بسم الله الرحمن الرحيم

﴿وما أوتيتم من العلم إلا قليلا﴾

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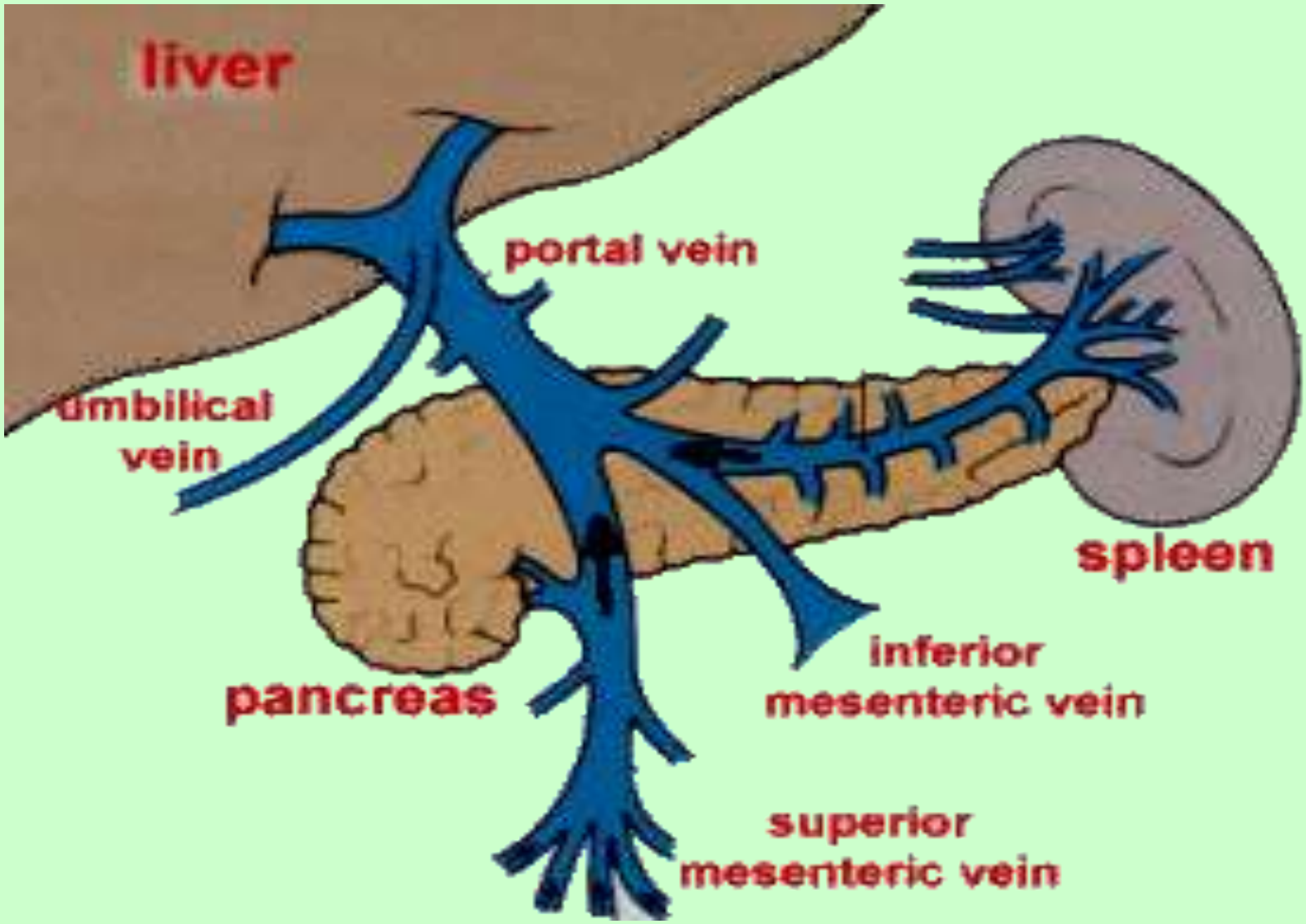
Presents

Portal Vein Thrombosis

Goals of the Lecture:

- What is the portal vein?
- How common is PVT?
- What conditions are associated with PVT?
- How does patient with PVT present?
- How can we diagnose PVT?
- How can we treat patients with PVT?

PORTAL SYSTEM



Vascular supply of the Liver

Portal Vein:

- The diameter is normally up to 12mm, in fasting adults.
- From 13-17mm in suspected cases of portal hypertension.
- ≥17mm is sure portal hypertension.
- In some cases of portal hypertension the P.V diameter is within normal due to the presence of collaterals.

