TIPS, Variceal Embolization and Retrograde Transvenous Obliteration in Management of Variceal Hemorrhage

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Disclosures

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I disclose the following financial relationships with a commercial interest:
Inventiva, Novo Nordisk, Madrigal, Takeda (Clinical trial site PI)
Gilead, Kinetix group (Independent research funding)

Purpose and Scope

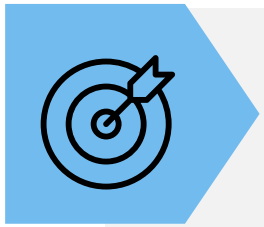
Interventional Radiology guided Endovascular Therapies for Variceal Hemorrhage

Anatomy of portosystemic collaterals

Technical details of endovascular treatments

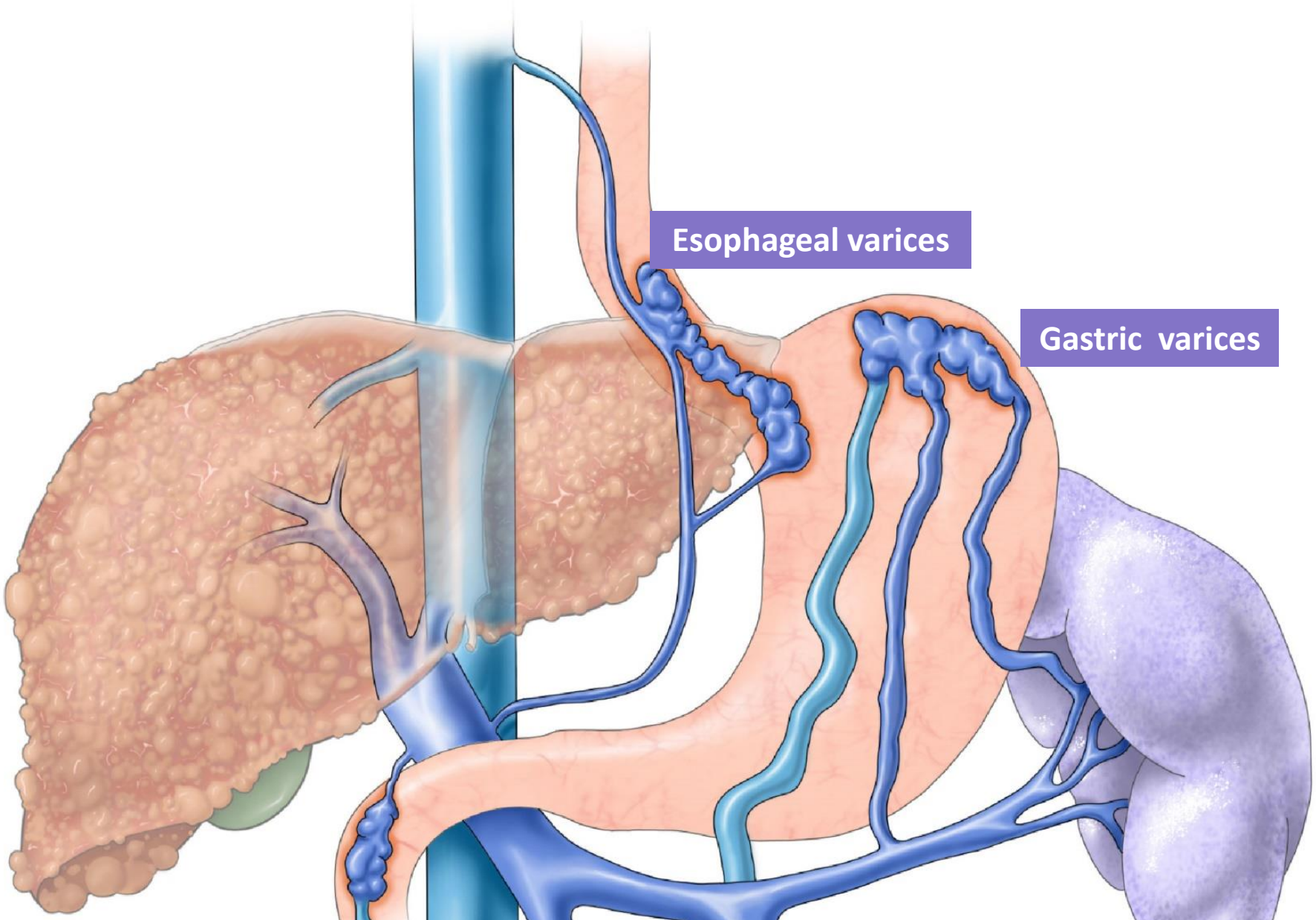
Clinical use of endovascular treatments in variceal bleeding

