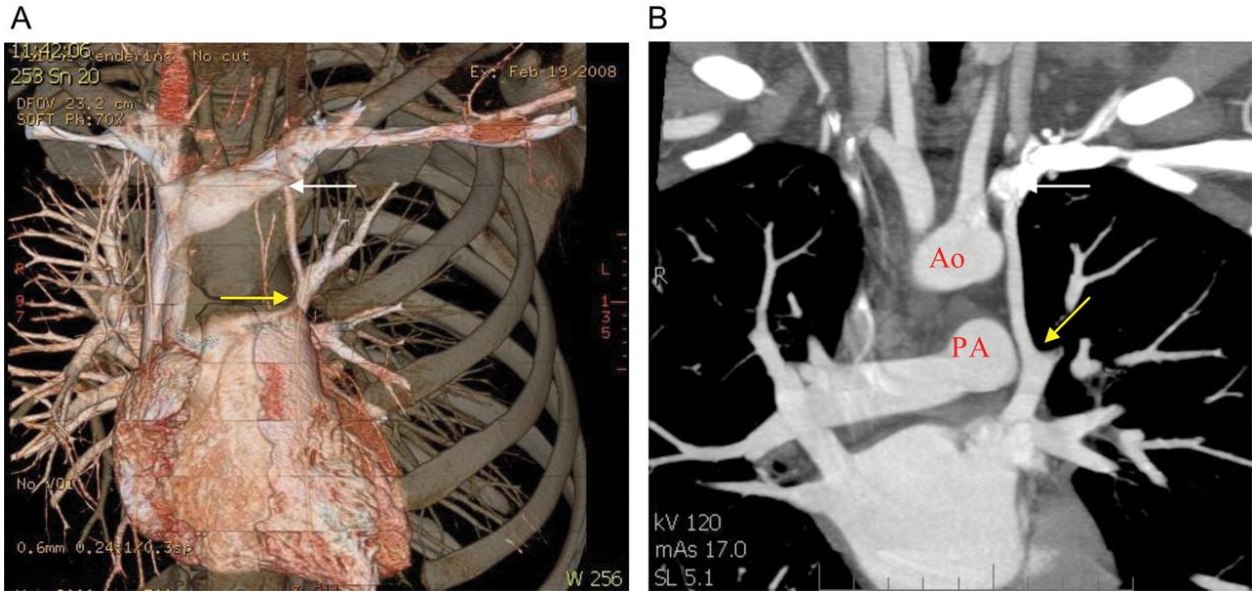
Jaké další vyšetření budete indikovat?

1. **CTA**
2. MRA
3. Angiografie
4. Radionuklidová angiokardiografie

Persistent left superior vena cava - detection

Computed tomography of the chest.

