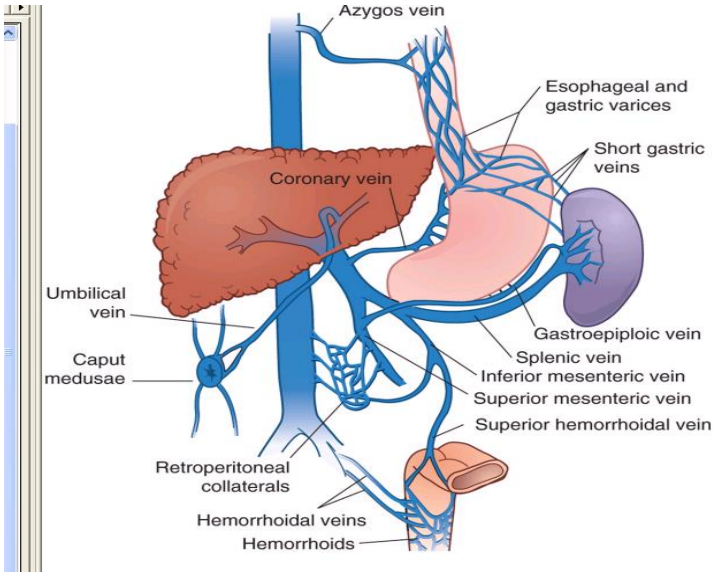
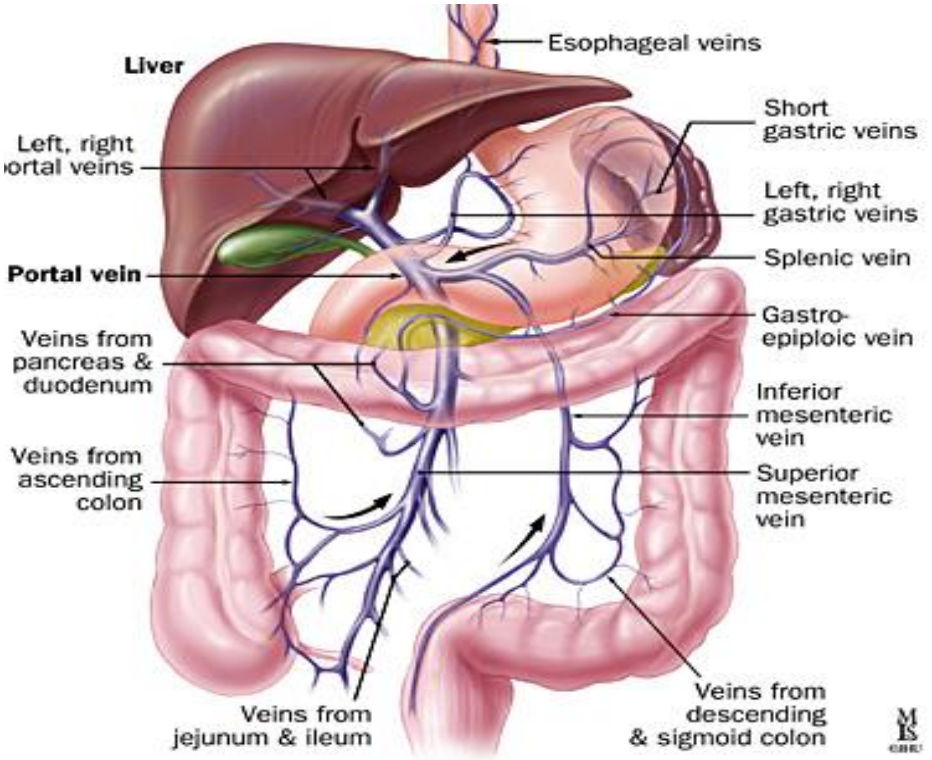
Portal Hypertension