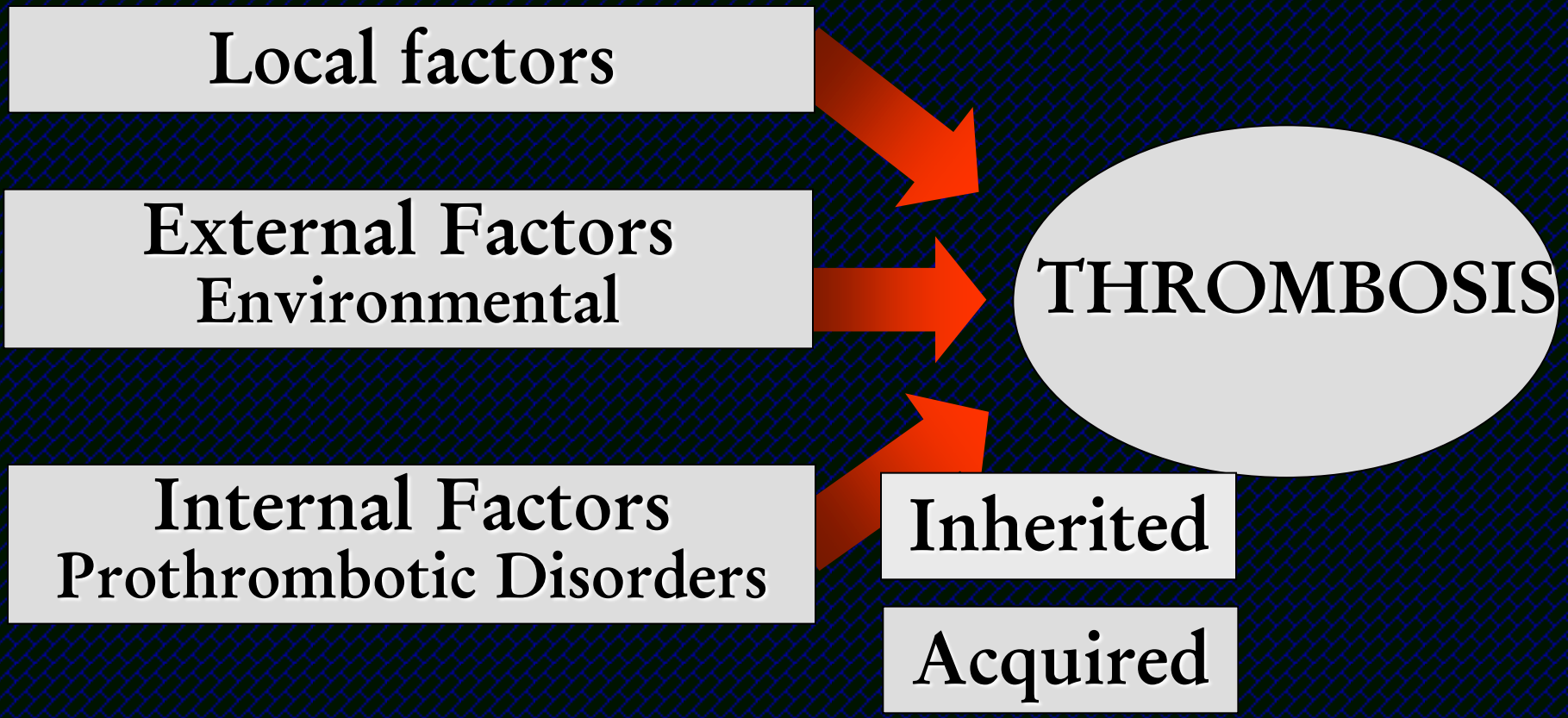
PVT: Epidemiology

- The highest incidence of PVT is in Africa and India- probably due to a high incidence of liver infections, parasites and liver cancers.
- The condition occurs in all ethnic groups and there are no sex differences.
- In children with PVT, the prognosis is much better overall, with a 10-year survival rate greater than 70%, which is attributable to the low incidence of underlying malignancy and cirrhosis.

PVT: Causes

- In adults, approximately 25% of patients with PVT have underlying cirrhosis.
- The annual incidence of PVT among patients with cirrhosis is less than 1 percent.
- No apparent cause for PVT is evident in more than one-third of patients. Many of these patients probably have an underlying hypercoagulable state.

PVT: Causes


Local factors
External Factors
Environmental
Internal Factors
Prothrombotic Disorders
THROMBOSIS
Inherited
Acquired

PVT: Causes

Cirrhosis is most common - 10-30%

Local Factors		Thrombophilia	
Inflammatory	Surgical	Inherited	Acquired
Sepsis	Liver Transplant	FVL	Malignancy
Pancreatitis	Splenectomy	Prothrombin Mutation 20210G/A	APL syndrome
Diverticulitis	Colectomy	Anti-thrombin III	Anti-cardiolipin
Appendicitis	Umbilical Vein Catheters	Protein C/S deficiency	Elevated Homocysteine
Peptic Ulcer Dz	Portocaval Shunt		OCPs
Blunt Trauma			Pregnancy
IBD			

10-50%

40-60%

Risk Factors for PVT in Cirrhosis without HCC

Univariate:

-Age.

-Child-Pugh class.

-Surgery for portal hypertension.

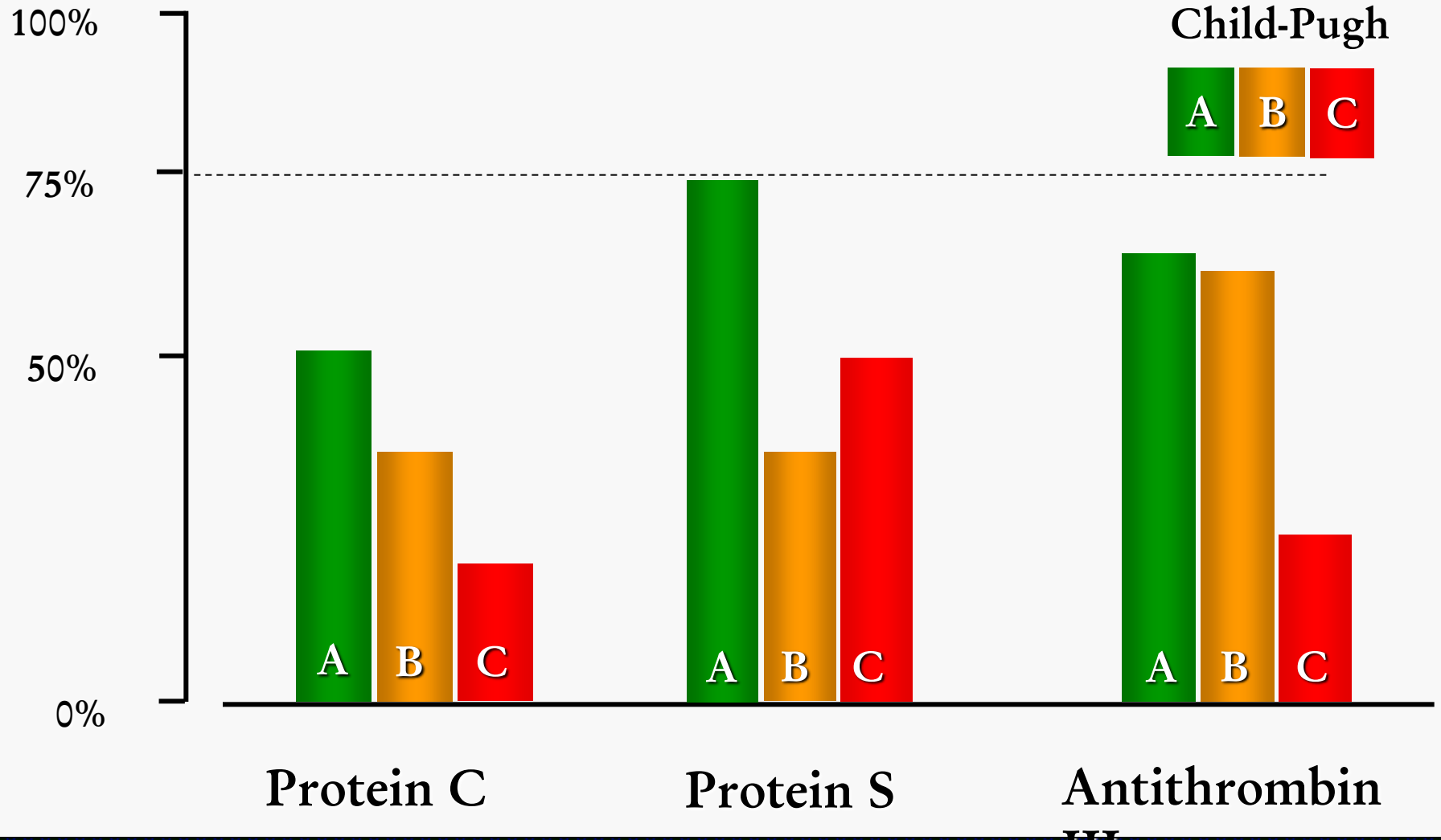
-Endoscopic sclerotherapy.

-Prothrombotic features.

Pathogenesis of PVT in Cirrhosis and in HCC

- **Cirrhosis:**
  - ↓ Portal blood flow.
  - ↓ Liver synthetic activity of protein C, S and antithrombin III.
  - High incidence of concomitant HCC.
- **HCC:**
  - Tumor invasion.
  - Compression or constriction effect.
  - Prothrombogenic changes (cysteine protease).