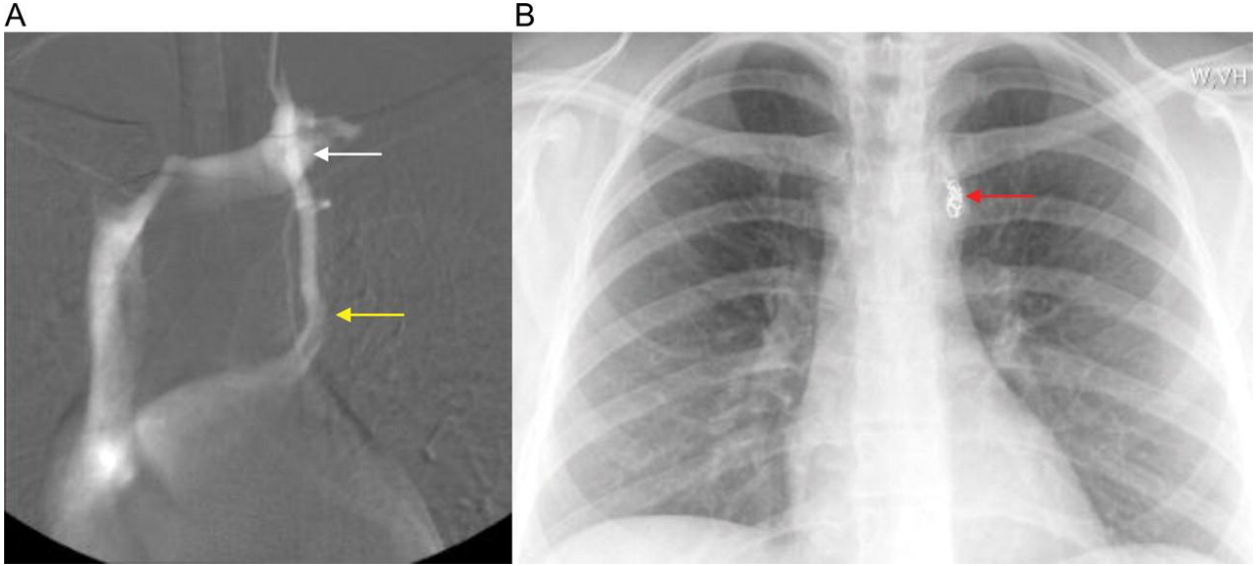


Reconstructed images using volume rendering (A) and a two-dimensional image (B) demonstrates that the persistent left superior vena cava originates from the left brachiocephalic vein (white arrow) and drains (yellow arrow) into the left upper pulmonary vein, which leads directly into the left atrium.
Ao, aorta; PA, pulmonary artery

Eur J Echocardiogr, Volume 11, Issue 9, October 2010, Page E35, https://doi.org/10.1093/ejechocard/jeq079

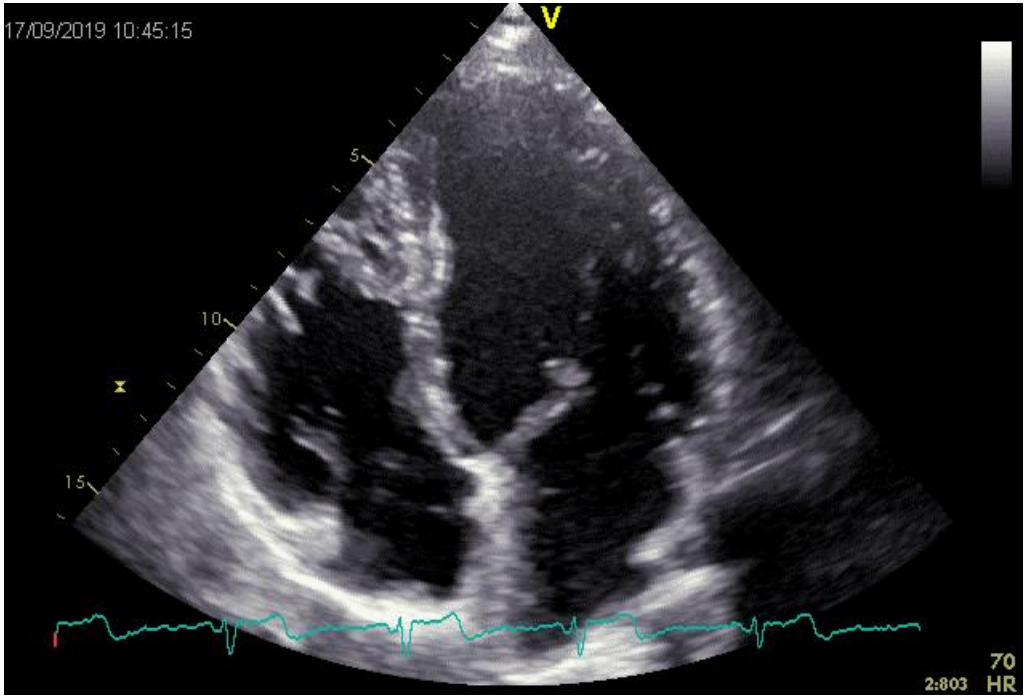
Persistent left superior vena cava – confirmation and occlusion

Venography (A) and chest X-ray after catheter closure of PLSVC (B)



(A) After application of a contrast agent, the persistent left superior vena cava can be seen, originating from the left brachiocephalic vein (white arrow) draining into the left upper pulmonary vein at the conflux with the pulmonary vein (yellow arrow), from where the flow is seen as a negative contrast (darker endovascular content) is apparent. Furthermore, there is an evident of normal venous inflow into the right atrium through the superior vena cava. **(B)** The position of the coil under the left clavicle is visible after the catheter closure procedure (red arrow).

