Intervention in the Hepatic Portal Venous System

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Definition

Portal venous system – Venous vasculature fed and drained by capillary vessels.

Hypophyseal portal system

Hepatic portal system
What do we want to do?

• Look at it – diagnostic imaging
• Improve flow – plasty, stents, lysis, thrombectomy
• Impede flow - embolization
• Divert flow – shunts
• Make the liver grow
• Grow islet cells
Diagnostic methods

• Conventional radiological techniques – U/S, CT, MR

• Catheter directed techniques

  Indirect – Late phase visceral angiography, wedged hepatic venography

  Direct – Transjugular or percutaneous transhepatic portal access
Ultrasound
Computed Tomography
Magnetic Resonance
Late phase visceral angiography
Wedged hepatic venography
Quick review TIPS

• Decompress symptomatic hypertensive portal system after failed medical management.

• Mainly used to treat bleeding varices and refractory ascites.

• Reduce portal systemic gradient below 12 mmHg to minimize risk of bleeding. Lower for ascites.

• Contraindicated in coagulopathy, biliary obstruction, severe liver disease, encephalopathy and right heart failure.
Gore Via-Torr Stent
TIPS reversal

- Worsening encephalopathy
- Onset right heart failure
- Worsening hepatic function
Methods

- Occlusive devices
  Coils, plugs, excluders

- Reduced diameter stents
  Maintain shunt with smaller diameter
Varix embolization

• Common in the pre-Tips era for controlling variceal bleeding.

• Now performed after TIPS in patients that continue to have bleeding episodes or in patients with competing portal systemic shunts inducing TIPS failure.

• BRTO
Transhepatic Obliteration of Gastroesophageal Varices: Results in Acute and Nonacute Bleeders

MANUEL VIAMONTE, JR., RAUL PEREIRAS, EDWARD RUSSELL, JAMES LE PAGE, AND DUANE HUTSON

Fig. 1 – Patient with cirrhosis and portal hypertension, not bleeding at time of study. Top left. Direct portogram showing no tributaries or collateral circulation. Top right. Selective catheterization of short gastric veins (SG) not visualized on direct portogram. Gastroesophageal varices may be overlooked unless superselective catheterization of tributaries of portal vein is attempted. Bottom left. Selective splenic venogram following embolization of short gastric veins. Note varices no longer fill (arrows). Bottom right. Control portogram showing reversal of flow in small gastric vein (broken arrow) and in coronary vein (solid arrow). IMV = inferior mesenteric vein, o = catheter tip, PV = portal vein, SG = short gastric vessels, SV = splenic vein.
BRTO
Balloon occluded retrograde transvenous obliteration

- Less invasive than TIPS
- Useful in gastric varices with patent gastrorenal shunt
- No encephalopathy
- Doesn’t compromise hepatic function
- May exacerbate gastroesophageal varices and ascites
BRTO method

- Access portal system via splenorenal collateral
- Occlude flow with occlusion balloon
- Embolize collateral outflow veins
- Inject sclerosant
  - ethanolamine oleate iopamidol with IV haptoglobin to prevent ARF from hemolysis (Asia)
  - Sotradecol, lipiodol, gas 2:1:3 (America)
- Remove balloon after 12 hours
BRTO

• Technical success 85 – 100%

• Rebleeding gastric varices uncommon

• Worsening gastroesophageal varices up to 68%
Portal recanalization

• Balloon/Stent

• Mechanical thrombectomy

• Fibrinolysis

• Often a combination of these
Transplant patients

• Stenosis- 0.5 – 3%, Plasty treatment of choice

• Thrombosis can be catastrophic
  Direct, indirect lysis, mechanical thrombectomy

• Thorough planning of potential catheter directed therapies vital for determining access options (transjugular vs. transhepatic)
• 4 yo female one month post transplantation with gastric varix bleeding.

• Question portal stenosis
• Portal vein thrombosis with worsening abdominal pain
Portal Lytic Therapy

- JVIR 2005 May, Hollingshead et.al.
- 20 patients treated with 15 having some degree of thrombolysis
- 17 had resolution of symptoms
- 12 developed a major complication along the way.
- Conclusion - Beneficial, but high complication rate suggests this should be reserved for patients with severe disease
Lysis rule of thumb

- Know high risk situations
  - GI bleed
  - recent stroke
  - recent surgery or trauma

- ICU during t-PA infusion

- Follow fibrinogen during infusion
  - adjust dose when drops below 200

- Follow H/H
  - consider scan to assess for bleeding at access site
Planned extended right liver resection
Presurgical portal embolization for induction of remnant hypertrophy

- Makuuchi, et.al. 1990 Surgery – Portal vein embolization (PVE) to induce future liver remnant (FLR) hypertrophy increases safety of major hepatectomy.

- Kubota et. Al. Hepatology 1997 >40% FLR required in compromised livers

Islet cell transplantation

• Patients with chronic pancreatitis unable to achieve pain control.
• Acute pancreatitis with multiple episodes not successfully treated by other methods
• Total pancreatectomy with reimplantation of isolated islet cells into liver via portal vein infusion.
Islet cell transplantation

- Catheter placed at surgery or via transhepatic approach
- Pressures obtained stepwise during infusion
- Infusion halted when portal pressure exceeds 30 mmHg to prevent portal thrombosis
- Catheter removed surgically if placed in OR or with tract embolization if placed by IR
MATERIAL AND METHODS-PROCEDURE

Total pancreatectomy

Pancreas
MATERIAL AND METHODS - PROCEDURE

1. Pancreatic tissue
2. Mechanical and enzymatic digestion
3. Harvested Islets
MATERIAL AND METHODS-PROCEDURE

Chiba needle → Portal vein percutaneous access
MATERIAL AND METHODS-PROCEDURE

percutaneous access

Portal venogram
Islet cells infusion by gravity
MATERIAL AND METHODS - PROCEDURE

Final portogram
Tract embolization
Complications (First 50 patients)

- 10 Pneumonia
- 3 DVT
- 2 Hepatic Artery Pseudoaneurysm
- 2 Bile Leak
- 2 Cardiac Arrest requiring CPR
- 1 Death within 30 days
- 1 Portal Vein Thrombosis
- 1 Hepatic Abscess
- 1 Biliary Anastamotic Stricture
Outcomes

- Approximately 10% insulin free with 40% requiring less than 10 U / day

- Statistically significant improved physical and mental quality of life scores at six and twelve months postop

- Decreased narcotic requirement
Thanks