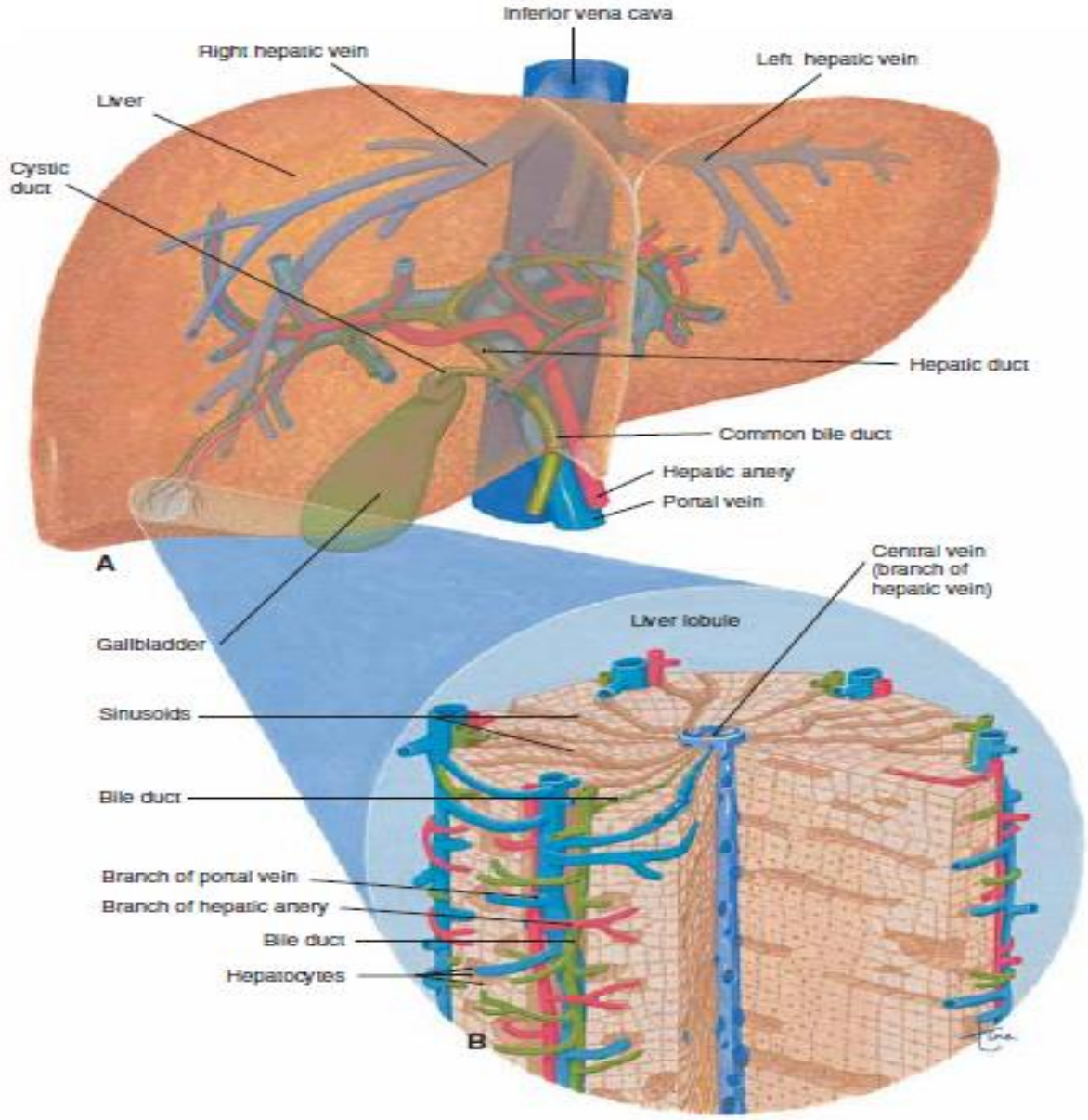


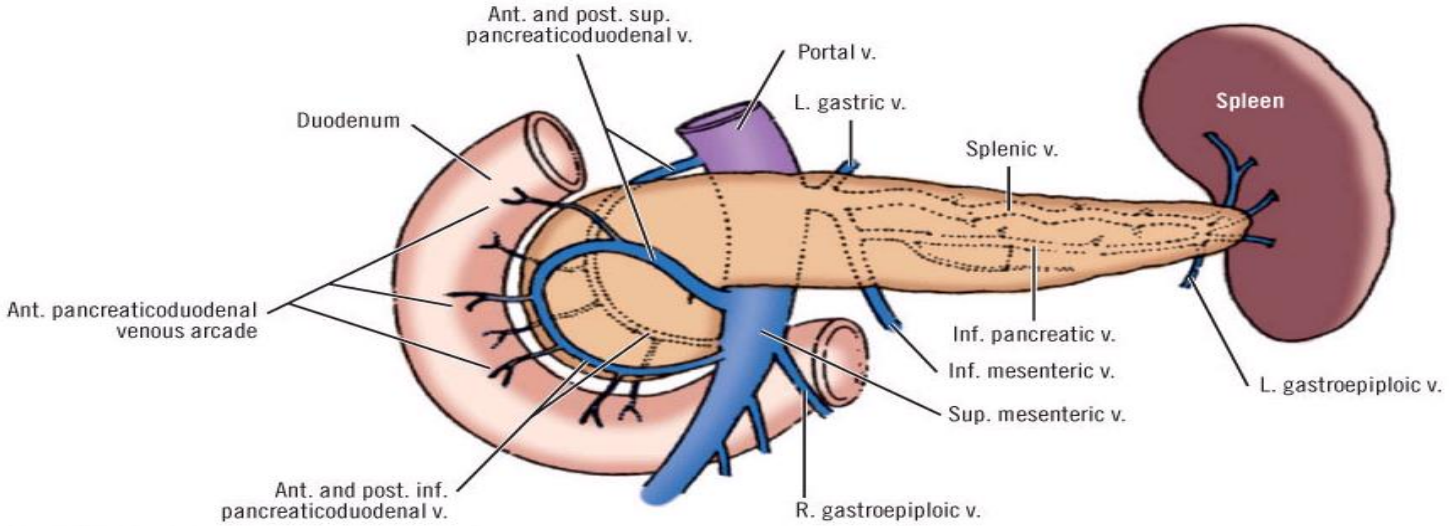


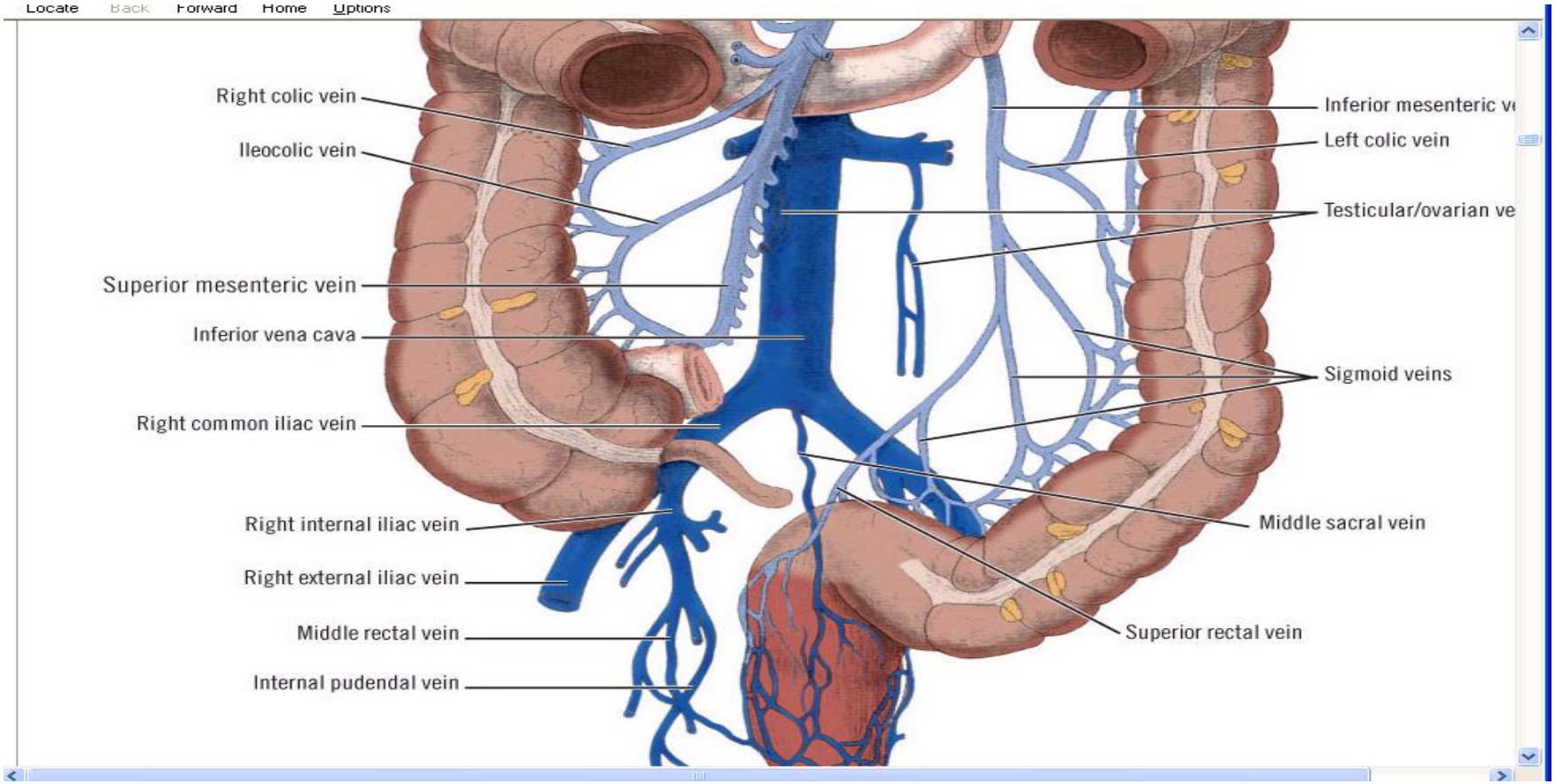
Michal Oren

Lecture contents- PH

- anatomy of splanchnic, extrahepatic circulation
- Basic facts –liver physiology
- PH- definitions
- PH- Pathophysiology
- PH- Etiologies
- PH- Clinical features(History, physical exam, complications , lab tests, Child – Pugh classification)
- **Treatment for ACUTE Variceal hemorrhage**
- **Prevention of recurrent hemorrhage**



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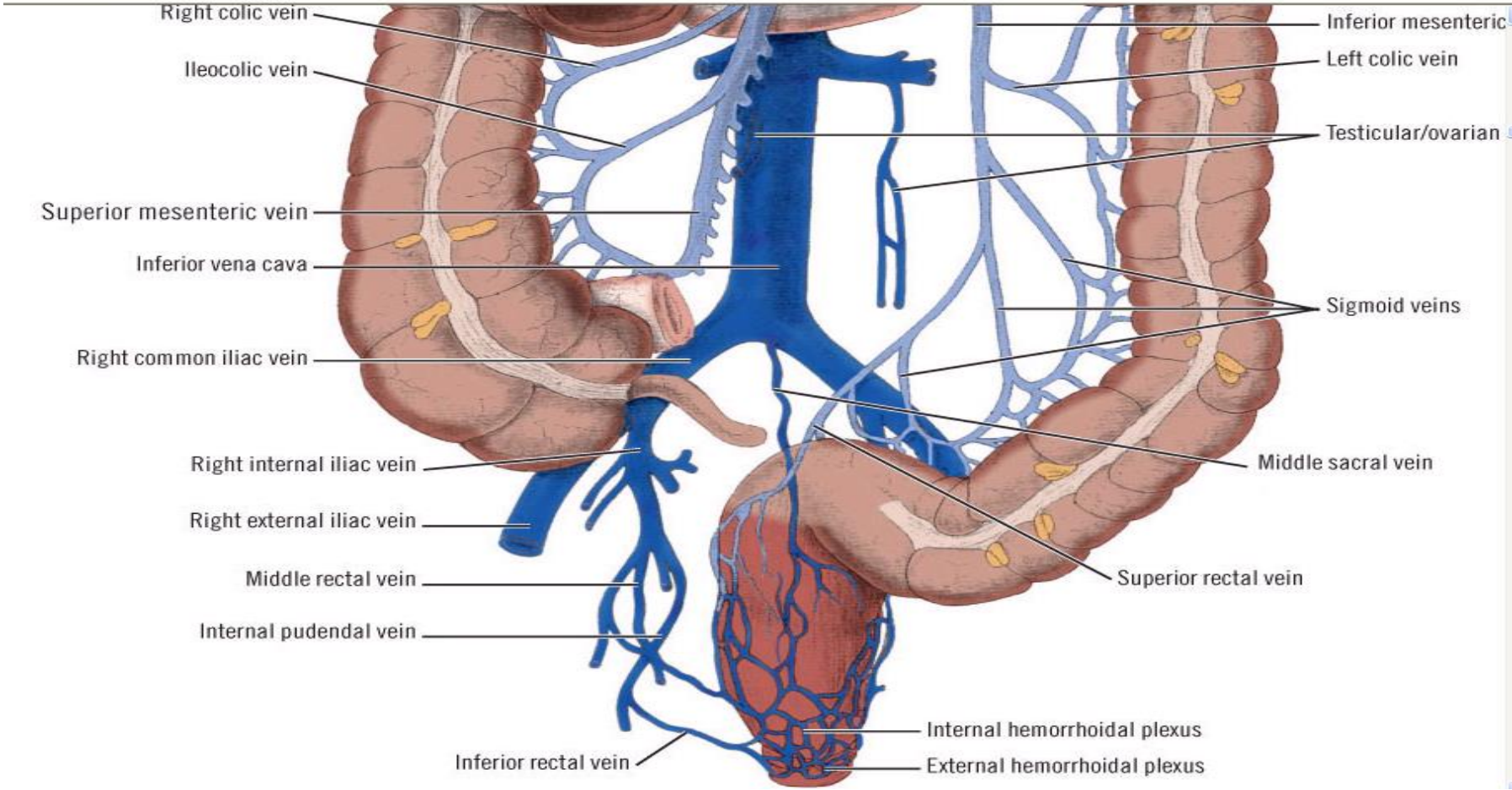
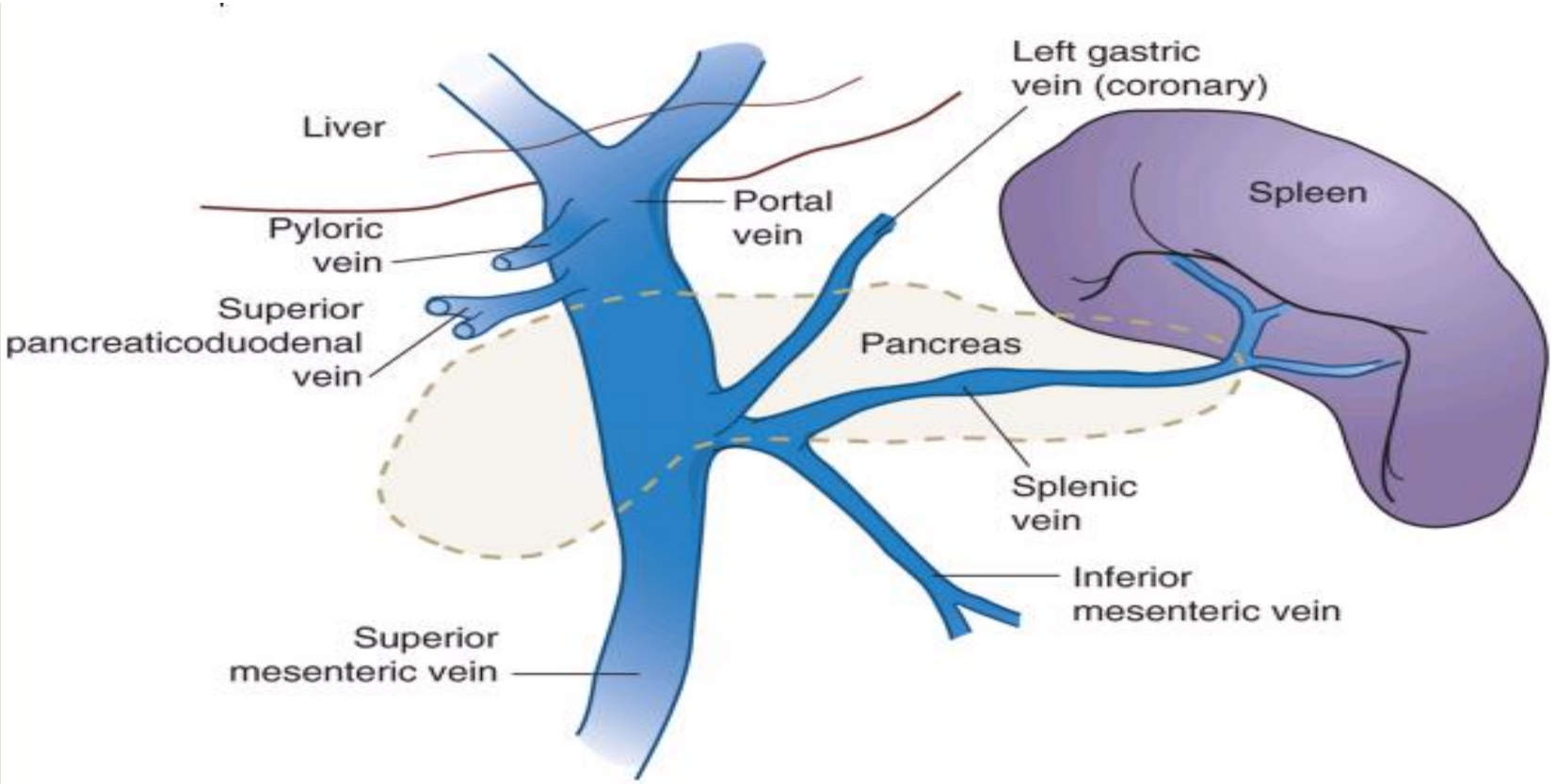
Sigmoid veins
Middle sacral vein
Superior rectal vein