Coagulation Inhibitors in Cirrhosis



PVT: Causes

Inherited Prothrombotic Disorders:

Loss of function	Gain of function
-Inhibitors (PC, PS, AT)	-Factors (FV, FII)
-Uncommon (< 0.1%)	-Common (> 2.0%)
-High risk	-Moderate risk
-Dg: Plasma level	-Dg: DNA analysis

PVT: Causes

Acquired Prothrombotic Disorders

Common (Moderate risk)	Uncommon (High risk)
-Inflammatory states	-Myeloproliferative dis.
-Malignancy	-APL syndrome
-Hyperhomocysteinemia…	-PNH
	-Behcet's disease…

PVT: Clinical manifestations

- No definitive time-frame distinguishes acute from chronic PVT (~ 60 days).
- Acute PVT could be clinically silent, and is often diagnosed during radiologic examination for other reasons.
- Spontaneous resolution of the acute thrombus may occur and the symptoms improve. In others, development of collaterals may mask the symptoms. However, the chronic variety never resolves on its own.

PVT: Clinical manifestations

Acute:

- Sudden onset of right upper quadrant pain.
- Nausea.
- Fever.
- Progressive ascites.
- Intestinal ischemia resulting from propagation of thrombus, or lack of intestinal perfusion secondary to acute portal hypertension.
- Occasionally, hematemesis (if there is preexisting varices with liver cirrhosis).

PVT: Clinical manifestations

- Chronic PVT may either produce a chronic noncavernous thrombosed portal vein or cavernous transformation of the portal vein.
- Cavernous transformation refers to the development of collateral blood vessels that bring blood in a hepatopedal manner from the region of obstruction.

PVT: Clinical manifestations

Chronic:

- Hematemesis.
- Ascites.
- Hepatic encephalopathy.
- Weight loss, loss of appetite, nausea and abdominal pain.
- Rarely, patients with present with a fever of unknown origin.
- 10-year-survival was 81% without cirrhosis, cancer or mesenteric vein thrombosis.

PVT: Clinical manifestations

- The most common clinical manifestation of chronic PVT is variceal hemorrhage, which occurs at least once in 50 to 70 percent of patients and at least twice in 30%.
- More than 85 to 90% of patients with chronic PVT have esophageal varices, while 30 to 40% have concomitant gastric varices.
- Approximately 50% of patients with chronic PVT have splenomegaly, which may be massive; 10% of these patients have anemia, thrombocytopenia, and leukopenia (hypersplenism).

PVT: Clinical manifestations

- A small amount of ascites is present in about 10% of patients. Patients typically do not have significant ascites unless they develop acute dilutional hypoalbuminemia during fluid resuscitation for a variceal bleeding or have associated cirrhosis.
- Jaundice, which is present in approximately 5% of patients, is usually related to concomitant hepatobiliary disease.
- Pylephlebitis should be considered in patients with fever and bacteremia or sepsis in addition to the clinical manifestations described above.

PVT: Clinical manifestations

Advanced Liver Disease

⇩

Blood stasis
Wall changes (PHT)

