
BACKSTREET BUBBLES

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No conflict of interest

Objectives

1. Investigate paradoxical embolism from an anatomical perspective
2. Describe the causes of extracardiac shunts, with an emphasis on cirrhotic patients
3. Illustrate how close intraprofessional collaboration led to understanding and addressing a complex anatomical issue

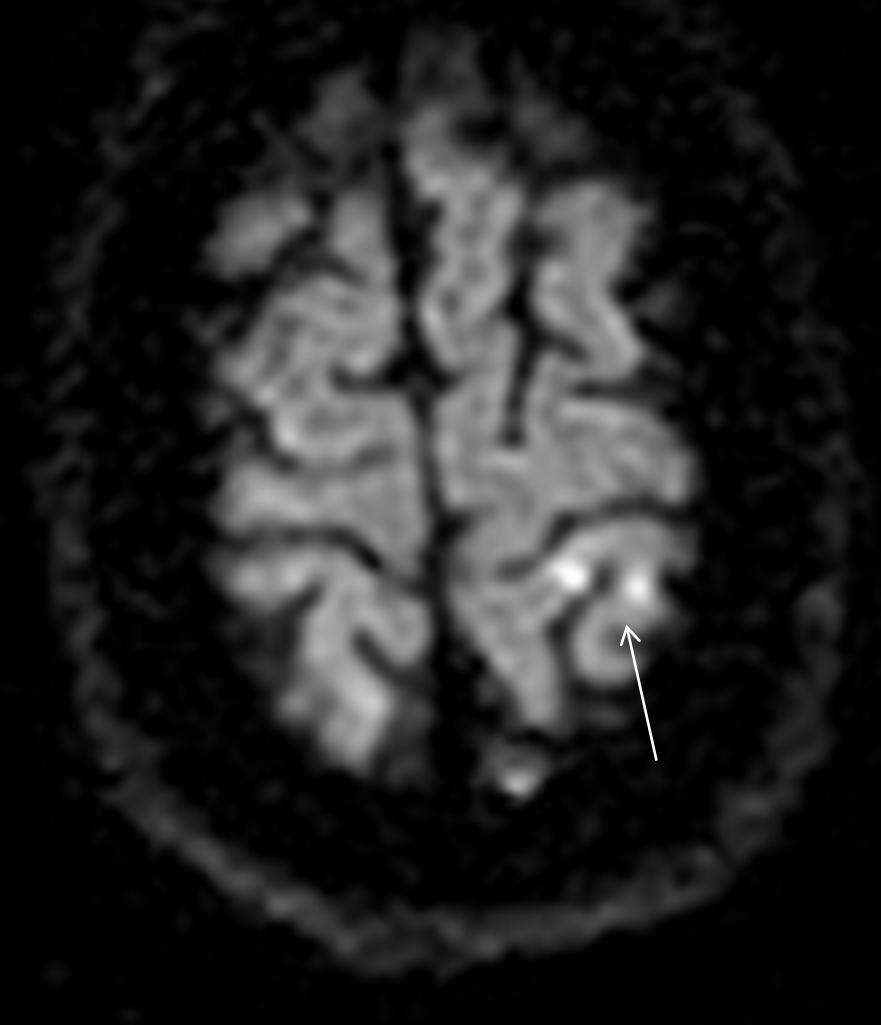
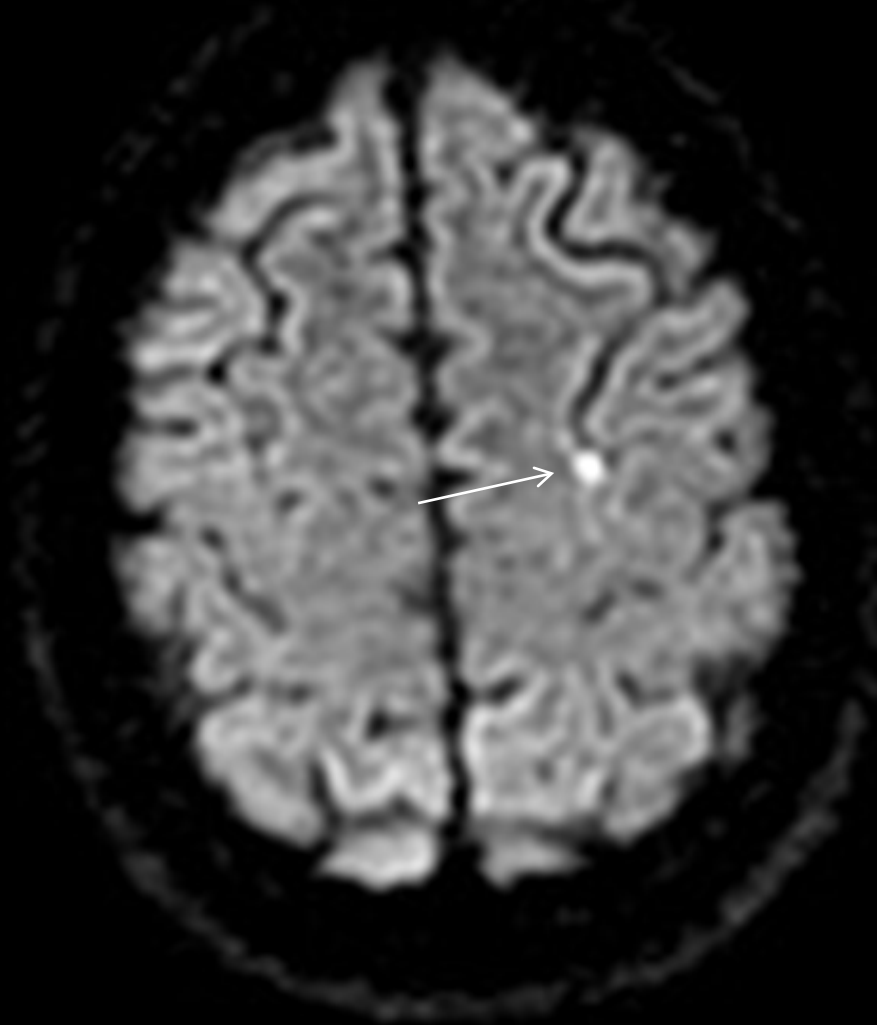
1.