Eur J Echocardiogr, Volume 11, Issue 9, October 2010, Page E35, https://doi.org/10.1093/ejechocard/jeq079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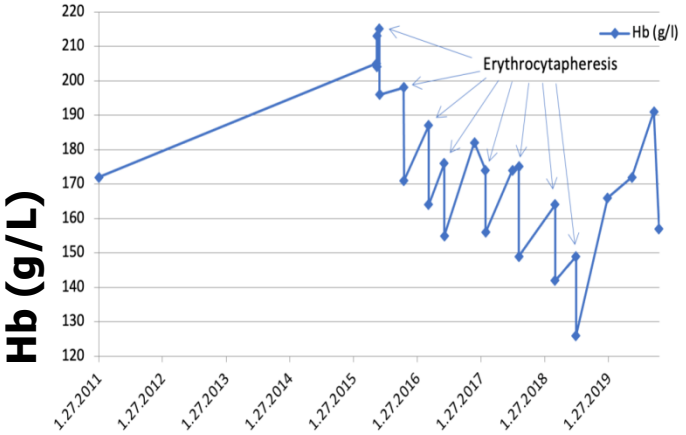
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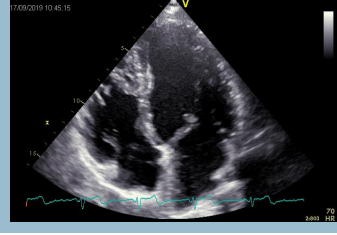

Otázka 3

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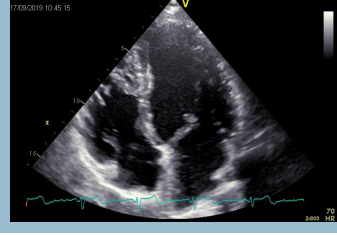
3. po podání do levé kubitální žíly se se zpožděním 3 srdečních cyklů za pravou síní plní levá síň
4. po podání do pravé kubitální žíly se nejdříve plní levá síň



Otázka 3

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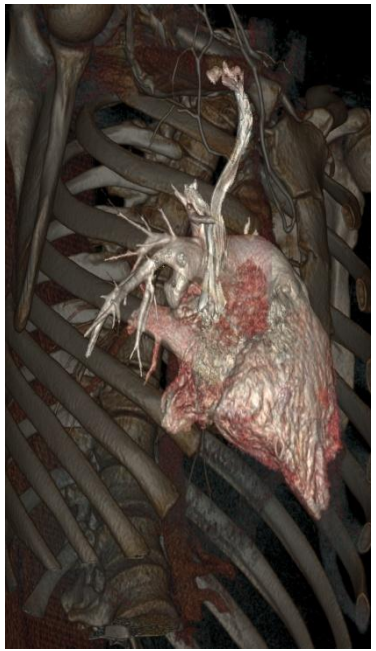
4. po podání do pravé kubitální žíly se nejdříve plní levá síň

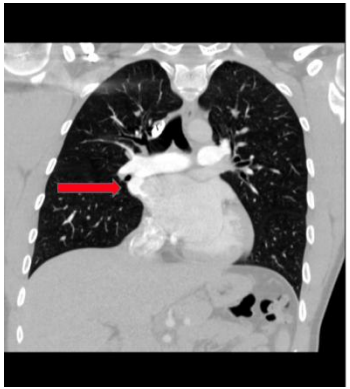
Pulmonary artery to left atrial fistula

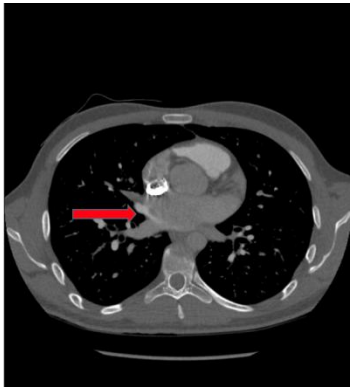
- Communication between right pulmonary artery and left atrium is a rare anomaly. It was first described in 1950 by Friedlich et al., it is usually a congenital anomaly, however it can also occur in a post-traumatic setting. True prevalence of this anomaly is unknown, in current literature approximately a hundred cases exist, almost all of them from right pulmonary artery (PA) to left atrium (LA), only three cases of left PA-to-LA fistula have been reported.
- In 70 % cases it is diagnosed before age of twenty, in 30 % before the age of ten. Prevalence is higher in men than women (3:1)
- Typical symptoms are shortness of breath, cyanosis, clubbing of the fingers, polycythemia, hypoxia. Larger shunts usually present earlier with heart failure and subsequent death. First symptoms in moderate shunts can be paradoxical embolism resulting in infarcts or abscesses throughout the body.