⇩

Thrombosis

Thrombosis

⇩

Decreased Portal Blood Inflow

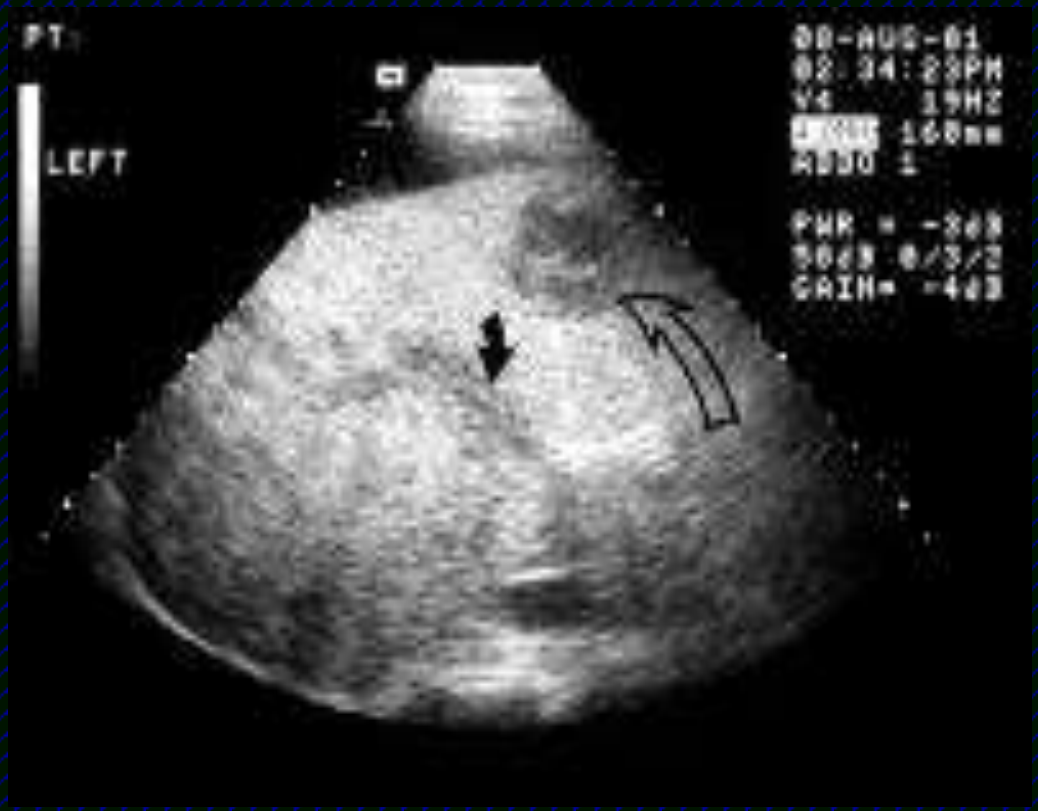
⇩

Advanced Liver Disease

Investigation: Radiology

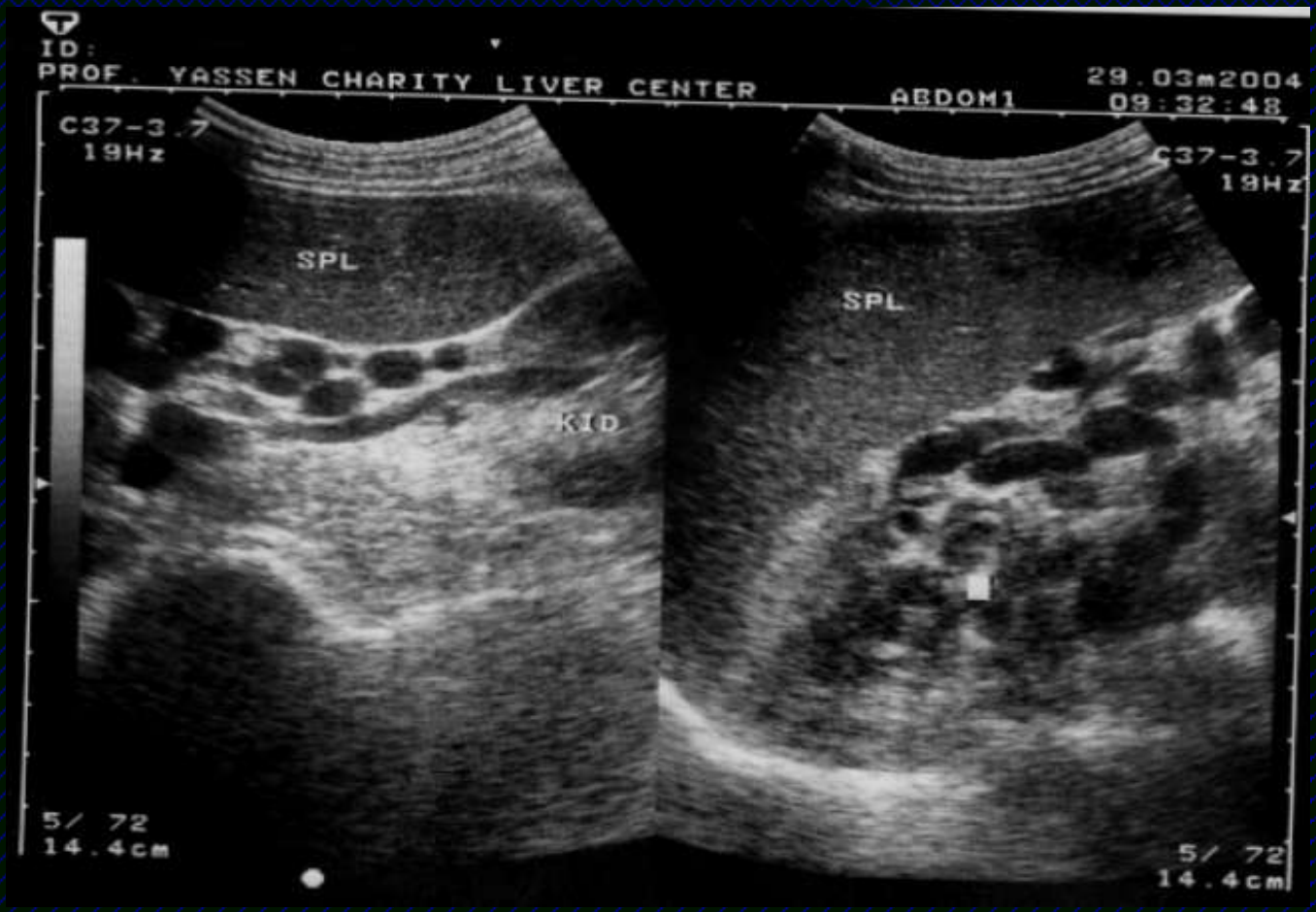
- Color doppler ultrasonography:
  - Echogenic thrombus within portal vein lumen.
  - Dilation proximal to the occlusion.
  - Absence of an identifiable portal vein.
  - Collateral vessels (cavernous transformation).
- CT scan:
  - Filling defect in contrast-enhanced lumen.
  - Train track appearance when totally occluded.
- MR angiography.
- Portal venography.
- Endoscopic ultrasound.

Investigation: Radiology



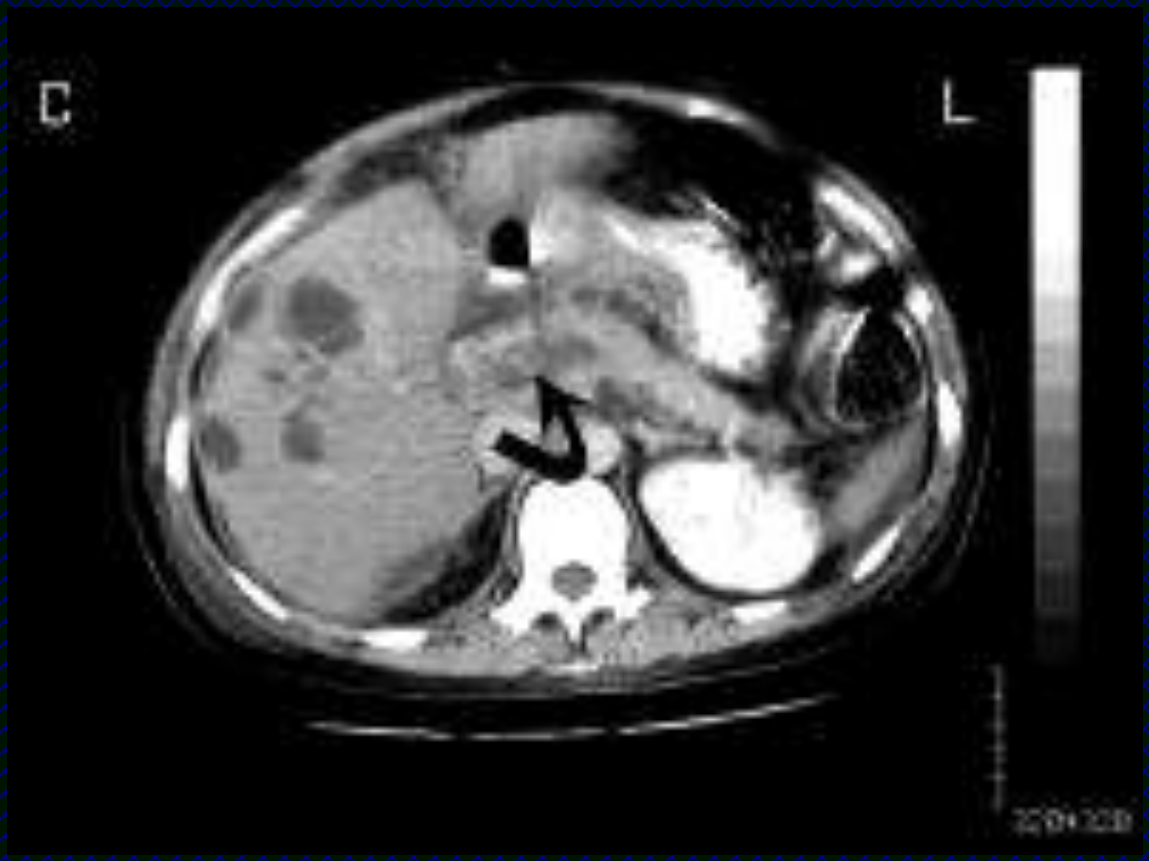
- PVT: Image shows ascites and a bright liver (fatty). The portal vein has a linear echogenic structure running the length of the portal vein (solid arrow). A complex cystic mass is present within the liver (open arrow .(