CASE PRESENTATION

Mr. G, ♂ 20 years old

Reason for consultation

Multiple embolic strokes



Past medical history

- ▷ Primary sclerosing cholangitis, neonatal diagnosis
- ▷ Cirrhosis
 - Portal hypertension (HTN)
 - Esophageal varices
 - Splenomegaly and hypersplenism
 - Liver failure

Initial presentation

- ▷ 2 episodes of tonic-clonic seizures
- ▷ T° 38,3
- ▷ No nuchal rigidity, normal neurological exam

Initial laboratory workup

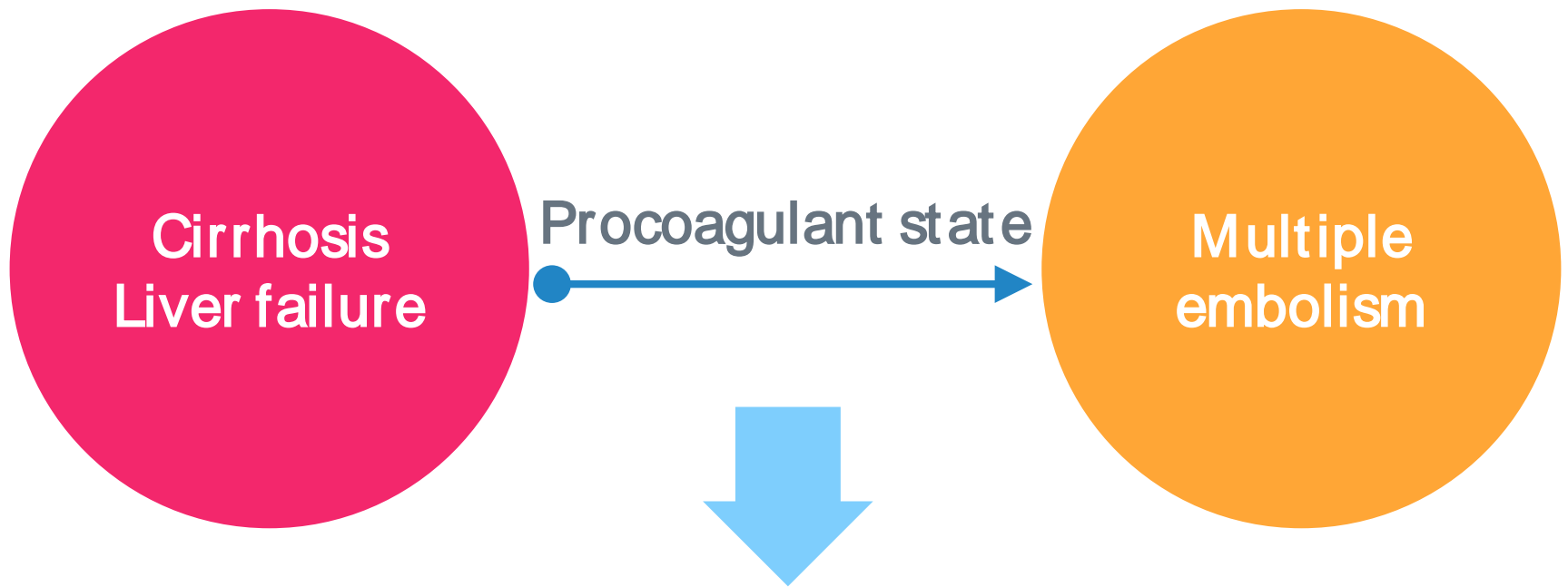
- ▷ Pancytopenia
- ▷ Progressive liver failure
- ▷ Negative extensive infectious panel
- ▷ Normal TTE and TEE