The extrahepatic portal venous circulation

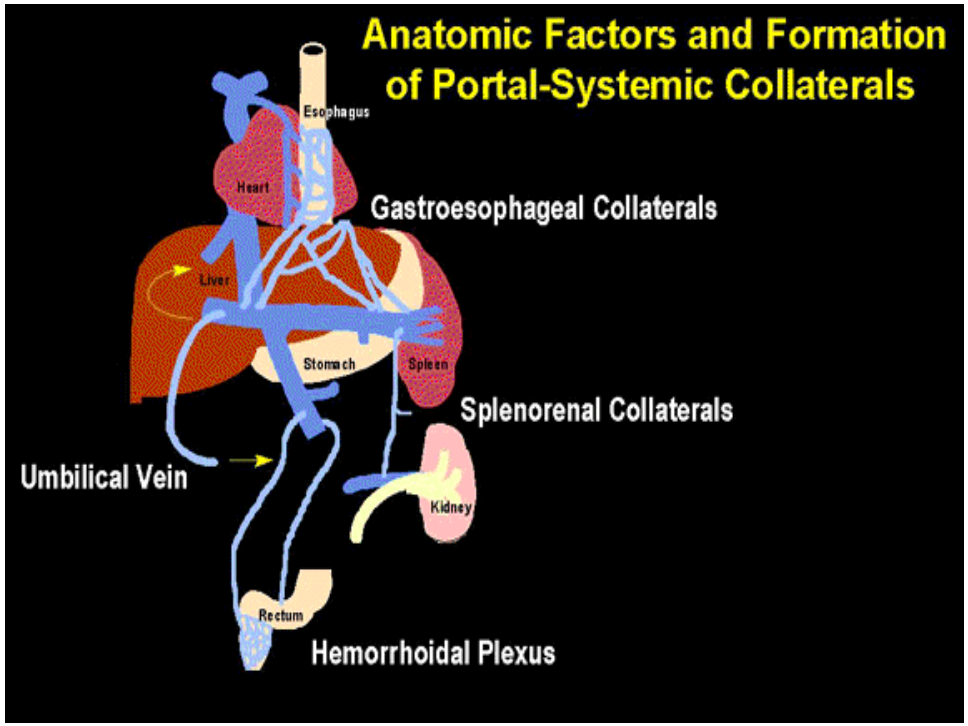


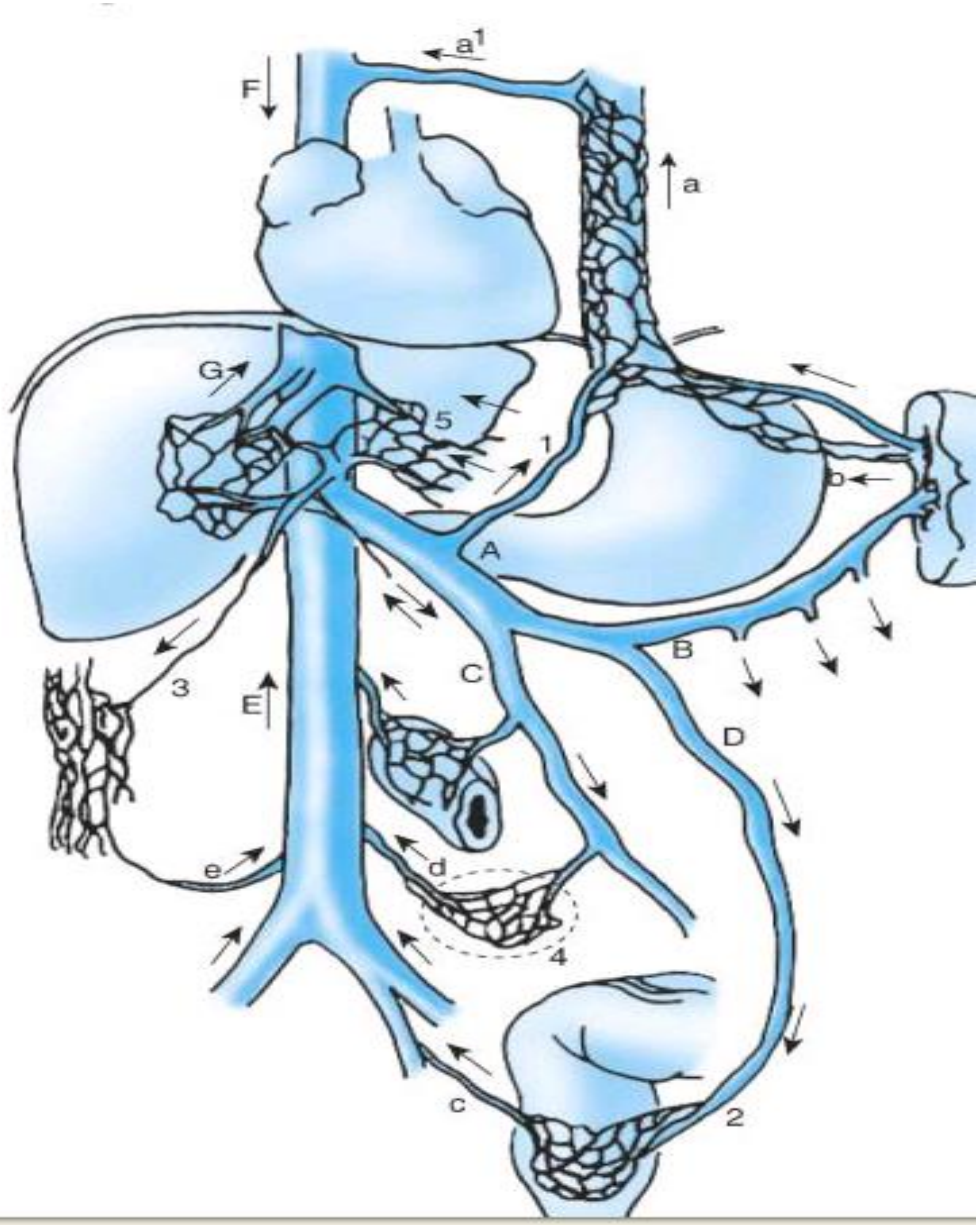
Basic facts about liver’s physiology

- dual blood supply: portal venous and hepatic arterial
- Hepatic blood flow averages 1500 mL/minute
- portal vein contributes two thirds of the total hepatic blood flow
- hepatic arterial perfusion accounts for more than half of the liver's oxygen supply

Definitions:

- portal venous pressure > 5 mmHg
- collaterals > 10 mmHg
- bleeding > 12 mmHg

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Portal hypertension

caused by :

(1) increased intrahepatic resistance

(2) (2) increased splanchnic blood flow

Etiologies:

- Pre- hepatic
- Hepatic
- Post -hepatic

prehepatic

- portal vein thrombosis
- Congenital atresia or stenosis of portal vein
- splenic vein thrombosis
- left sided portal hypertension (inflammation – tumor)
- Splanchnic arteriovenous fistula

intrahepatic - presinusoidal

Primary biliary cirrhosis (early stage)

- Idiopathic portal hypertension (early stage)
- Myeloproliferative diseases
- Polycystic disease
- Hepatic metastasis
- Schistosomiasis
- Hepatic fibrosis

intrahepatic - sinusoidal / post-sinusoidal

- Hepatic **cirrhosis**
- Acute alcoholic hepatitis
- Schistosomiasis (advanced stage)
- Primary biliary cirrhosis (advanced stage)
- Idiopathic portal hypertension (advanced stage)
- Acute and fulminant hepatitis
- Congenital hepatic fibrosis

intrahepatic - sinusoidal / post-sinusoidal

- Vitamin A toxicity
- Venoocclusive disease
- Budd-Chiari syndrome

Post- hepatic

- Inferior vena cava (IVC) obstruction
- Right heart failure
- Constrictive pericarditis
- Tricuspid regurgitation
- Budd-Chiari syndrome
- Veno-occlusive disease
- Arterial-portal venous fistula
- Increased portal blood flow
- Increased splenic flow

Cirrhosis

alcohol	
viral	hepatitis B & C
cholestatic	primary biliary cirrhosis
	Autoimmune cholangitis
	primary sclerosing cholangitis
autoimmune	AIH
metabolic	hemochromatosis
	Wilson's
	alpha 1 – antitrypsin deficiency
Cardiac	cardiac cirrhosis

Cirrhosis

- **two major phenomena:**

loss of cell mass - *hepatocellular failure*

increased hepatic vascular resistance - ***portal hypertension***

Clinical Features- History:

- Jaundice
- Pruritus, fatigue, steatorrhea, deficiencies of fat-soluble vitamins
- past history of chronic alcoholism/hepatitis/ complicated biliary dis./exposure to hepatotoxins

Clinical Features- complications of portal HTN:

- Melena, Hemoptysis, Hematochezia (**variceal GE bleeding)**
- **Ascites**
- fever,pain (SBP)
- **Splenomegaly (hypersplenism)**

Physical examination:

- spider angiomas
- palmar erythema
- Clubbing
- Dupuytren contracture
- Testicular atrophy
- Muscle wasting
- Gynecomastia

- A **palpable spleen** suggests portal HTN
- **Firm and irregular liver edge**

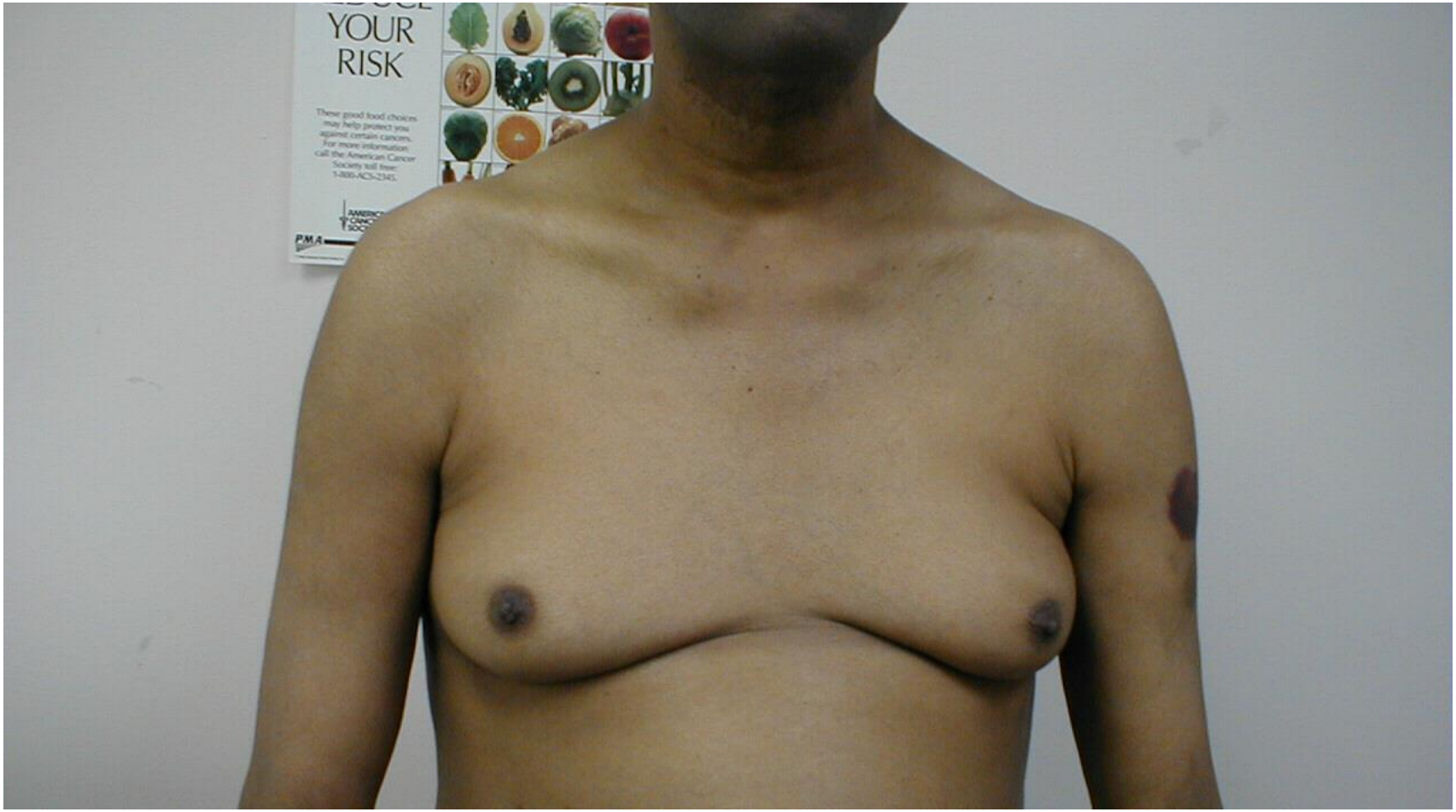
- **Shifting dullness (=ascites**)
- **Dilated abdoimnal veins**
- Impaired mental status
- Asterixis