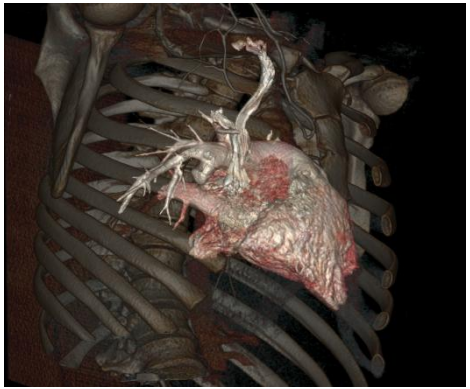


Friedlich, A. Circulatory dynamics in the anomalies of venous return to the heart including pulmonary arteriovenous fistula. *Bull Johns Hopkins Hosp.* 1950; 86: 20–57
Chauhan A. Pulmonary artery-to-left atrial fistula discovered after the closure of atrial septal defect: A rare clinical scenario. Ann Pediatr Card 2018,11:211-3.
Chowdhury UK. Right pulmonary artery to left atrium communication. Ann Thorac Surg 80:365–370.
De Souza. Communication bertween right pulmonary artery and left atrium. Am J Cardiol 1974,34:857-863.

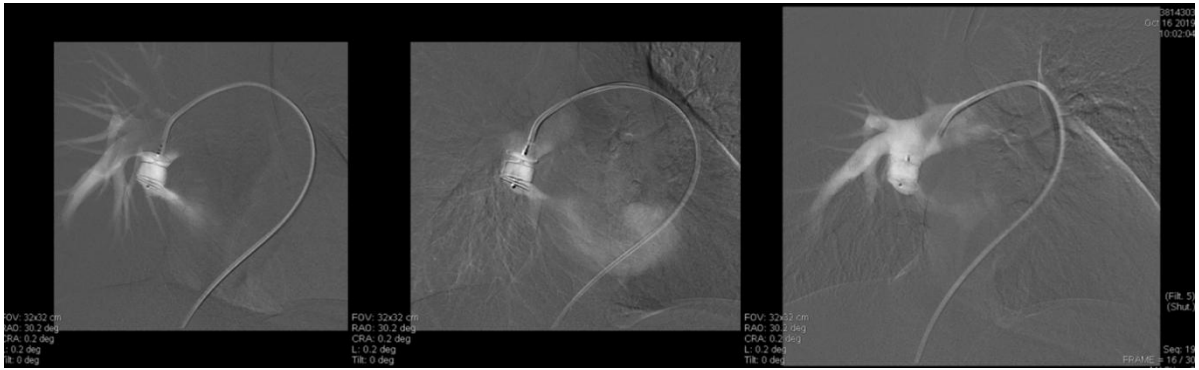
Pulmonary artery to left atrial fistula – detection and occlusion