**Cirrhosis
Liver failure**

Procoagulant state

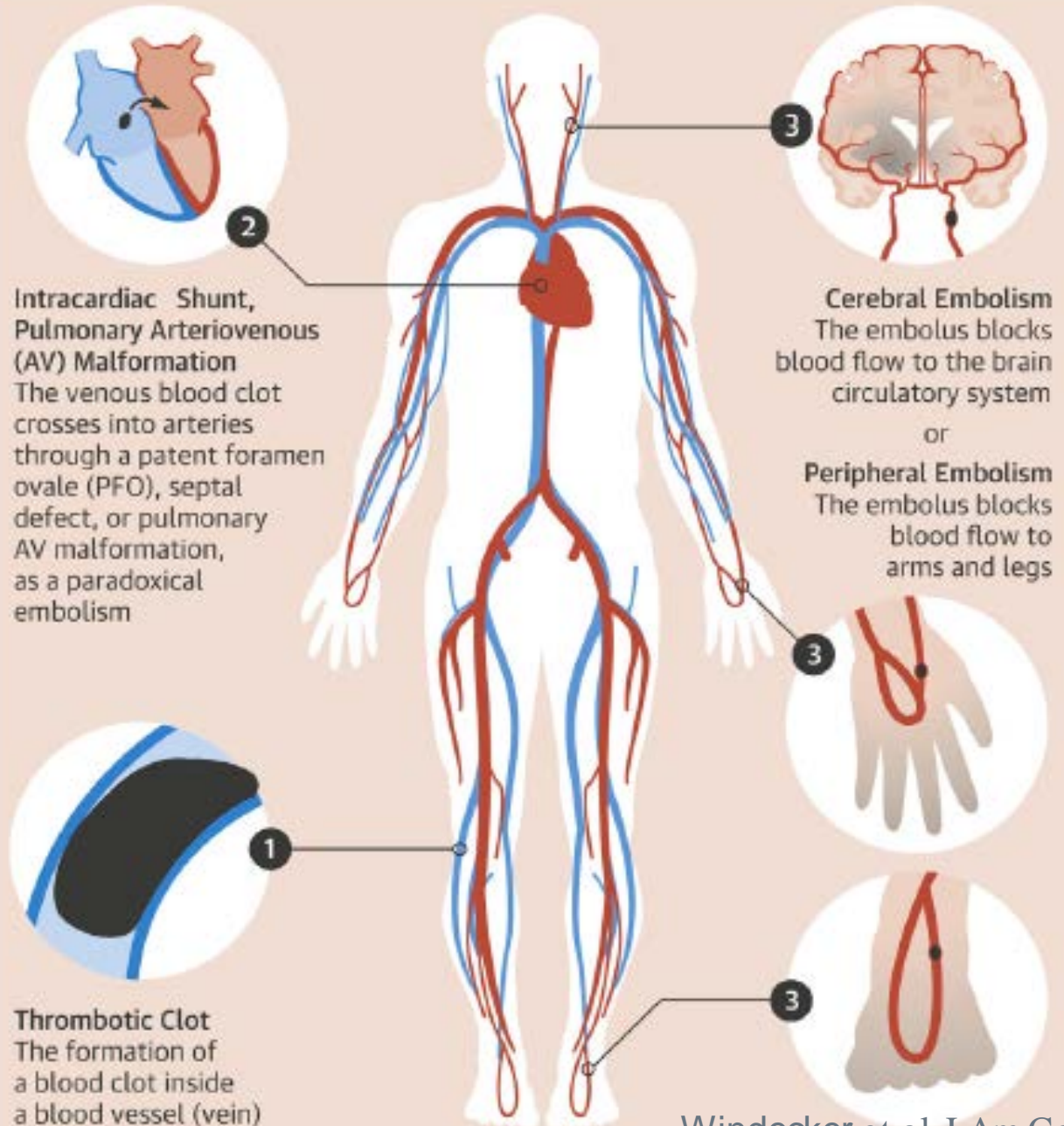
**Multiple
embolism**



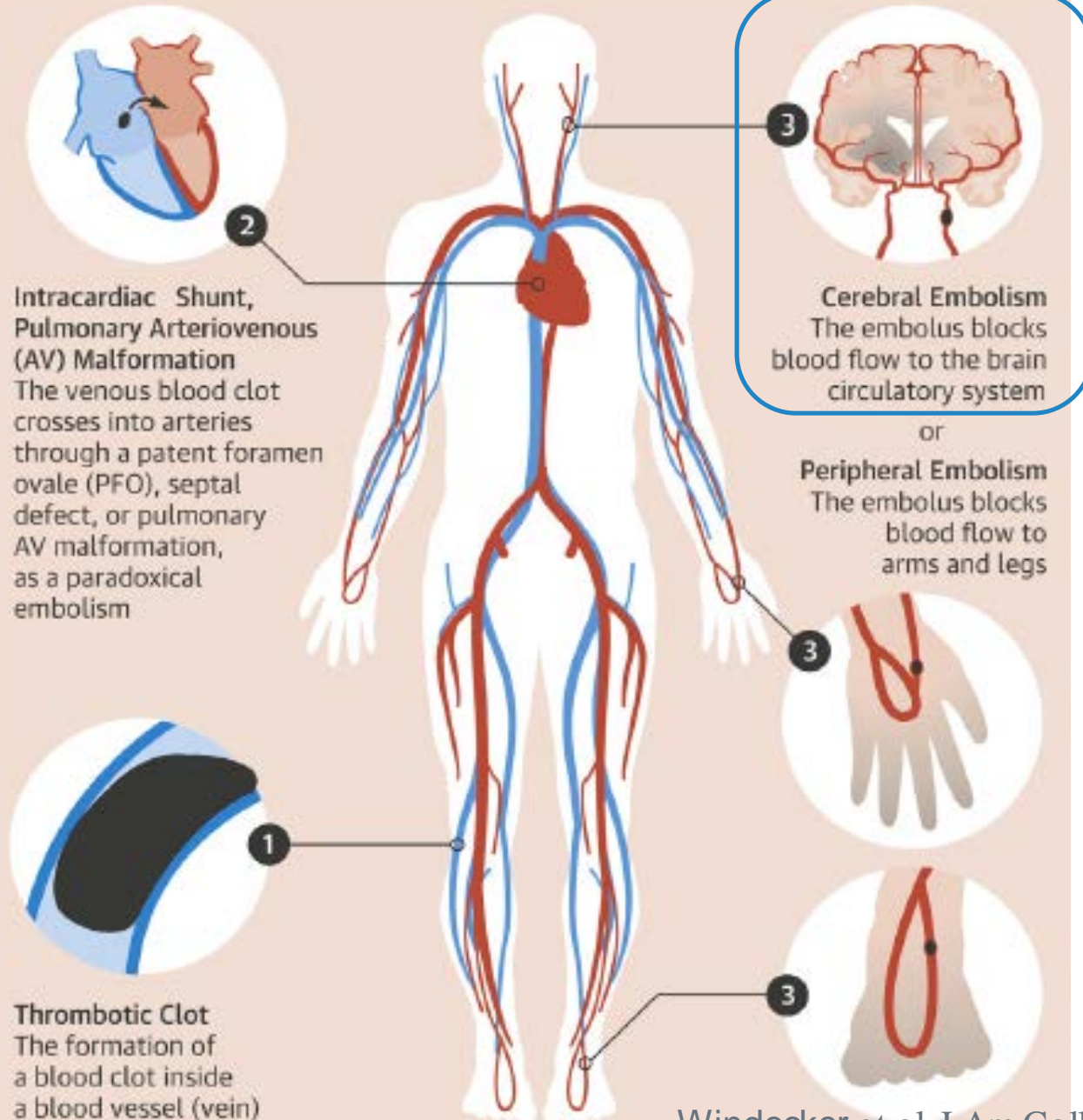


Paradoxical embolism?