Ascites

Caput medusa

Palmar erythema

Gynecomastia



Dupuytren contracture

Laboratory Tests

- serum alanine and aspartate aminotransferases (ALT and AST)
- alkaline phosphatase, glutamyl transpeptidase (GGT)
- direct and total serum bilirubin
- albumin
- prothrombin time.
- hepatitis serology
- autoimmune markers –

❑ primary biliary cirrhosis (antimitochondrial antibody; AMA)

❑ sclerosing cholangitis (peripheral antineutrophil cytoplasmic antibody; P-ANCA

❑ autoimmune hepatitis (antinuclear, smooth-muscle, and liver-kidney microsomal antibody)

Hepatic Functional Reserve

Child – Pugh classification

points	1	2	3
albumin (g/dl)	> 3.5	2.8 – 3.5	< 2.8
bilirubin (mg/dl)	< 2	2 – 3	> 3
PT (sec prolonged)	1 – 4	4 – 6	> 6
ascites	none	mild	moderate
encephalopathy	none	minimal	marked

Hepatic Functional Reserve

Pugh score 5 – 6 = Child's A

good hepatic reserve

good operative candidate *< 5 % mortality*

Pugh score 7 – 9 = Child's B

moderate hepatic reserve

modest operative candidate *10 – 15 % mortality*

Pugh score 10 – 15 = Child's C

low hepatic reserve

poor operative candidate *> 25 % mortality*

Variceal hemorrhage

- **Bleeding: portal pressure exceeds 12 mm Hg**

- **most life-threatening** complication **of portal hypertension**
- responsible for **one third of** all **deaths** in patients with **cirrhosis**
- risk for death from bleeding is mainly related to the **underlying hepatic functional reserve**.

Treatment of the Acute Bleeding Episode

- **Resuscitation**
- emergency treatment should be **nonoperative** whenever possible.
  - **Endoscopic** treatment (sclerosis or ligation)
  - **Balloon tamponade**
  - **Pharmacotherapy**
  - **TIPS**
  - Emergency **surgical** intervention

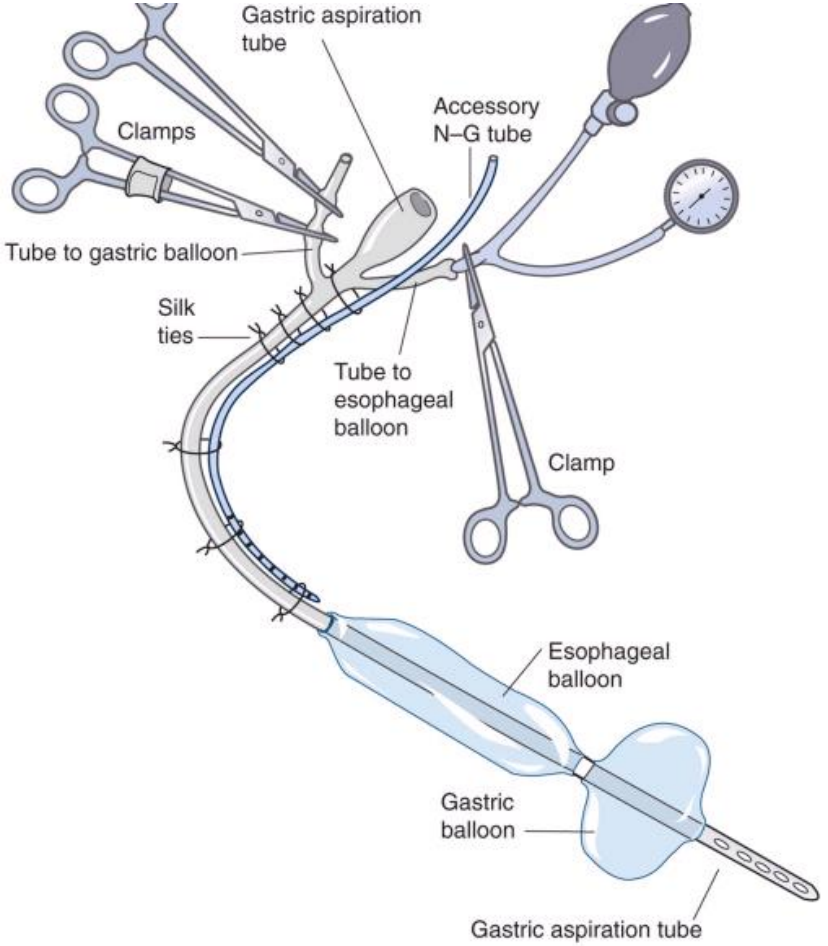
Resuscitation and Diagnosis

- Restoration of circulating blood volume
  - isotonic crystalloid solutions
  - Six units of blood for typing and cross matching
- Volume status assessment: cvp, urinary output**,**
- Give **FFP** if PT is prolonged more than 3 sec.
- **Platelet transfusions** only when platelet count less than 50,000
- prophylactic antibiotics are initiated

Pharmacologic therapy

- **Splanchnic vasoconstrictors**: **Somatostatin efficacious as endoscopic** treatment for control of **acute** variceal bleeding
- Central role when endoscopic treatment is unlikely to be effective
- Combination of **octreotide and endoscopic** therapy more effective in controlling bleeding than octreotide alone

Balloon-tube tamponade

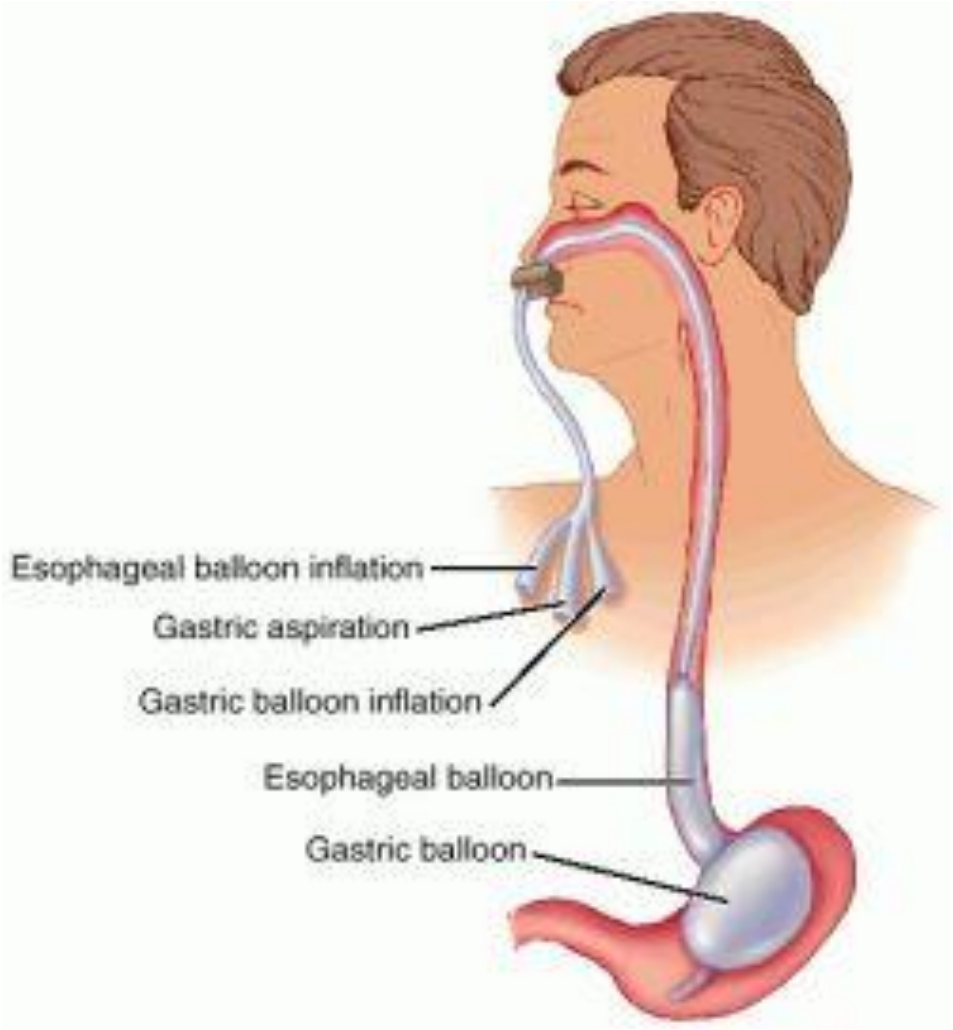


4- lumen:

- esophageal balloon
- gastric balloon

- Gastric aspiration tube
- Accessory N-G tube (suctioning of secretions above the esophageal balloon)

Balloon Tamponade



Balloon Tamponade

- **lifesaving** when **exanguinating hemorrhage /**when endoscopic treat Failed.
- **advantages** :
  - **immediate cessation** of bleeding in more than 85% of patients
  - widespread availability of device
- **Disadvantages:**
  - frequent recurrent hemorrhage
  - definitive treatment is planned
  - **lifesaving** when **exanguinating hemorrhage /**when endoscopic treat Failed.

  - lethal **complications**: esophageal perforation, ischemic necrosis of esophagus, aspiration