Investigation: Radiology



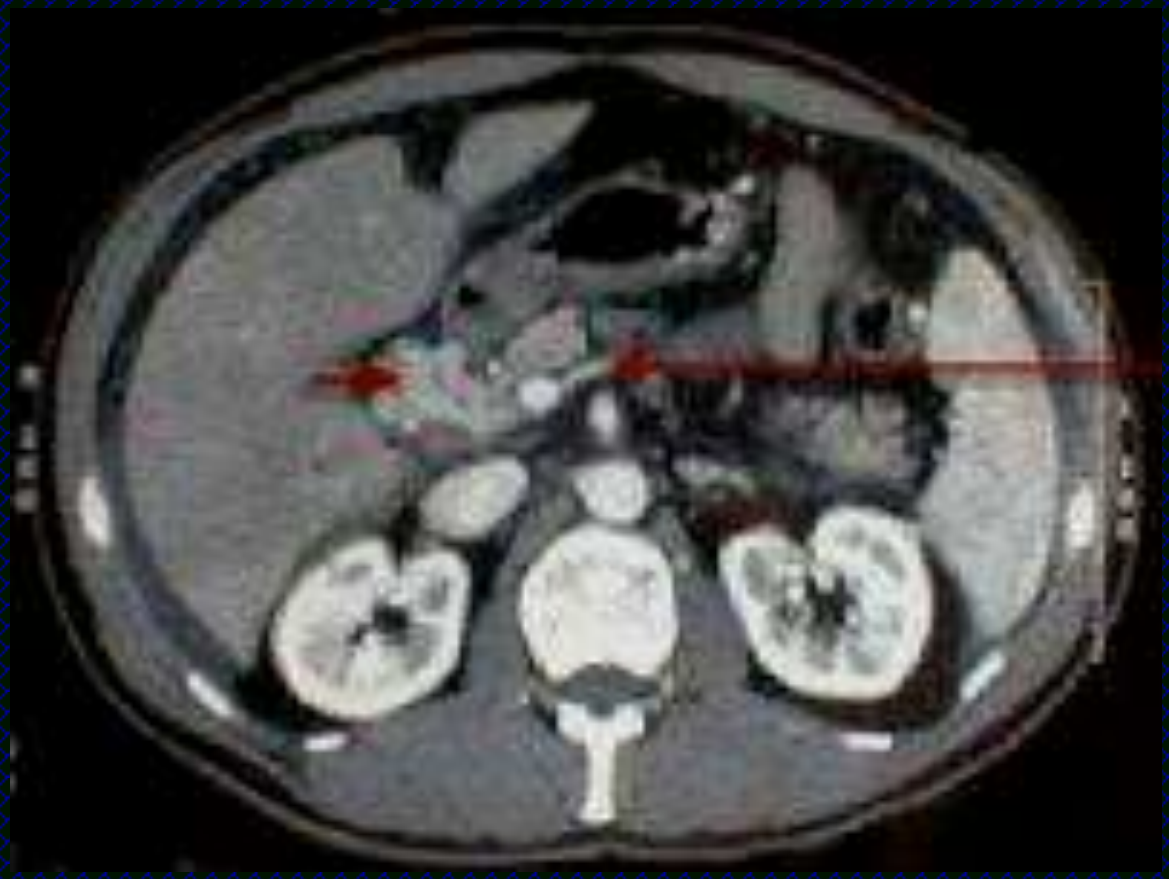
- PVT: Abdominal US shows extesive splenic collaterals .

Investigation: Radiology



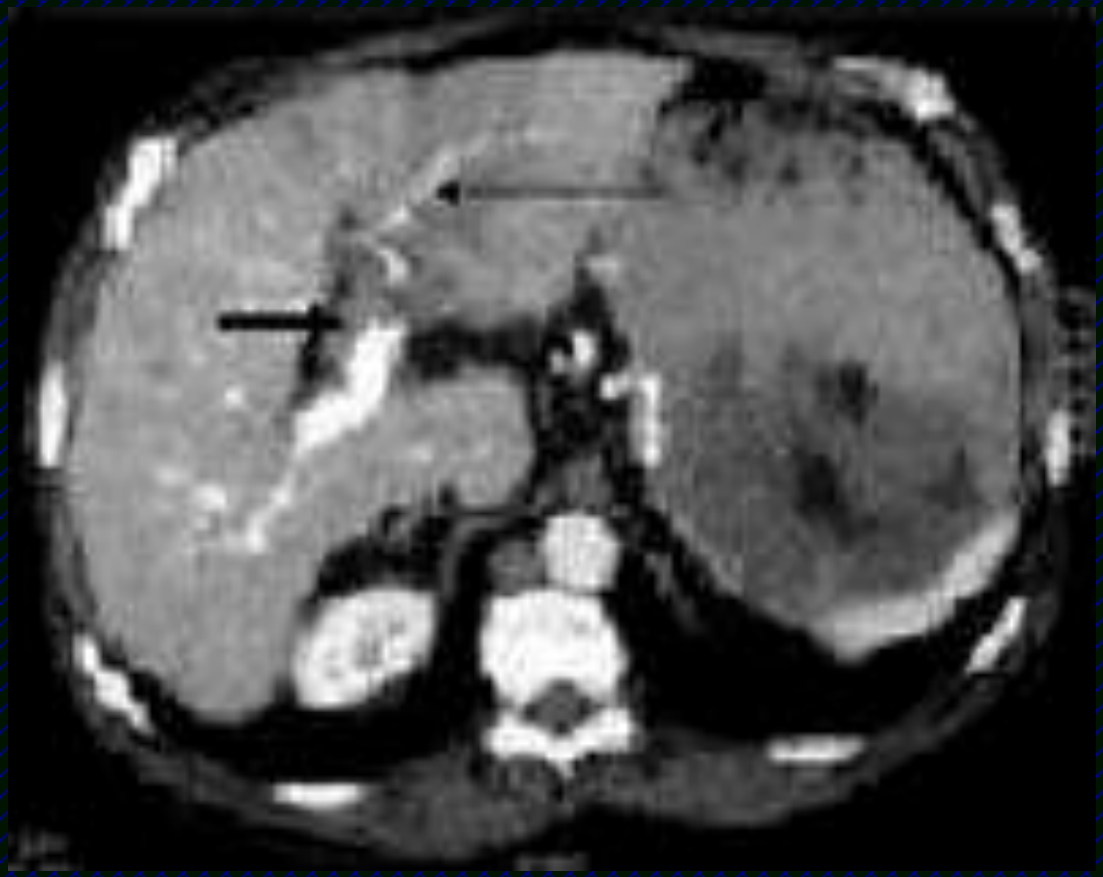
- PVT. Portal venous-phase enhanced axial CT scan, shows a low-attenuating mass in the termination of the splenic vein (arrow). Note the multiple low-attenuating masses at the periphery of the right lobe of the liver .

Investigation: Radiology



- PVT with cavernous transformation. The long arrow indicates the splenic vein at the junction with the superior mesenteric vein just below the site of thrombosis. The short arrow points to a serpiginous mass consistent with periportal collaterals, the so-called cavernous transformation of the portal vein .