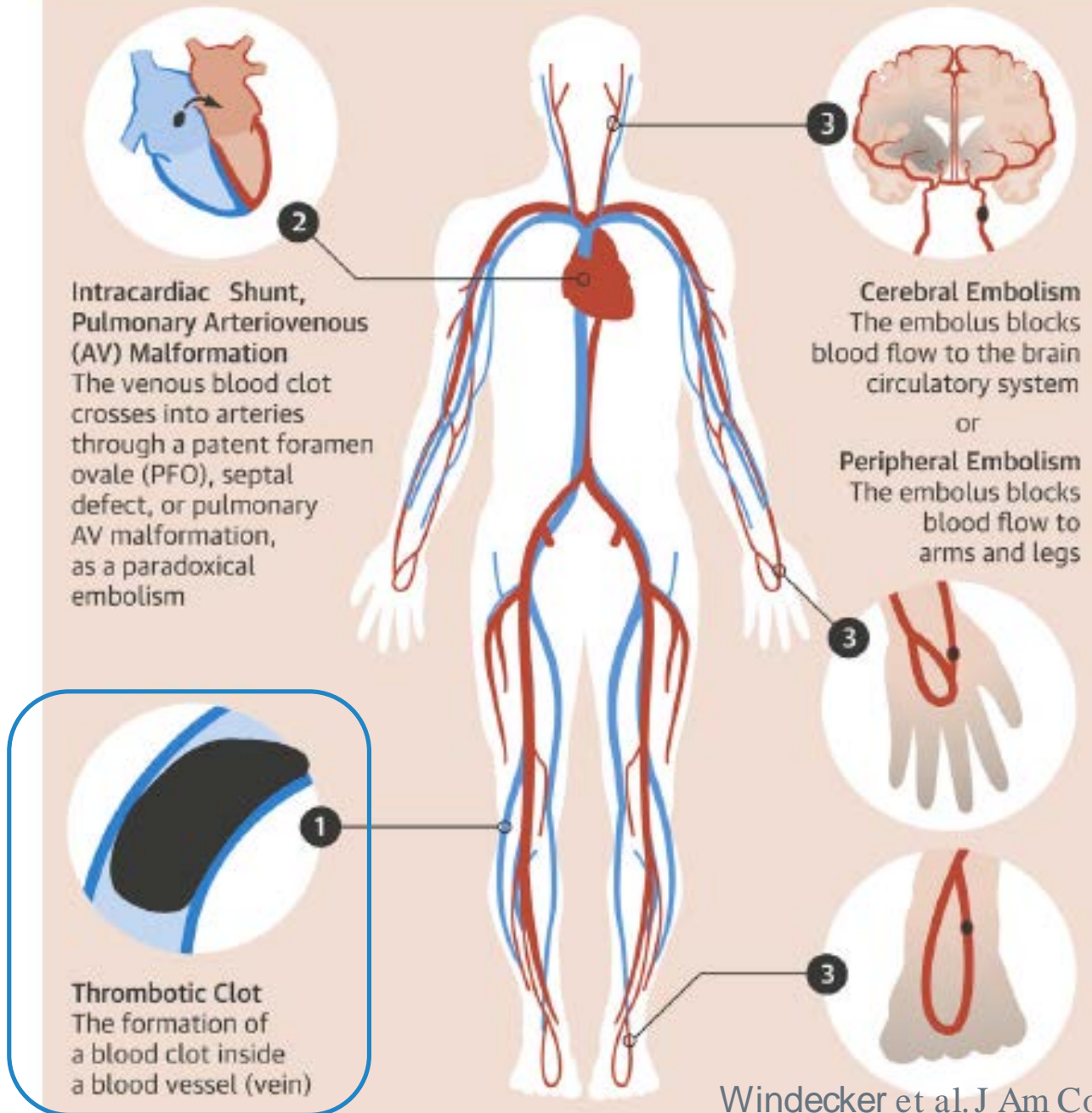
PATHWAY OF A PARADOXICAL EMBOLISM



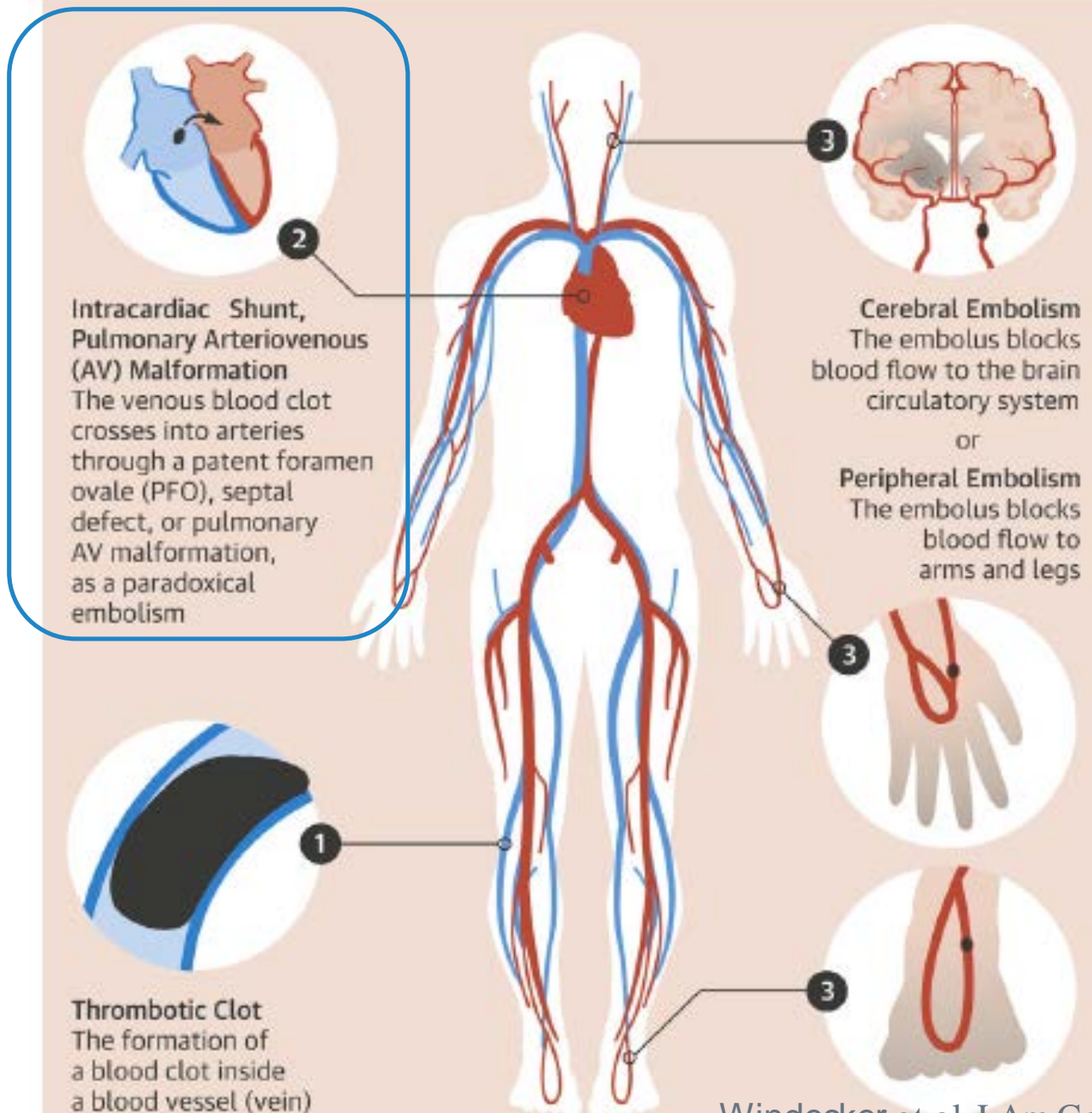