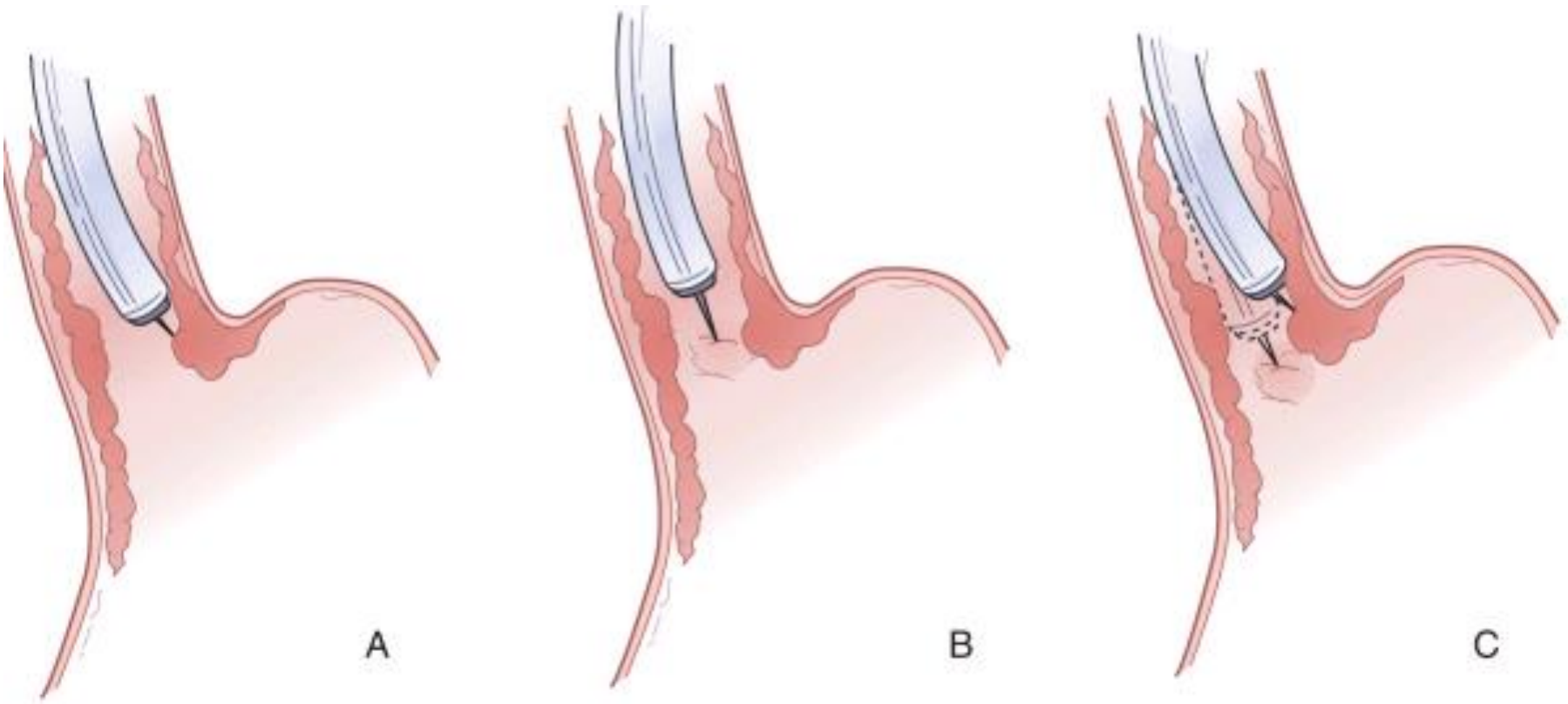
Endoscopic Treatment

- most commonly used therapy
- Acute setting- **sclerotherapy/band ligation** equally efficacious
- Both stop bleeding in 80-90% of pts
- Failure of endoscopic treatment is declared when two sessions fail to control hemorrhage.

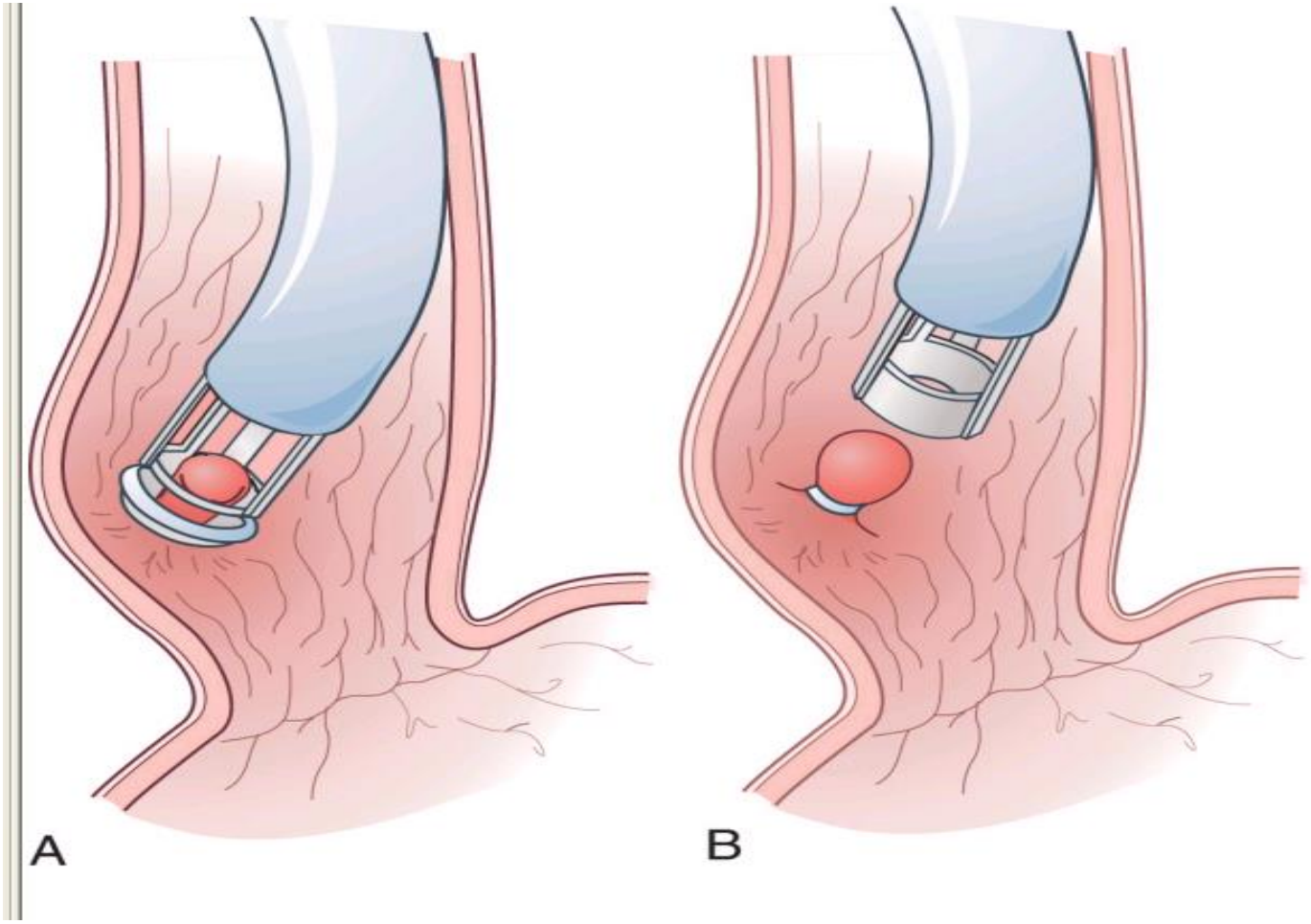
Endoscopic injection sclerotherapy **EIS**

- Injecting above esophagogastric junction
- subsequent treatment session is planned for 4 to 6 days later
- Minor common complications: retrosternal chest pain, esophageal ulceration, and fever
- serious complications: esophageal perforation, worsening of variceal hemorrhage, and aspiration pneumonitis

Endoscopic injection sclerotherapy EIS



Endoscopic ligation of esophageal varices

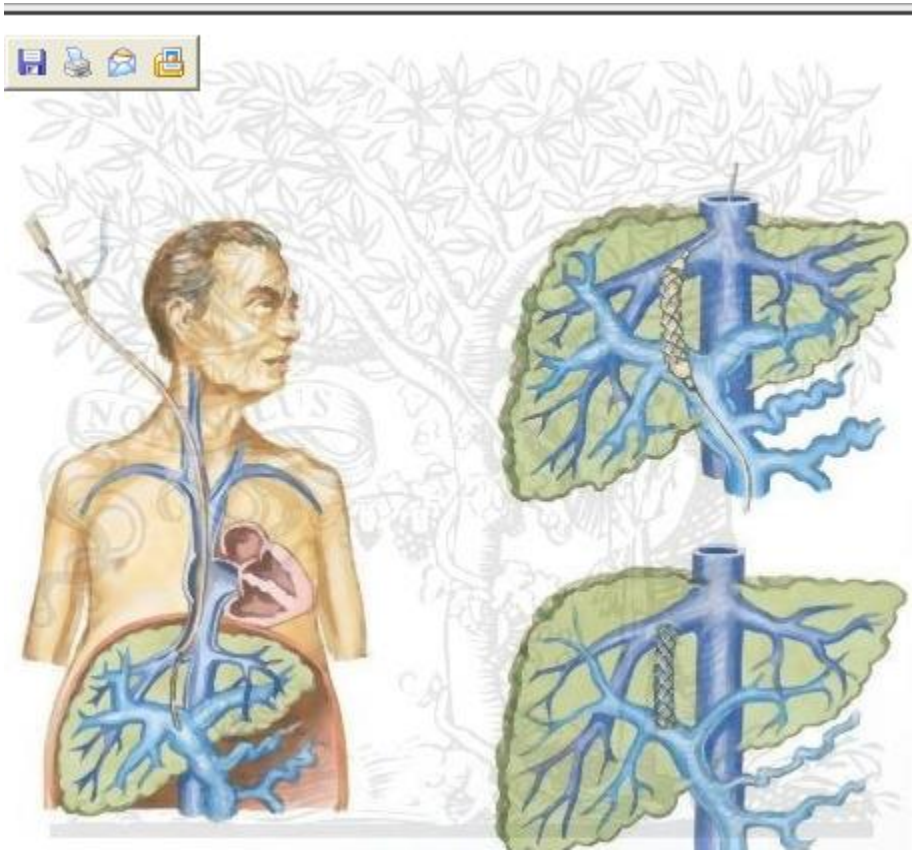


TIPS- Transjugular Intrahepatic Portosystemic Shunt

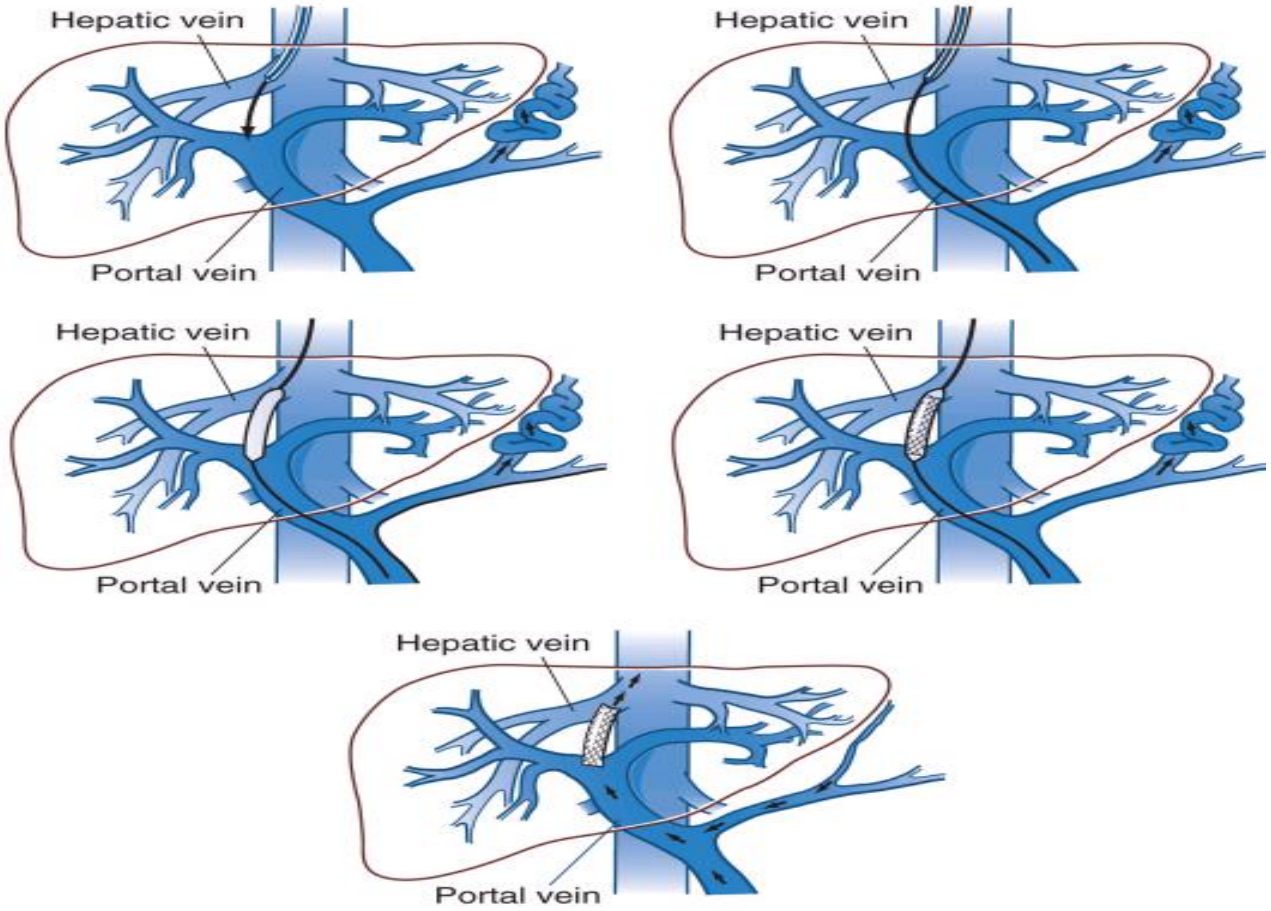
- **=portal decompression without** an **operation**
- **not recommended** as **initial** therapy for acute variceal hemorrhage
- ❑ used **only after** endoscopic therapy and pharmacotherapy **have failed**
- ❑ short-term bridge to liver transplantation for patients in whom endoscopic treatment has failed
- ❑ Tips better than emergency operation for Patients with advanced hepatic functional decompensation when less invasive approaches fail to control bleeding.
- **Disadvantage: shunt occlusion(develops in half of patients within 1 year of TIPS insertion)**
- **Absolute contraindications**: right-sided heart failure and polycystic liver disease
- **Relative contraindications**: portal vein thrombosis, hypervascular liver tumors, encephalopathy