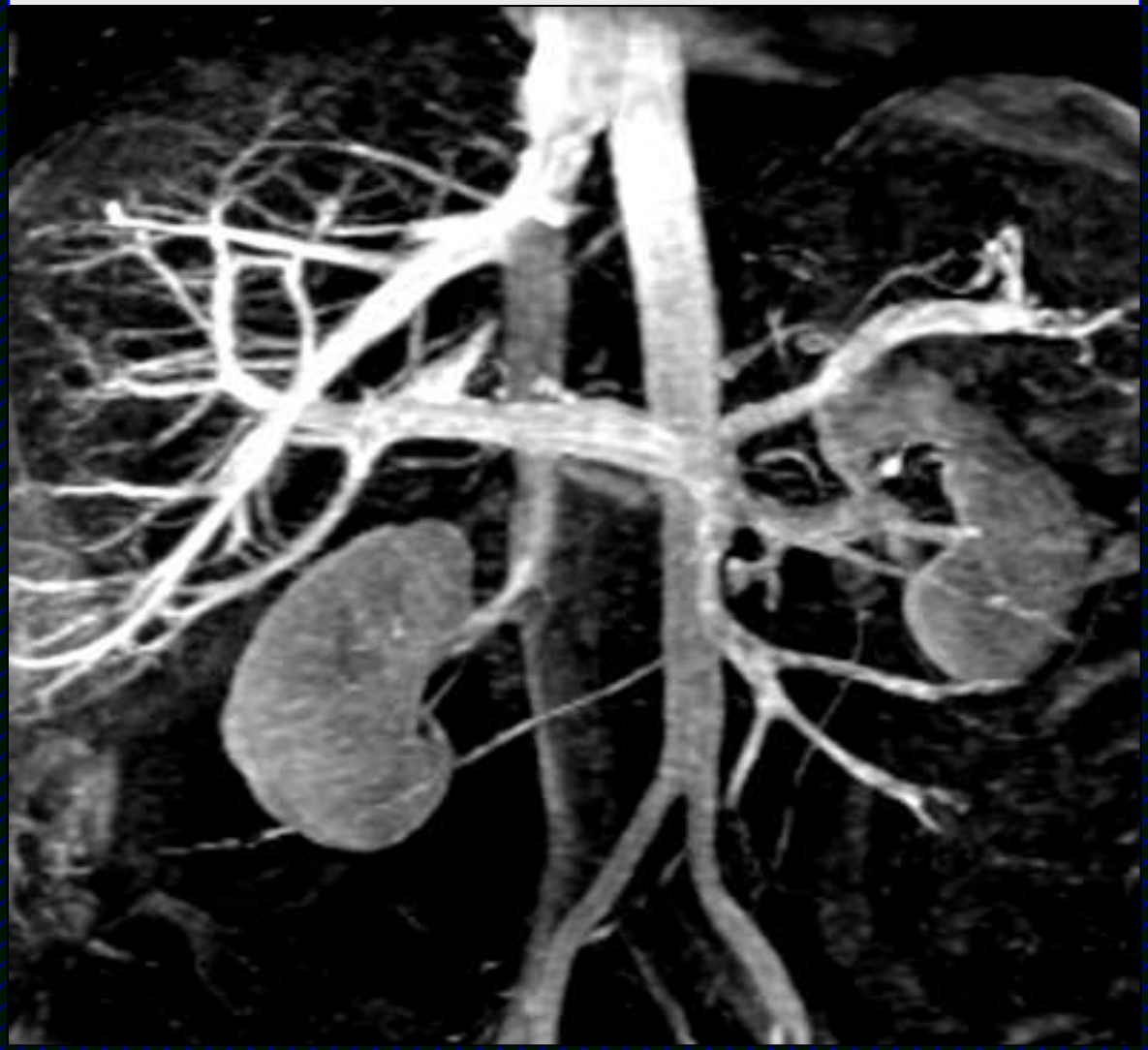
Investigation: Radiology



- Hepatocellular carcinoma with PVT. The short arrow indicates the tumor thrombus with an abrupt cut off of the portal vein. The long arrow points to a compensatory, prominent left hepatic arterial branch .