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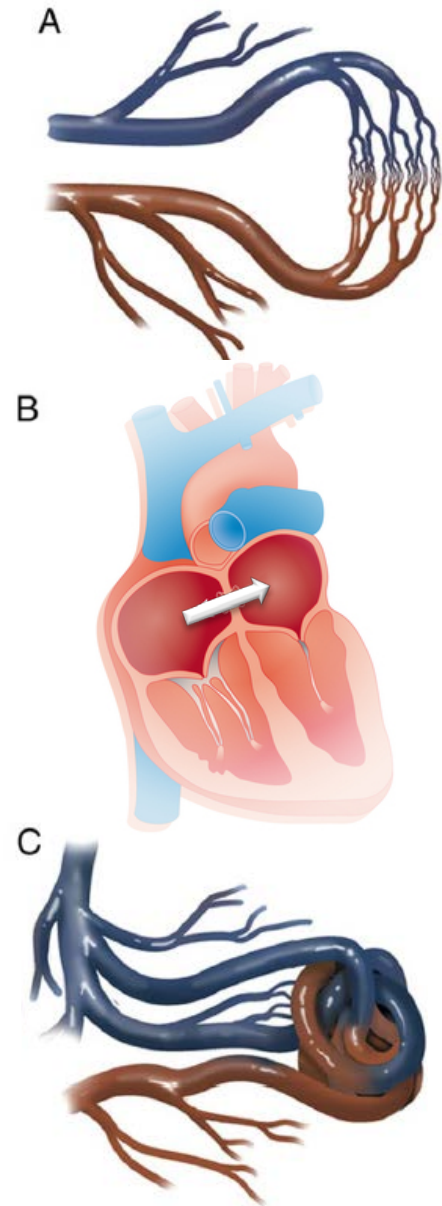