Transjugular intrahepatic portosystemic shunt

•Access :puncture through a hepatic vein
•Creation of parenchymal tract between hepatic and portal veins with **balloon** catheter
•creation of shunt- inserting a 10-mm **expandable metal stent**



TIPS


Hepatic vein
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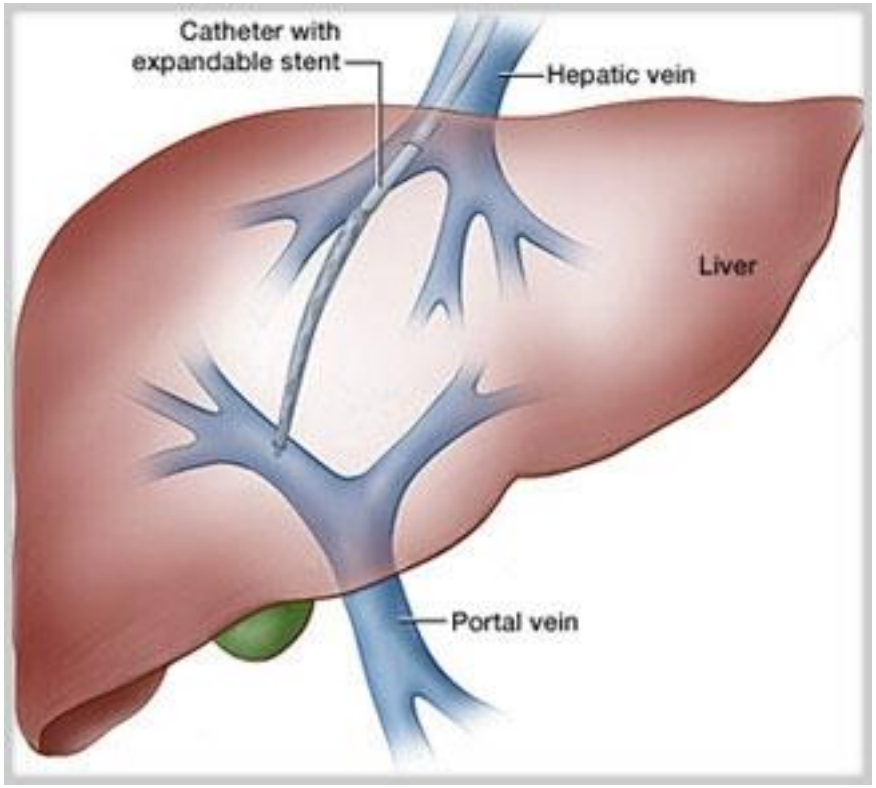
Transjugular Intrahepatic Portosystemic Shunt



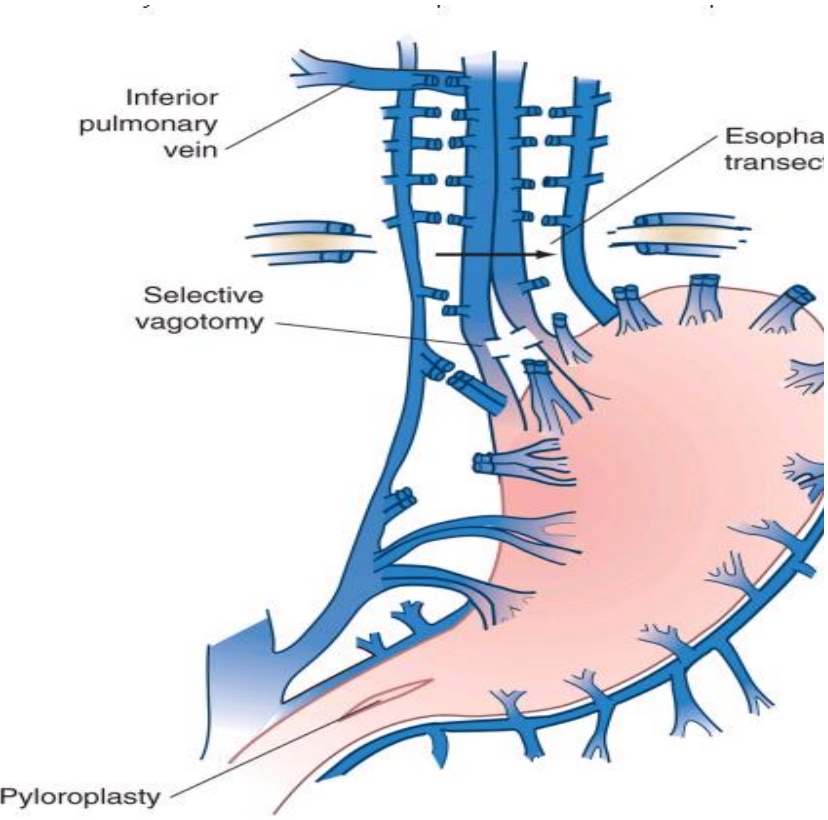
Emergency Surgery

- used
- ❑ **only after endoscopic** therapy and **pharmacotherapy/ TIPS have failed**
- ❑ **in hemorrhage from gastric varices**
- ❑ **failure of long-term endoscopic therapy**
- selection of emergency operation guided by experience of the surgeon.
- options: transesophageal ligation, emergency portal-systemic shunt**,** mesocaval/ splenorenal shunt, Esophageal transection
- **nonselective portocaval shunt** have **most immediate** and **durable** effect **in acute setting**
- **In potential liver transplant candidates- mesocaval shunt or central splenorenal shunt recommended.**

- **major disadvantage of emergency surgery - operative mortality rates exceed 25% in most reported series.**
- **Early postoperative mortality related to status of hepatic functional reserve**

Emergency Surgery: Esophageal transection

- Consists of: **esophageal transection, paraesophagogastric devascularization, splenectomy and either selective vagotomy with pyloroplasty/ highly selective without pyloroplasty**
- **High Initial/late mortality rates, high rebleeding rates**


Inferior
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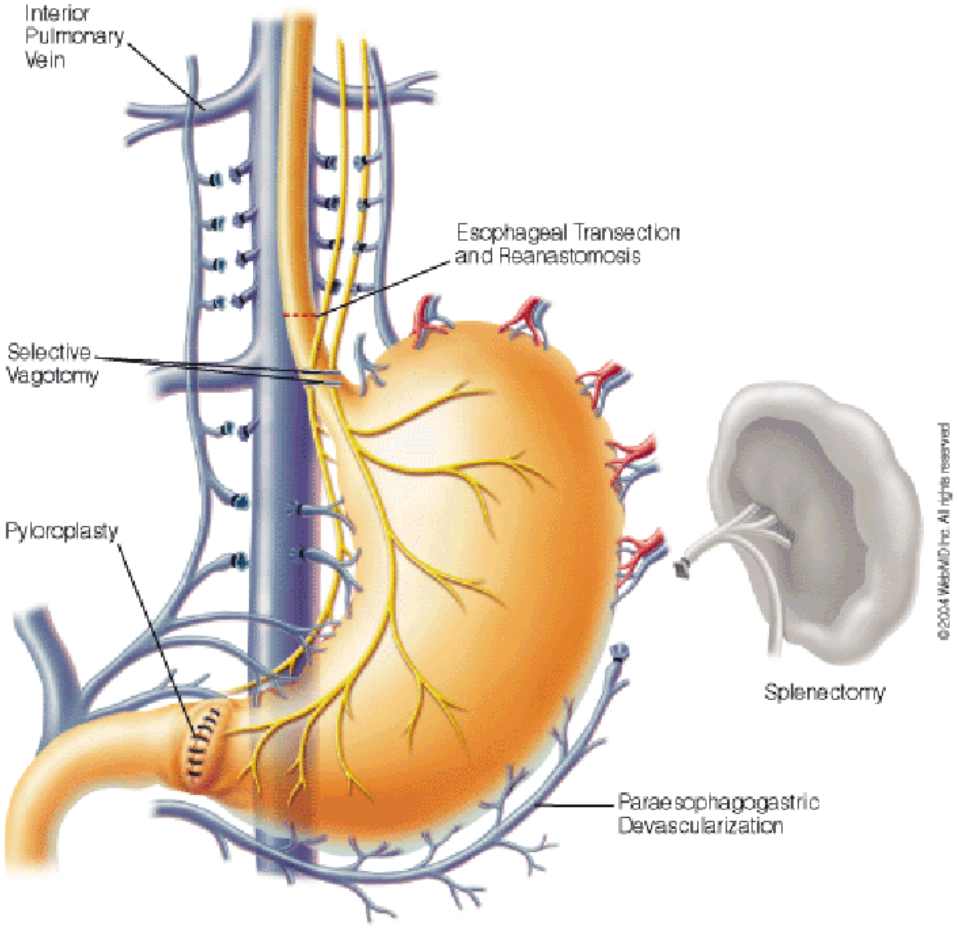
Pyloroplasty


Interior
Pulmonary
Vein
Esophageal Transection
and Reanastomosis
Selective
Vagotomy
Pyloroplasty
Splenectomy
Paraesophagogastric
Devascularization
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Prevention of Recurrent Hemorrhage

- **Goal**:long-term prevention of rebleeding, maintenance of hepatic function
-
- **Options**: pharmacotherapy, chronic endoscopic treatment, TIPS, shunt operations (nonselective, selective, and partial),hepatic transplantation
- **Repeated endoscopic** therapy sclerotherapy or banding eradicate varices and prevent rebleeding in up to 80% of patients in first year
- **Combining endoscopy** (sclerotherapy/banding) **with** pharmacotherapy most effective

prevention of recurrent bleeding: Pharmacotherapy

- **Objective:** reducing HVWP **below 12 mm Hg**
- **Use of beta-adrenergic blockade or octreotide significantly reduce rebleeding rates in combination with endoscopic therapy**
- **combining variceal ligation and pharmacotherapy with β-blockade -more effective than variceal ligation alone**

prevention of recurrent bleeding: Chronic Endoscopic Therapy(1)

- **Most common** treatment for **prevention** of **recurrent** variceal hemorrhage.
- **Objective: eradicating** esophageal varices
- **is a rational initial treatment for patients bleeding from esophageal varices**
- But**: subsequent treatment with TIPS/ operation/ hepatic transplantation is anticipated for many**

- **variceal eradication successful in about two thirds of patients**

- **After achieving eradication- diagnostic endoscopy performed at 6-month to 1-year intervals**

- **Increased frequency of bleeding from gastric varices and PHG after eradication of esophageal varices**

.