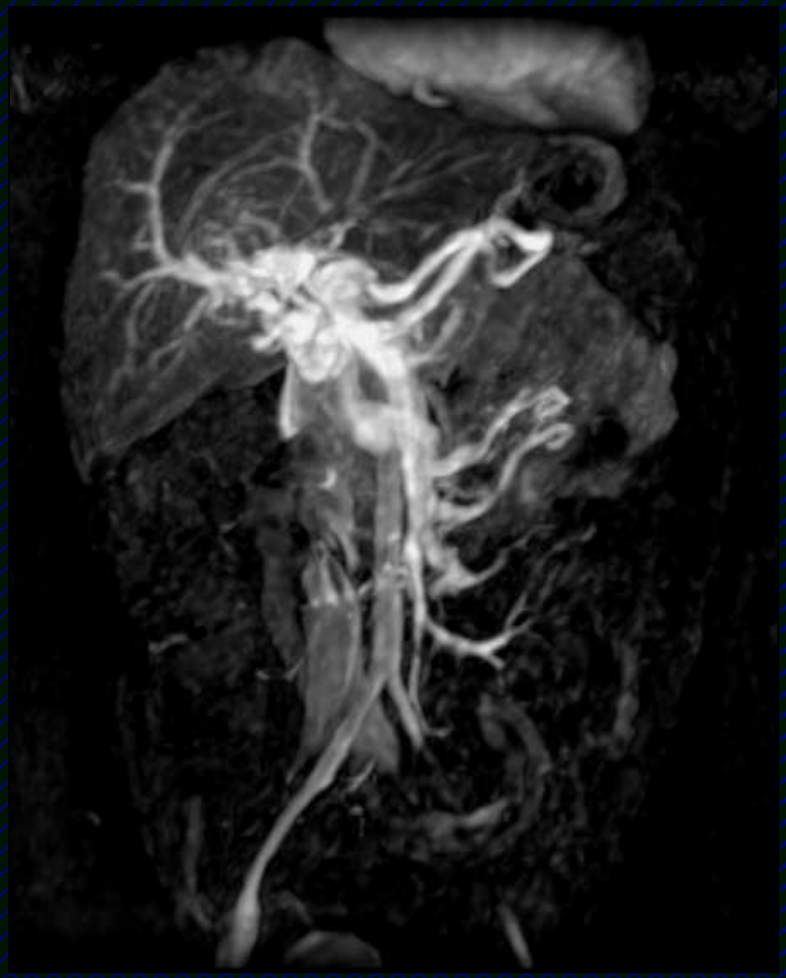
Investigation: Radiology

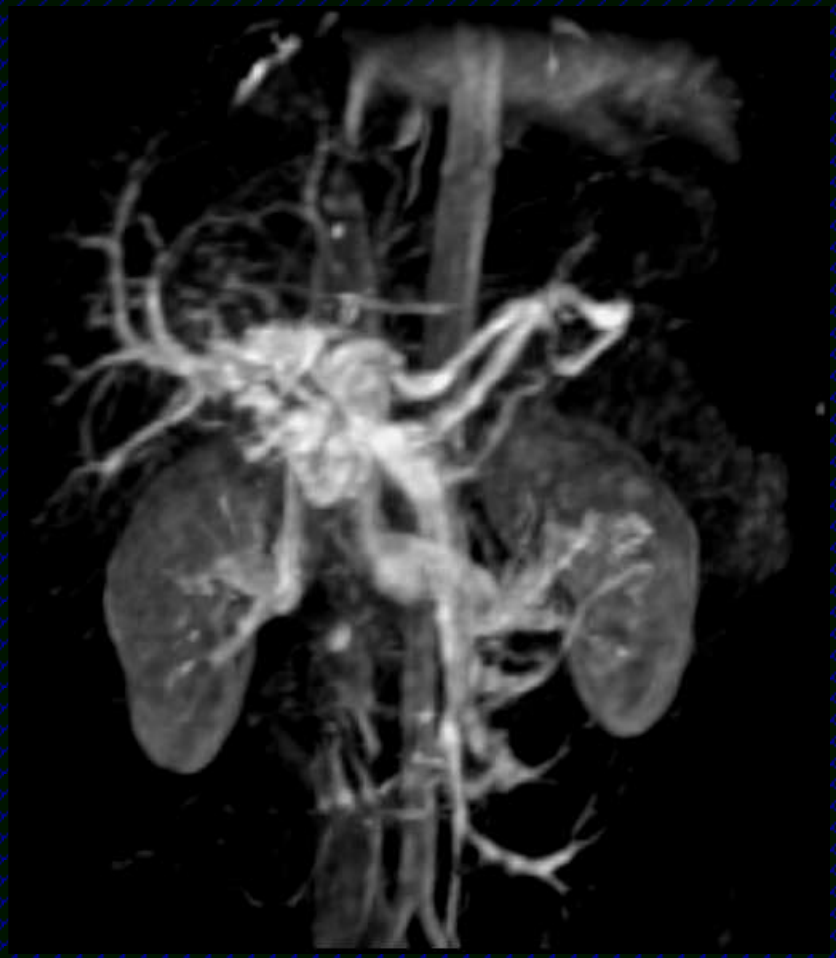
Portal MR Venography



Investigation: Radiology

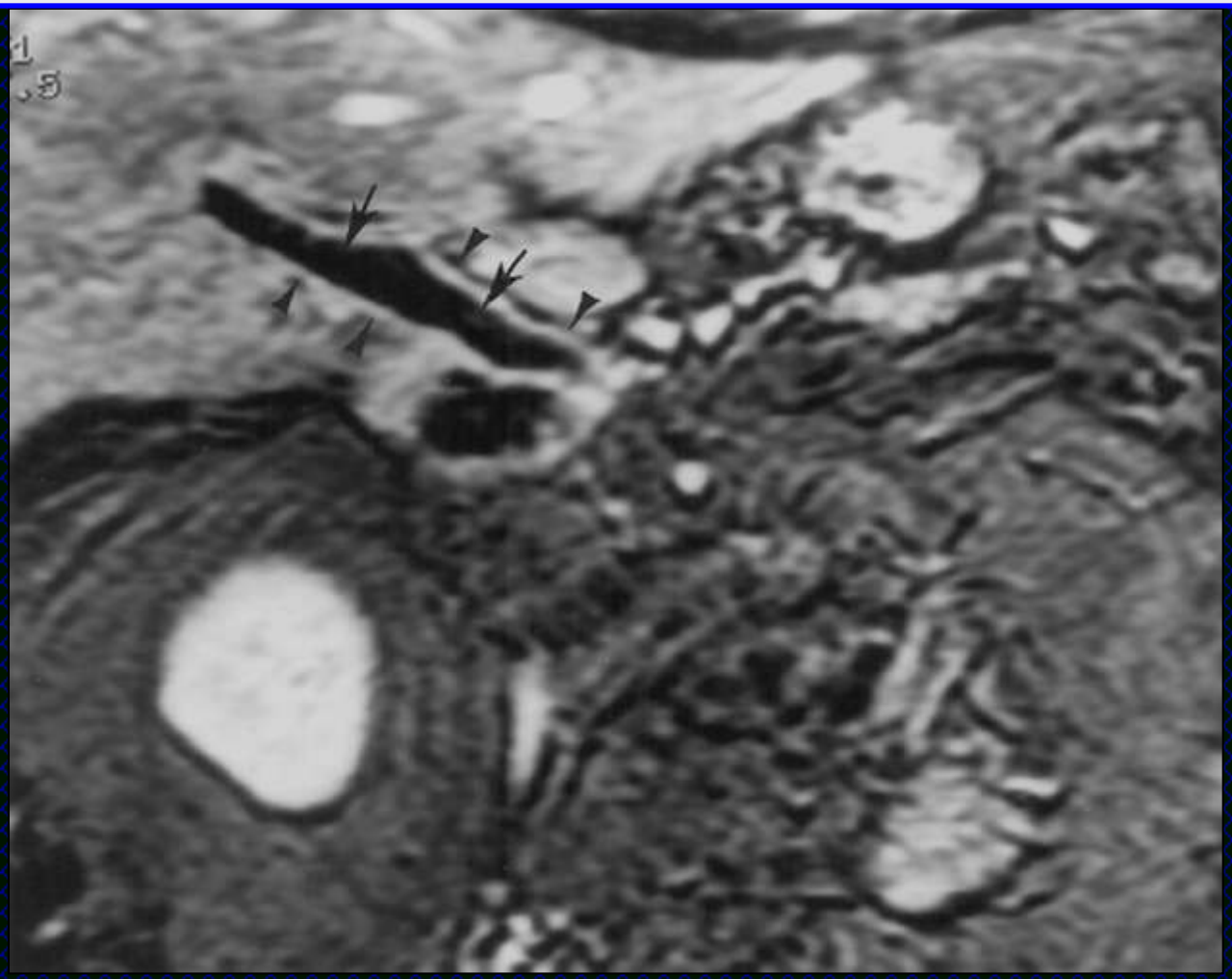
Cavernous Transformation





Investigation: Radiology

Acute thrombosis of portal vein (arrows) with perithrombus enhancement (arrowheads)



Maximum Intensity Projection

Investigations: Work-up

- Factor II and V mutations.
- APLA antibodies:
  - Lupus anticoagulant.
  - Anti-cardiolipin.
- Anti-β2 glycoprotein antibodies.
- PNH screen (CD55, CD59).
- Homocysteine elevation.

Investigations: Work-up

- Protein C, Protein S deficiencies:
  - Can be low in cirrhosis.
- Anti-thrombin III deficiency:
  - Can be low in cirrhosis.
- Factor VIII elevation:
  - Acute phase reactant.
- JAK2 V617F mutation:
  - 90-95% of polycythemia vera.
  - 50-70% of essential thrombocytosis.
  - 40-50% of myelofibrosis.

Investigations: The Prothrombin Mutation

Prothrombin G20210A Mutation

- A G-to-A substitution in nucleotide position 20210 is responsible for a factor II polymorphism.
- The presence of one allele (heterozygosity) is associated with a 3-6 fold increased for all ages and both genders.
- The mutation causes a 30% increase in prothrombin levels.

Differentials Diagnosis:

- Budd-Chiari Syndrome .
- Cirrhosis .
- Sarcoidosis.
- Schistosomiasis .
- Toxicity, arsenic.

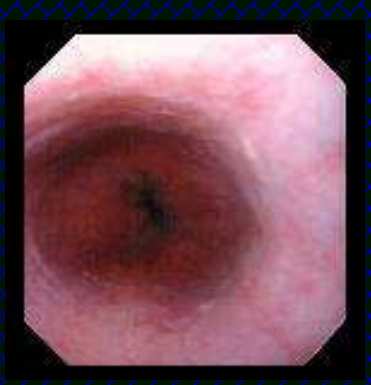
Management:

Goals of therapy:

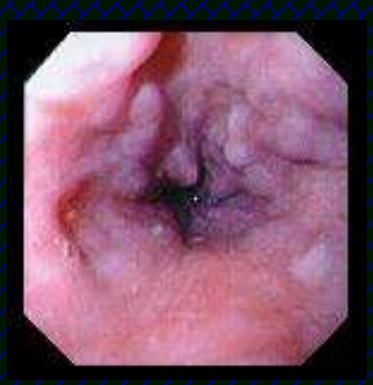
- ✓ Reverse or prevent the advancement of thrombosis.
- ✓ Treatment of complications.