PATHWAY OF A PARADOXICAL EMBOLISM



Bubbles in echocardiography

- ▷ Identification of R → L shunt
- ▷ N: contrast does not reach LV
- ▷ Intra♥ shunt: contrast reaches LV after 1-2 beats
- ▷ Extra♥ shunt: contrast reaches LV after 4-6 beats

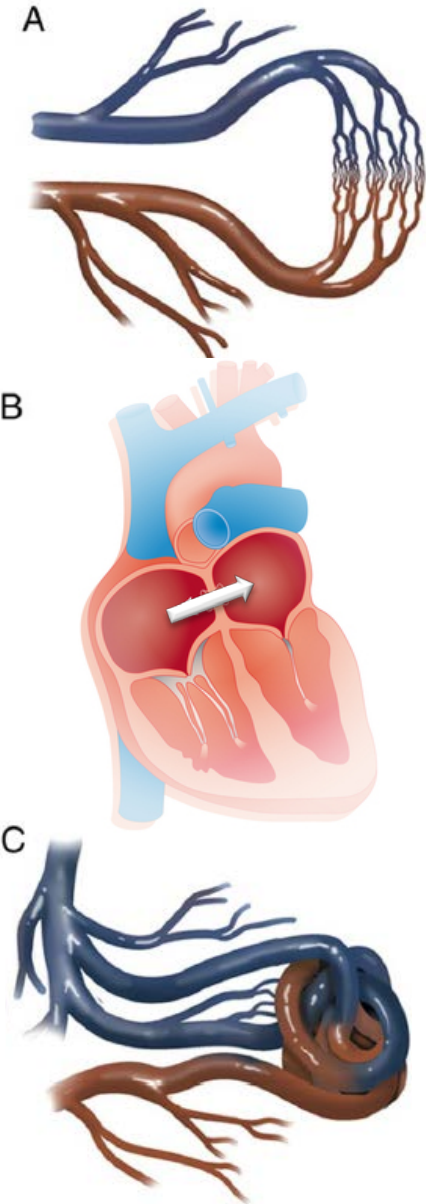


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Mr. G's echocardiography

- ▷ Appearance of massive delayed bubbles in LV: arteriovenous malformation?



Differential diagnosis

▷ Hereditary
hemorrhagic
telangiectasia

+



-

No epistaxis
No telangiectasia
No family history

▷ Hepatopulmonary
syndrome (HPS)

Differential diagnosis

▷ Hereditary
hemorrhagic
telangiectasia

▷ Hepatopulmonary
syndrome (HPS)



Portal HTN
Cirrhosis



No hypoxemia
Capillary dilation > AVM
Rarely associated with stroke



2.

PORTO-PULMONARY
VENOUS ANASTOMOSIS

Epidemiology

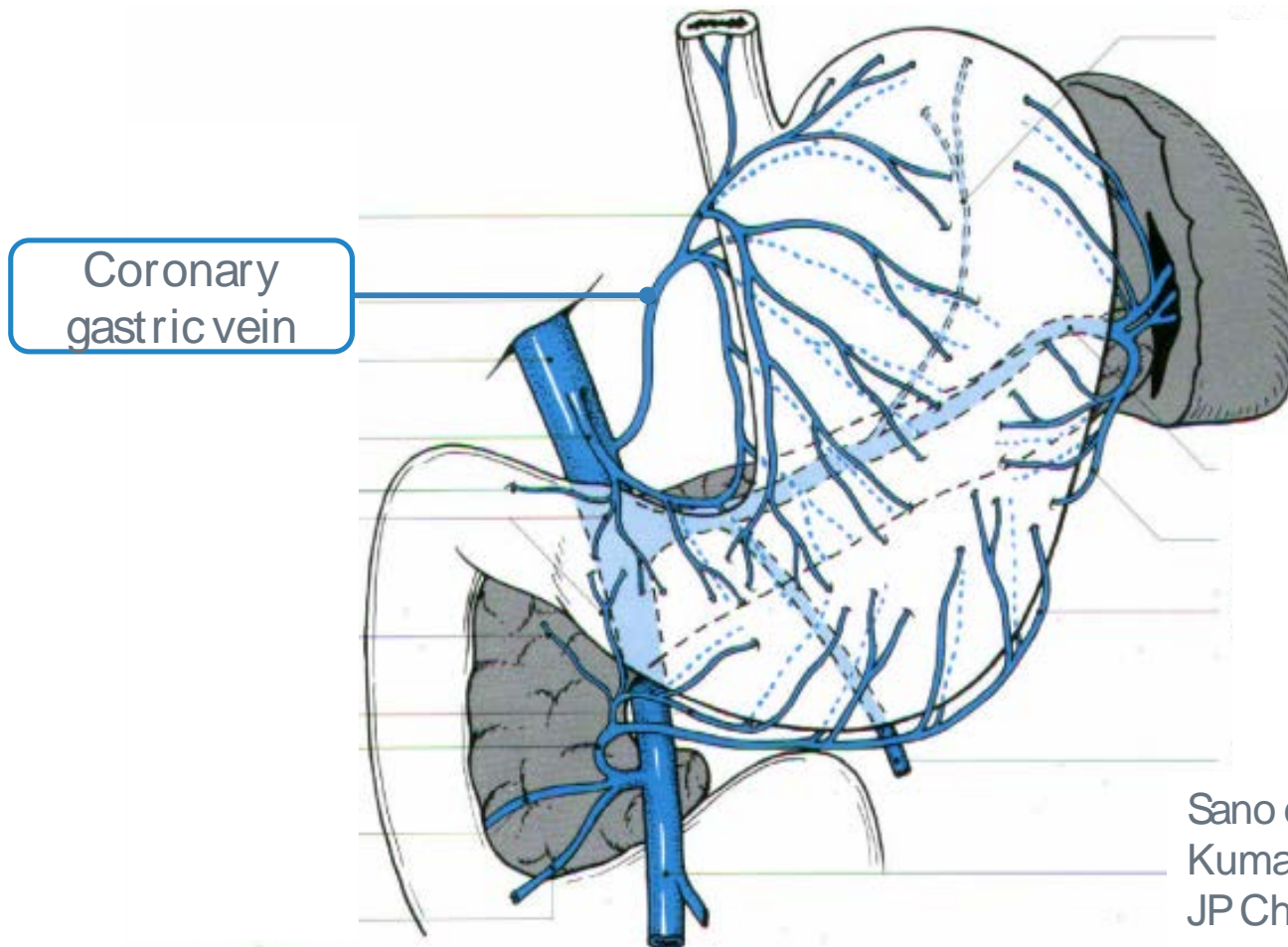
- ▷ Prevalence: $\approx 20\%$
- ▷ No association with the etiology of liver disease