- uncontrolled hemorrhage/multiple major episodes of rebleeding/ hemorrhage from gastric varices -all **require** using **other treatment** modality

Transjugular Intrahepatic Portosystemic Shunt

- **nonselective shunt**

When should we use it?

- **ideal therapy when only** short-term **portal decompression is required:**
  1. **liver transplantation candidates who fail endoscopic or pharmacotherapy**
  2. **patients with advanced hepatic functional decompensation who are unlikely to survive long enough for TIPS to malfunction**

✓ Advantages:

- **Fewer** patients **rebled** after TIPS than after endoscopic treatment (RCTs)

✓ **Disadvantage:**

- major **limitation**: high incidence of shunt stenosis/thrombosis within first year
- **encephalopathy significantly more common in TIPS patients(RCTs)**

Portosystemic Shunts-

- **most effective** means of preventing **recurrent bleeding** in PH
- **Decompre**ss portal venous system by shunting portal flow into the low-pressure systemic venous system.

- **adverse consequences-** portosystemic **encephalopathy**, accelerated hepatic failure

- Who should use it?

❑ patients with relatively **well-preserved liver function** (Child class A,B) **not candidates for liver transplantation**

classification: nonselective, selective,partial

- goal of selective and partial portosyste **portal perfusion**

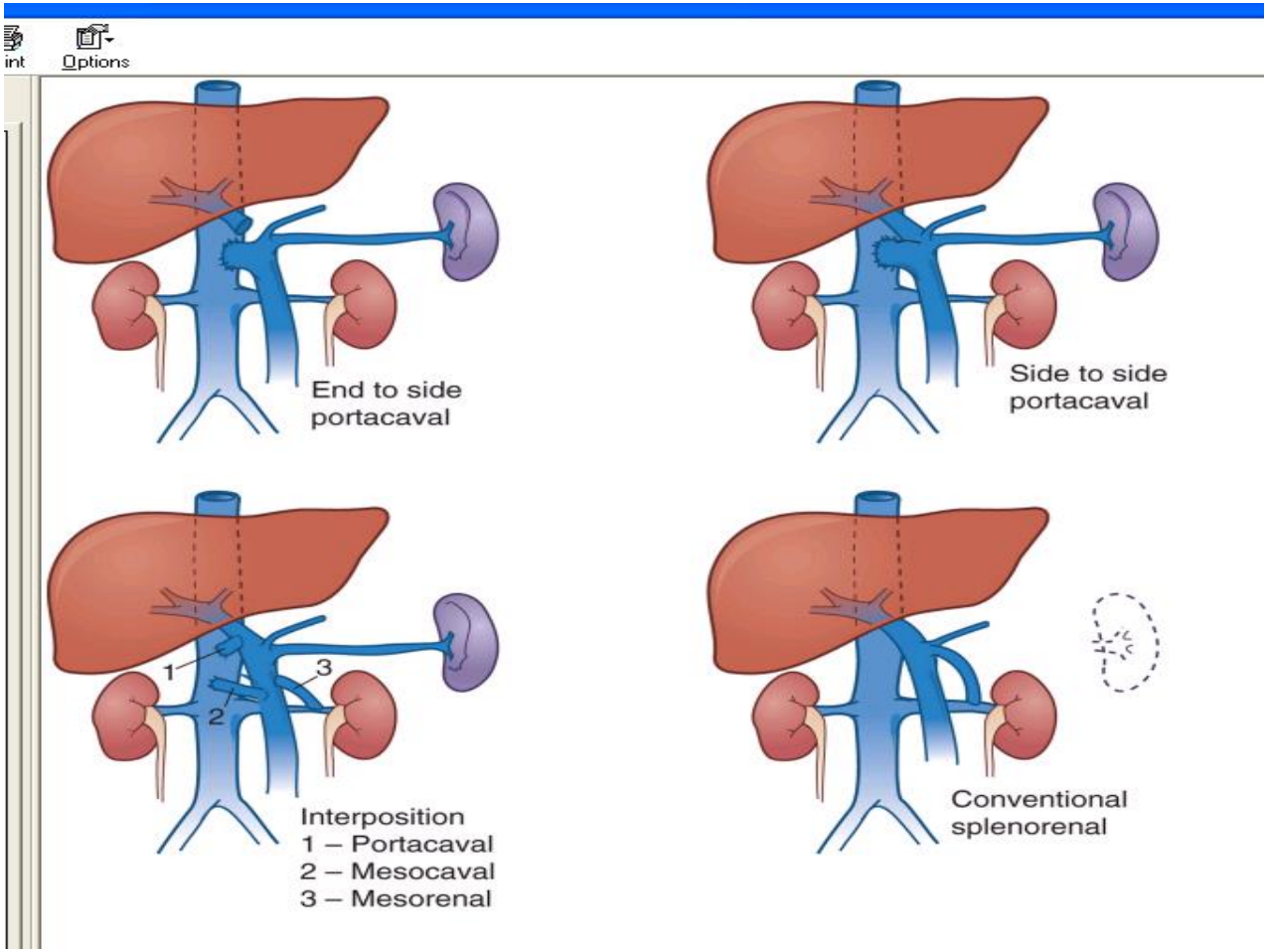
Table 30-6 Surgical Shunts to Reduce Portal Venous Pressure
Nonselective
End-to-side portacaval shunt
Side-to-side portacaval shunt
Large diameter interposition shunts (e.g., mesocaval)
Central splenorenal shunt
Selective
Distal splenorenal (Warren)
Small-diameter portacaval H graft shunt

Done

Nonselective Shunts

- **completely divert** portal flow
- **Hence,effectively decompress varices**.**But**- frequent **complications-** postoperative **encephalopathy and** accelerated hepatic failure
- nonselective shunt is constructed **only when a TIPS cannot be done or fails**
- Presently, **only rarely indicated**
- effectively **relieve ascites** and **prevent variceal hemorrhage**
- Include: **end-to-side portacaval shunt** (Eck fistula), the **side-to-side portacaval shunt**, large-diameter interposition shunts, and the **conventional splenorenal shunt**

Nonselective shunts



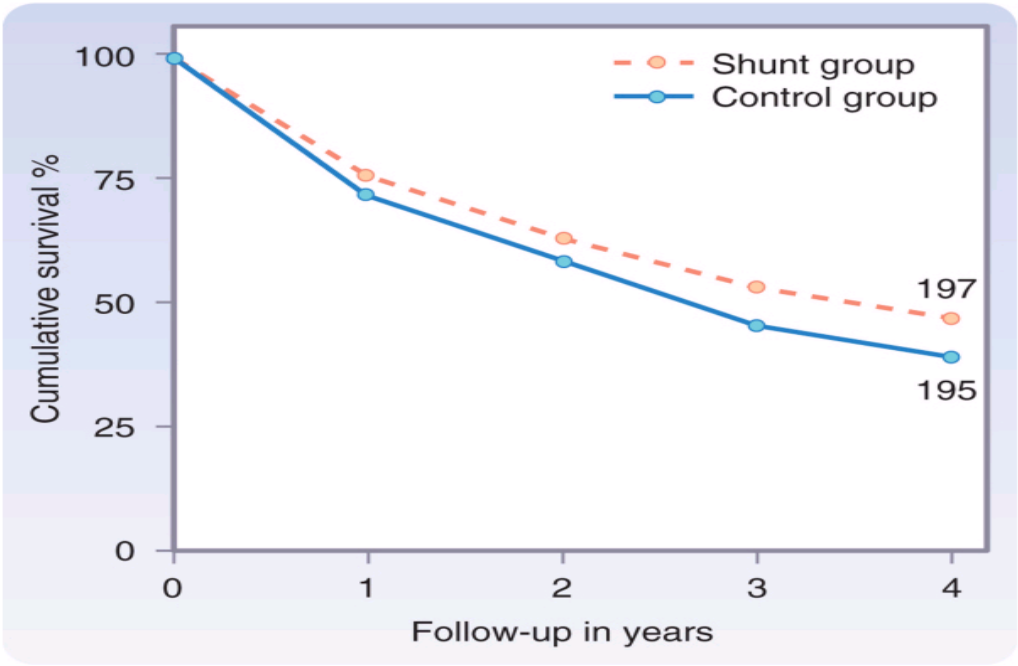
Nonselective shunts

- **Synthetic grafts**
- major disadvantage- **high graft thrombosis** rate (35%)
- **autogenous vein (internal** jugular vein)
- Advantages- relatively **easy to construct**, hepatic hilum is avoided

survival data from controlled investigations of the therapeutic portacaval shunt

•**most common cause of death** in shunted patients- accelerated hepatic failure

•<u>important findings</u>:
o **reliable control** of bleeding in shunted patients
o **variceal rebleeding in more than 70% of medically treated patients**
o spontaneous, often severe**,** **encephalopathy** in 20% to 40% of shunted patients.



selective variceal decompression

- 1967 Warren(+colleagues)- **distal splenorenal shunt**
- 1968- Inokuchi and associates- **left gastric–vena caval shunt**

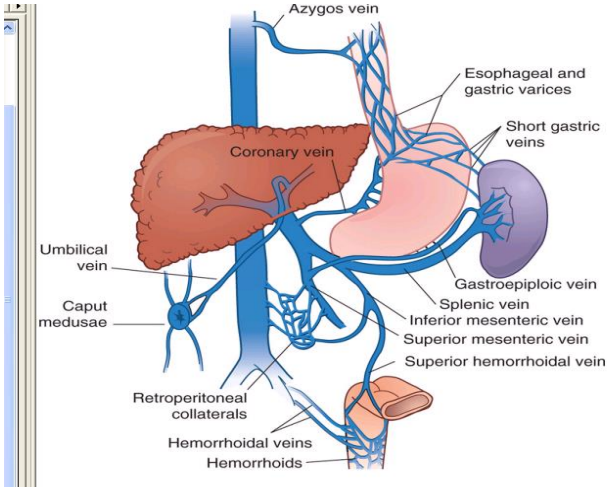
left gastric–vena caval shunt

- interposition of vein graft between **left gastric vein and inferior vena cava**
- **directly** and **selectively** decompresses esophagogastric varices
- Only **minority of patients with portal hypertension have appropriate anatomy for this operation**

Distal splenorenal shunt(1)

- anastomosis of **distal end of splenic vein to the left renal vein**
- **interruption of left gastric, gastroepiploic veins**
- **separation of portal venous** circulation into **decompressed gastrosplenic** venous circuit ,and **high-pressure superior mesenteric venous system**

- **Contraindications**:
  - patients with medically **intractable ascites**
  - **prior splenectomy**
  - **(relative) splenic vein diameter** less than 7 mm