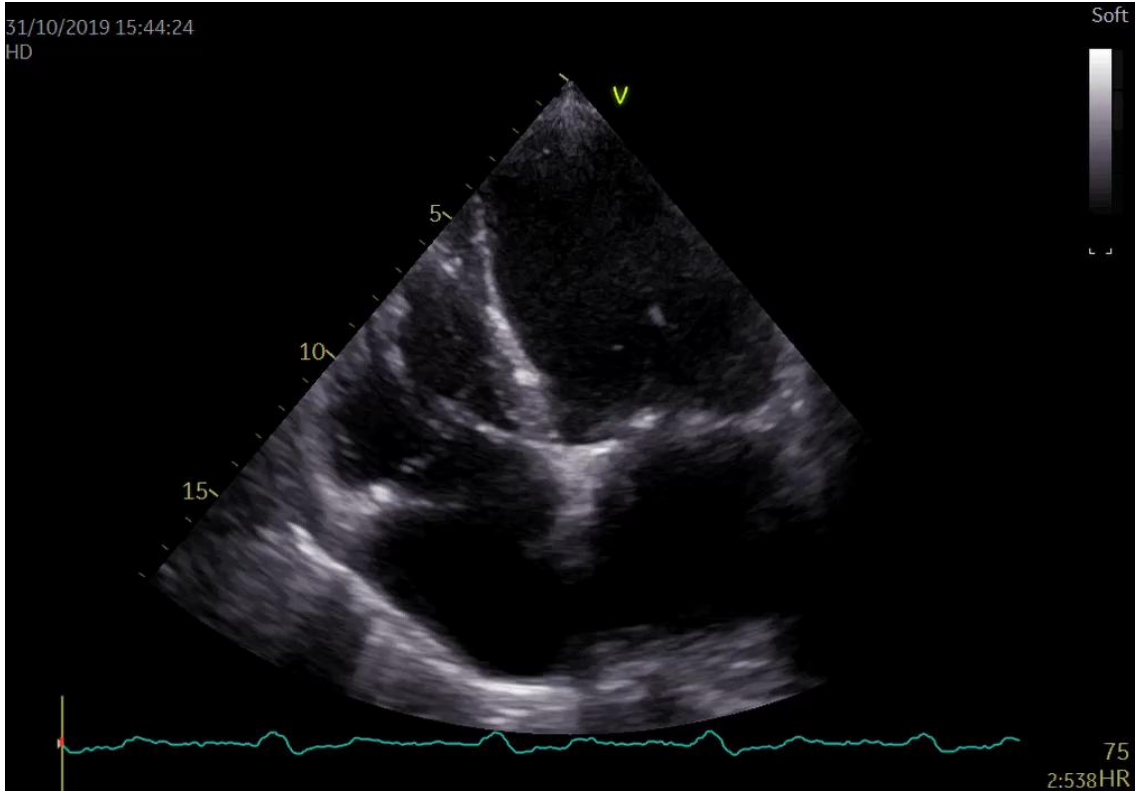


CT angiography of the chest. Reconstruction (2D and 3D) demonstrates the communication between right pulmonary artery and left atrium.



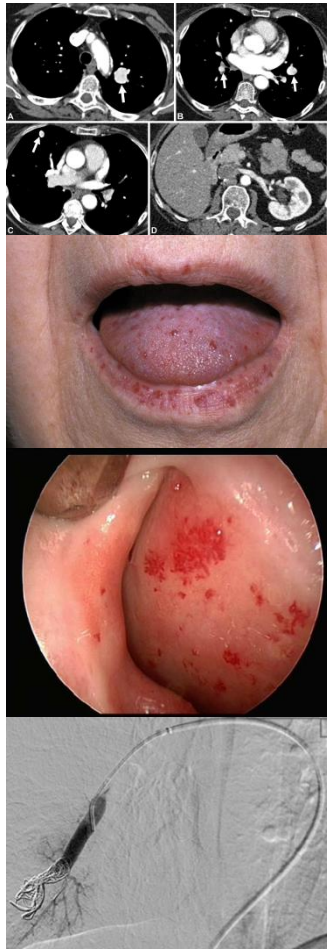
Digital subtraction angiography and interventional treatment with implantation of occluder.