Clinical consequences of PPVA

- ▷ LV volume overload leading to congestive heart failure
- ▷ Hypoxemia
 - Desaturation if shunt carries $> 20\%$ of CO
- ▷ Systemic embolism
 - Mainly described per procedure

Imaging

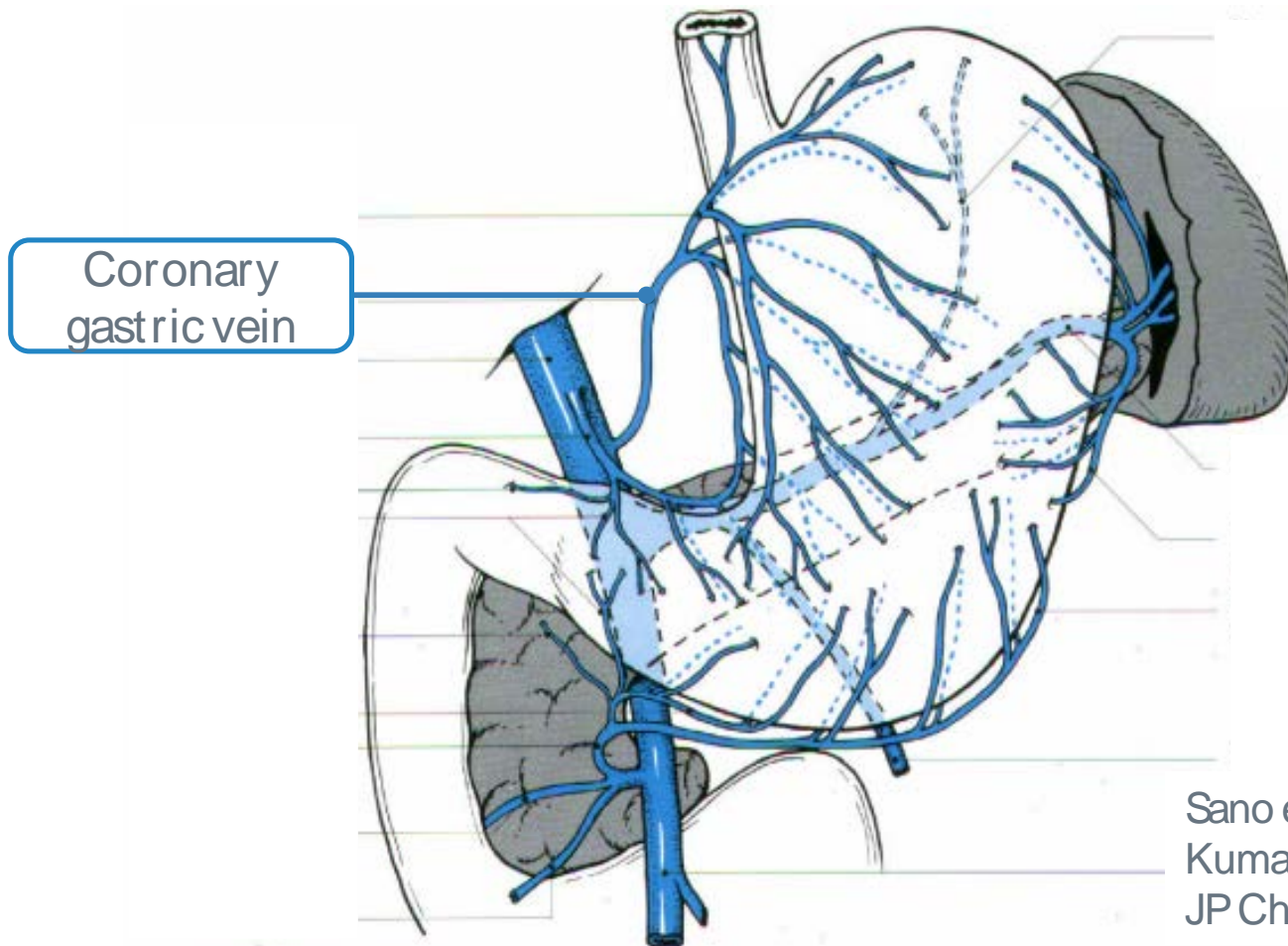
- ▷ Contrast-enhanced CT scan
- ▷ Fluoroscopy combined with contrast TTE
 - Contrast injected in the left gastric vein



Sano et al. Am J Roentgenol (1984)
Kumar et al. J Thorac Imaging (2010)
JP Chevrel. *Anatomie clinique*

Imaging

- ▷ If **PPVA +**:
 - Contrast reaches the LV before the RV
 - Contrast is more prominent in the LV



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3.