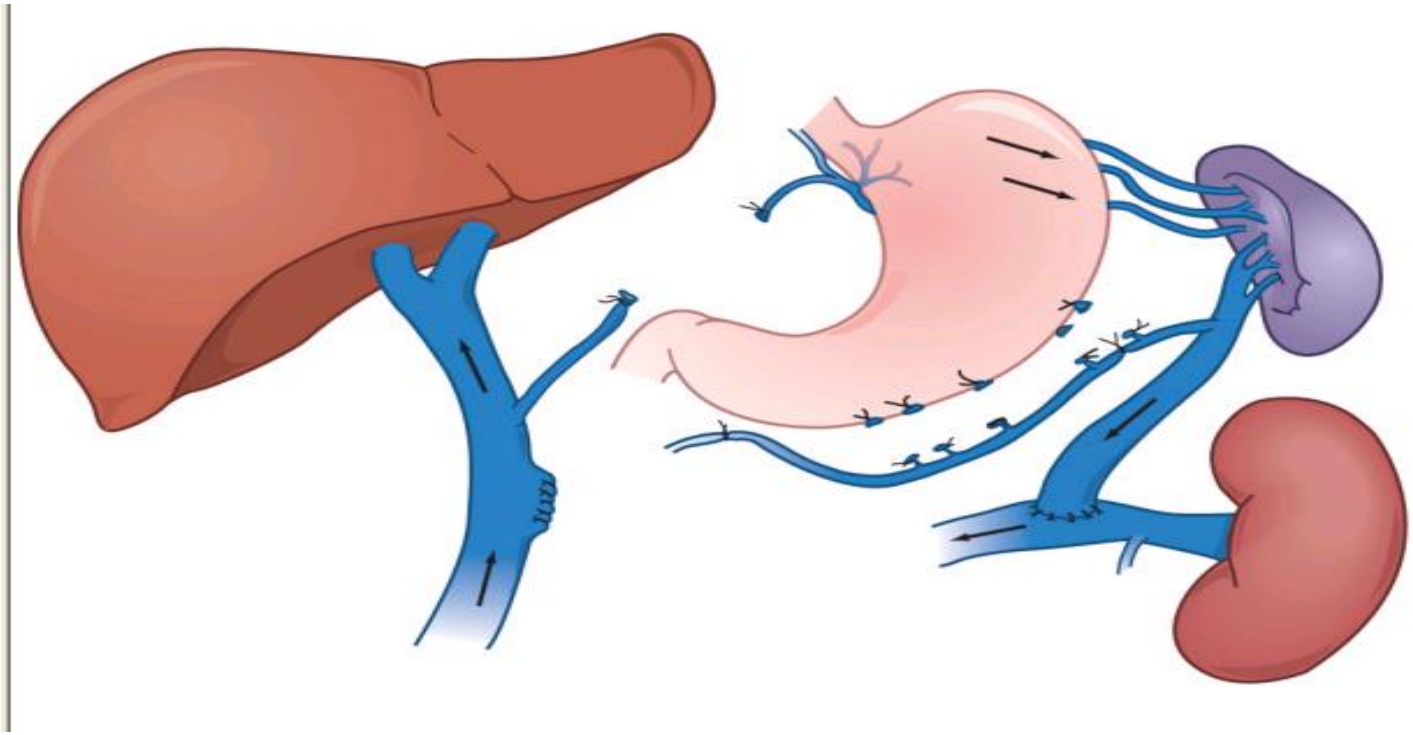


- **key questions:** How effective is it in preserving hepatic portal perfusion? Is it superior to nonselective shunts (survival)? Is it more effective than TIPS for long-term control of variceal bleeding?

Distal splenorenal shunt(2)

- Preservation of portal flow in more than 85% of patients during early postoperative interval
- high-pressure mesenteric venous system gradually **collateralizes** to low-pressure shunt
- result: **loss of portal flow** in about half of patients by 1 year
- degree of portal flow preservation depend on both the cause of portal hypertension and technical details of the operation

distal splenorenal shunt



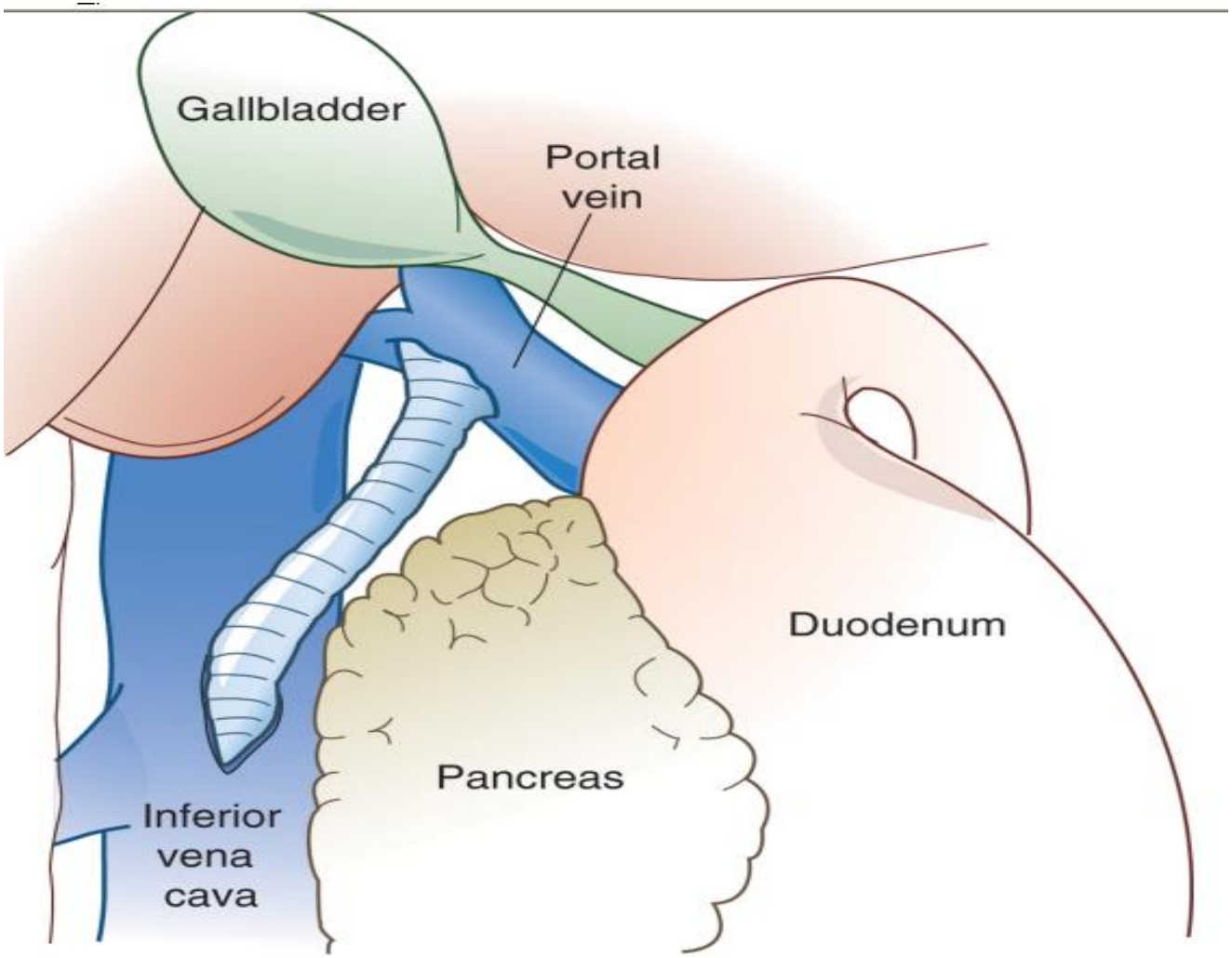
Partial Shunts

- **Objectives** – same as for selective
- interposition of small-diameter portacaval shunt
- hepatic portal perfusion preserved in most patients
- **prospective randomized trial: partial vs. nonselective portacaval shunts**

❑**less encephalopathy after partial shunt**

❑**similar survival for both types** of shunts

Partial Shunts



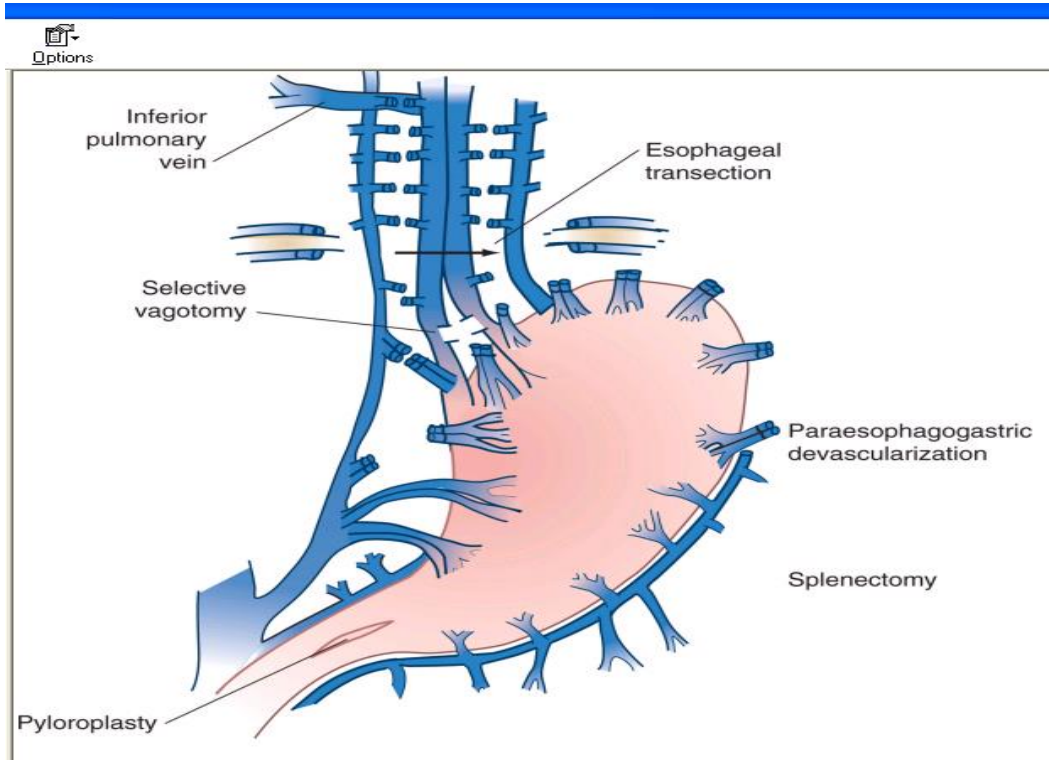
Nonshunt Operations

- **Objectives:**
- ablation of varices
- extensive interruption of collateral vessels

1. **most effective- Sugiura : extensive esophagogastric devascularization and esophageal transection and splenectomy**

- **High rebleeding rates**
- **Used for:**
- **unshuntable patients with diffuse splanchnic venous thrombosis**
- **patients with distal splenorenal shunt thrombosis**

Sugiura procedure



Hepatic Transplantation

- **not a treatment** for variceal bleeding **per se**
- **Who to consider?**

  patients with end-stage hepatic failure-

  nonalcoholic cirrhotic patients , abstinent alcoholic cirrhotic patients with limited hepatic functional reserve (Child's class B and C)
- **not available to all patients (**economic factors , limited supply of donor organs)
- **Contraindications:**

❑ **schistosomiasis (**normall liver function)

❑ **active alcoholism (**noncompliance)

Thank you