Pulmonary AV malformation - screening



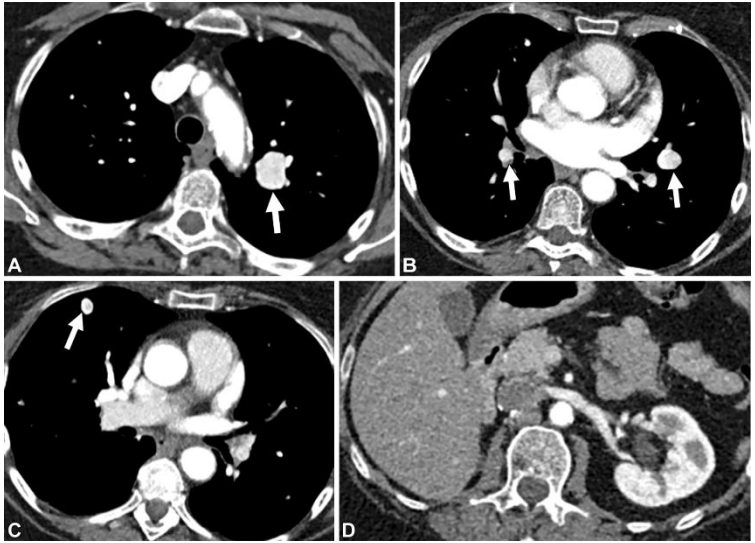
Pulmonary AV malformation

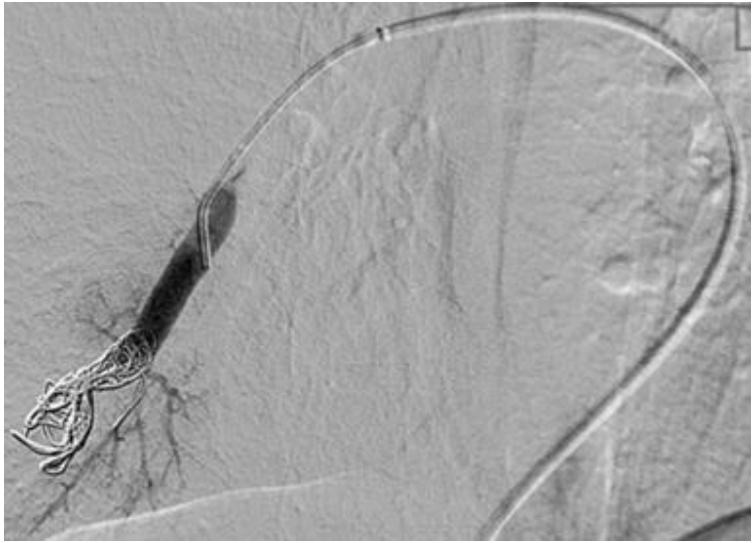
- Pulmonary arteriovenous malformations (PAVMs) are characterised by the presence of a direct pulmonary artery–vein shunt
- Most PAVMs are congenital and are closely associated with hereditary haemorrhagic telangiectasia.
- PAVMs have a low incidence worldwide and usually produce no obvious clinical manifestations. However, serious complications such as stroke, brain abscesses, haemoptysis, haemothorax, and hypoxaemia sometimes occur because of the absence of a capillary bed.
- Endovascular embolisation is recommended as the first-line treatment for PAVMs with a feeding artery of ≥ 3 mm in diameter.



Ma, X., Li, LL., Yu, D. *et al.* Management of pulmonary arteriovenous malformations involves additional factors aside from the diameter of feeding arteries: a 3-year case-case retrospective analysis. *Respir Res* **23**, 107 (2022). https://doi.org/10.1186/s12931-022-02030-9

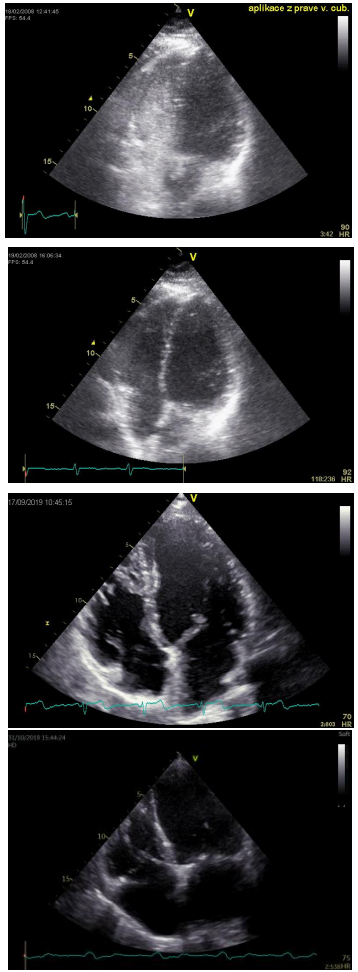
Pulmonary AV malformation – detection and closure





In contrast echocardiography, it is important...

1. administer contrast medium into the **left upper extremity vein**
2. observe the **sequence of filling of the heart** with the contrast agent
3. to record the site of contrast agent **entry** into the heart (there may be more than one at the same time)
4. observe the presence of contrast agent **in the left atrium, left ventricle and aorta** and determine **the (semi)quantity** of contrast agent in the left atrium spontaneously and during provocation manoeuvres
5. describe the **delay** in contrast agent penetration into the left-sided cardiac compartments compared with the right atrium



Eur Heart J Cardiovasc Imaging, Volume 22, Issue 6, June 2021, Pages e24–e57, https://doi.org/10.1093/ehjci/jeab008

DĚKUJEME ZA POZORNOST

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