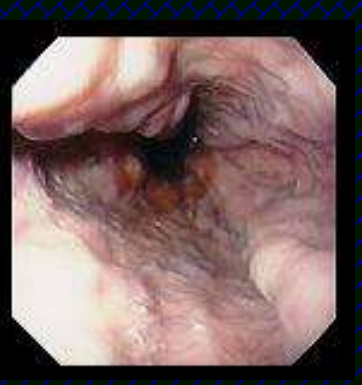
Management:

- Several anecdotal reports have documented successful lysis of acute PVT using SK or tPA administered locally by a catheter passed via a transjugular transhepatic or percutaneous transhepatic route.
- The treatment of chronic PVT depends upon the stage of the disease and the patient's comorbidities. Primary prophylaxis using nonselective beta blockers or endoscopic ligation could decrease the risk of variceal bleeding.

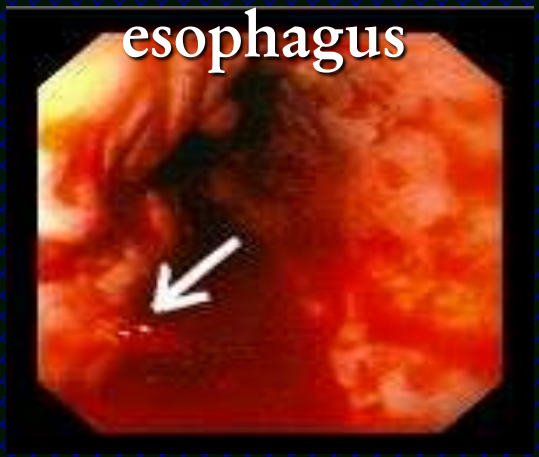


Normal esophagus

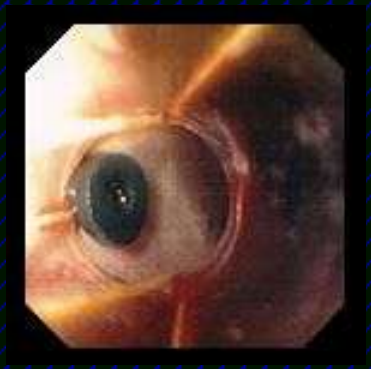


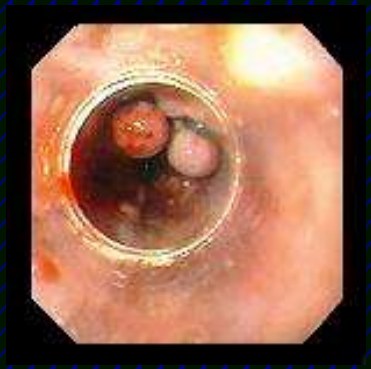


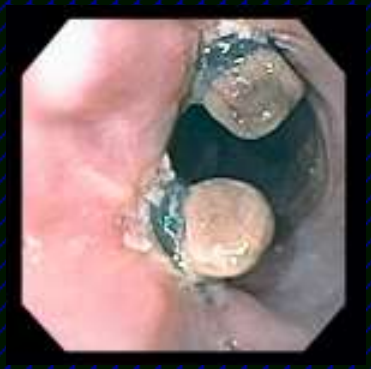
Esophageal varices



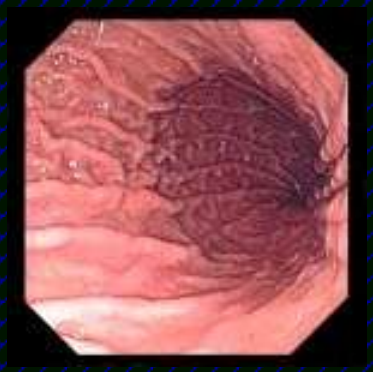
Bleeding varix



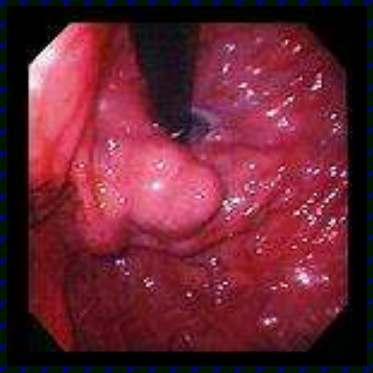


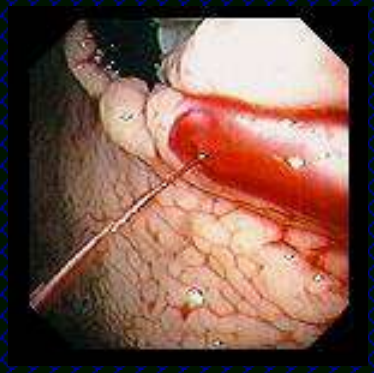


Band ligation

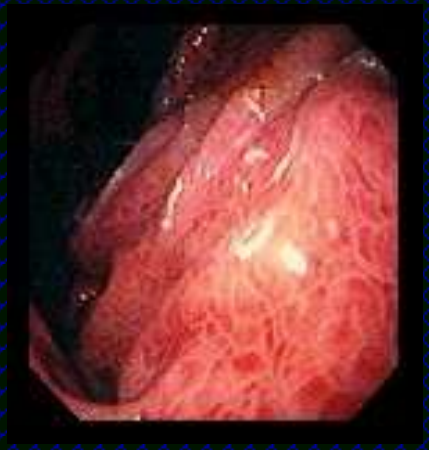


Normal stomach





Gastric fundal varices



Portal gastropathy

Management: Medical

- Chronic anticoagulation is a reasonable option in a very select subset of patients with recent onset of disease who:
  - Do not have underlying liver disease.
  - Have an acute or subacute PVT.
  - Do not have evidence of a recanalization.
- There is no role for anticoagulation in patients who have already developed cavernous transformation.

Management: Medical

- Adults who have acute PVT secondary to abdominal sepsis may completely recover, and the vessel may recanalize with successful treatment of the underlying sepsis .
- In children, the portal vein may recanalize with the development of multiple, small, collateral channels .

Management: Intervention

- PVT can mandate the need for emergency endoscopy for sclerotherapy of varices, TIPS, surgical portocaval shunt, transjugular or transhepatic portomesenteric thrombolysis and thrombectomy, or even resection of ischemic bowel or liver transplantation. Fine-needle aspiration biopsy of PVT can be performed with color doppler sonographic guidance to assess therapeutic effectiveness .

Conclusion

PVT: Conclusion

- Abdominal pain is more the exception than the rule in PVT and indicates likely mesenteric vein involvement.
- LFT's are often normal in PVT.
- Hypercoaguable states, not cirrhosis, account for majority of PVT cases.
- Myeloproliferative disorders are the most common explanation.
- Thrombolytics if mesenteric vein involvement.

THANK YOU