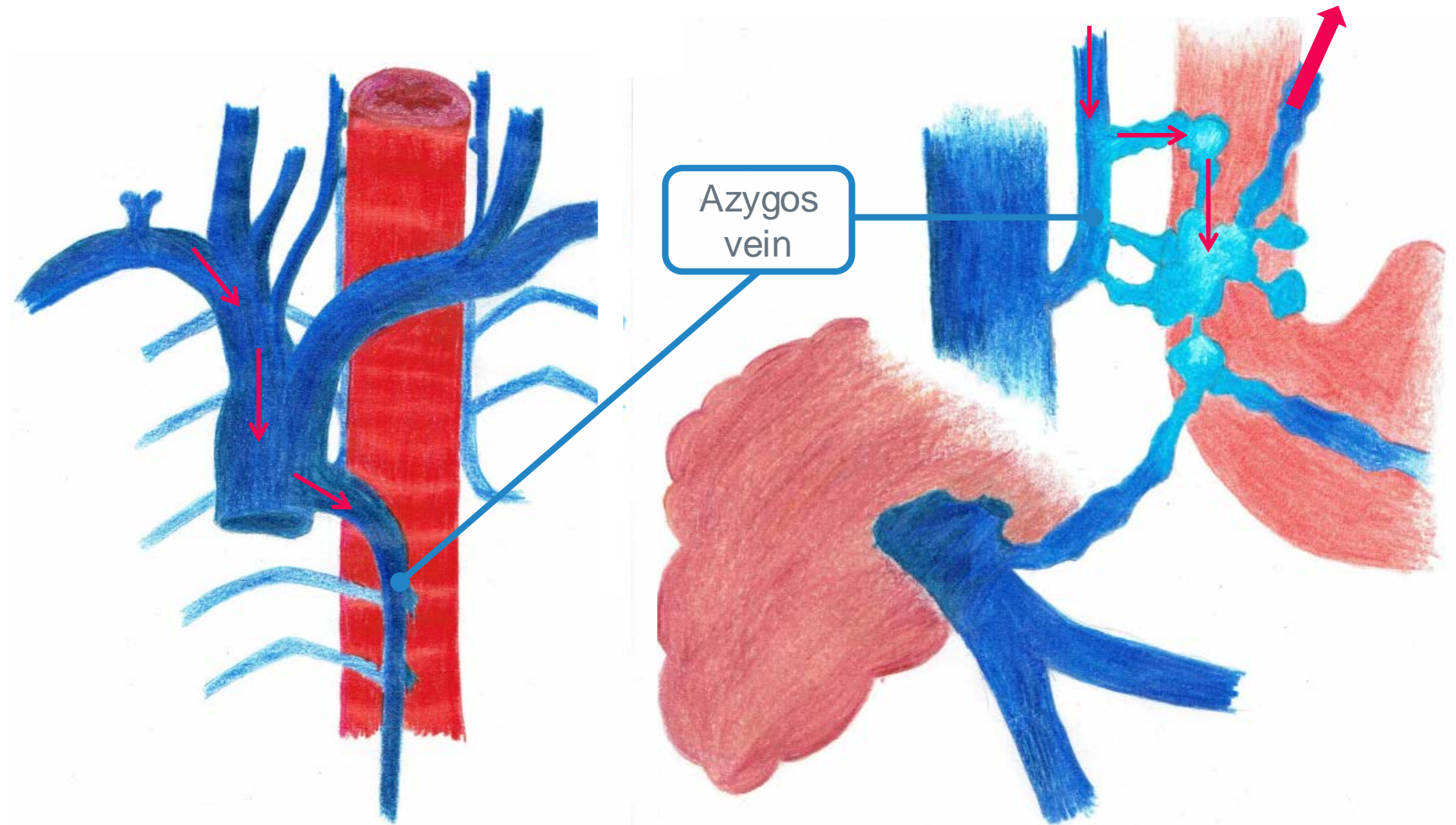
BACK TO THE CLINICAL CASE

Delayed bubbles remain unresolved

- ▷ PPVA is responsible for the cerebral embolism
- ▷ PPVA is a shunt from splanchnic system to left heart
 - It is not a right → left shunt
- ▷ Saline contrast was injected through the PICC line
- ▷ Hypothesis:
 - Backward flow of the contrast towards varices

A pathway via the azygos vein

To pulmonary vein



Adapted from Netter, Atlas d'anatomie humaine (2009)

Transplant occurred 30 days after admission

The PPVA was successfully ligated

Key messages

PPVA is a rare cause of paradoxical embolism in patients with portal hypertension.

Associated risk is not well characterized, however particular vigilance is warranted during interventions.

References

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Thank you