TIPS: Transjugular intrahepatic portosystemic shunt; RTO: Retrograde transvenous obliteration
ATO: Anterograde transvenous obliteration



Facilitate multidisciplinary discussions between hepatologists, gastroenterologists, interventional radiologists and surgeons in selection of endovascular treatments for variceal hemorrhage

Portosystemic collaterals in portal hypertension



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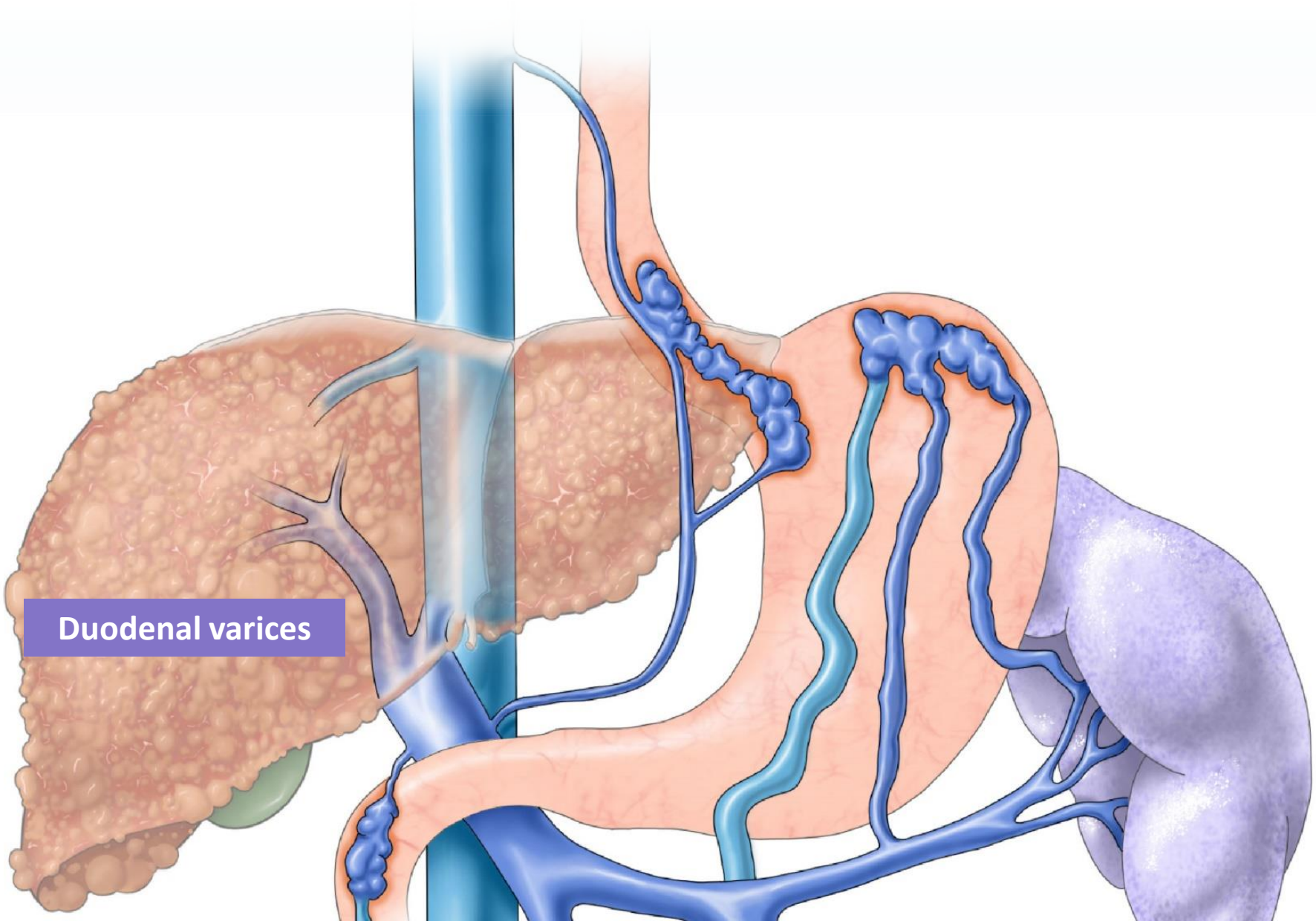
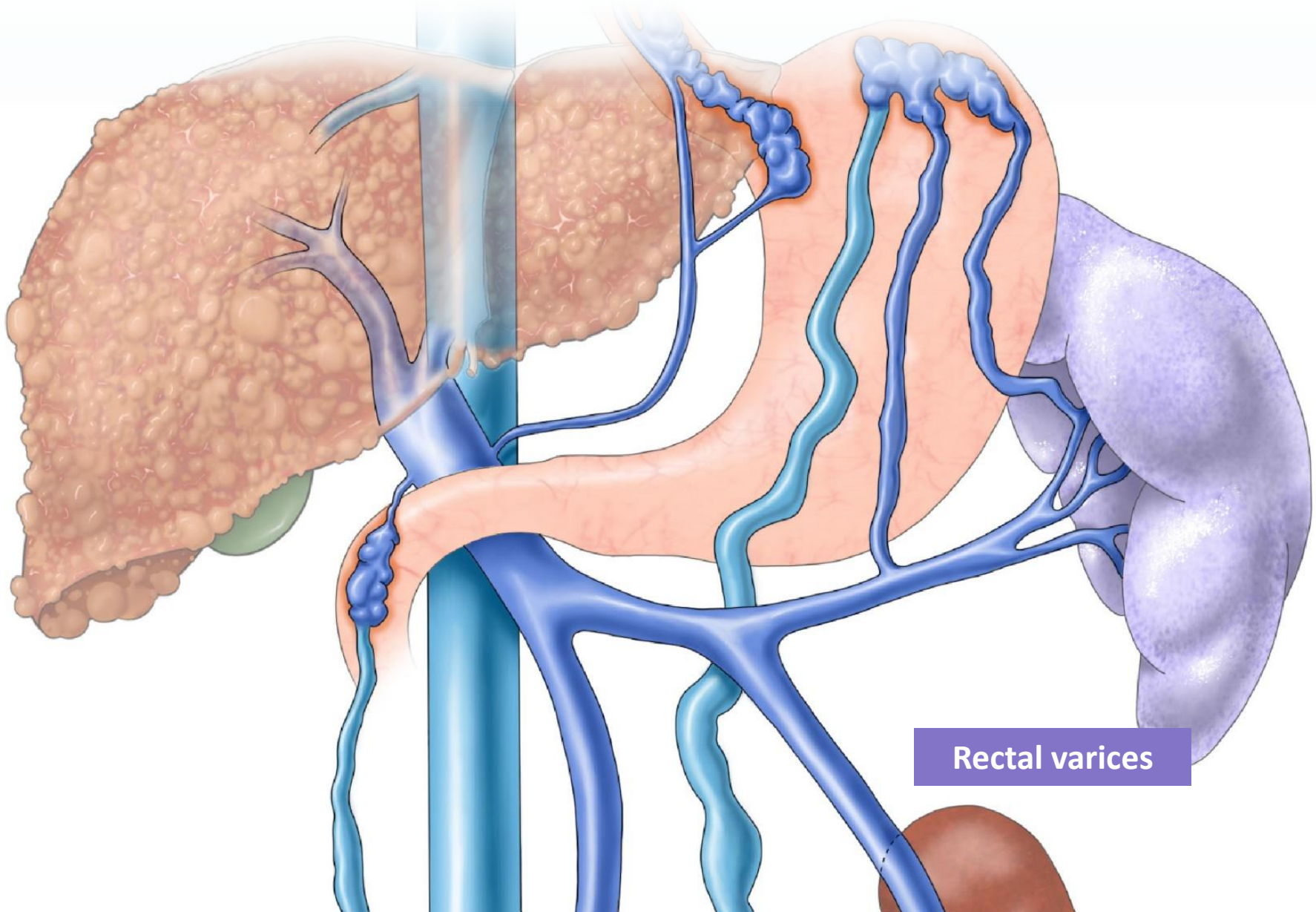
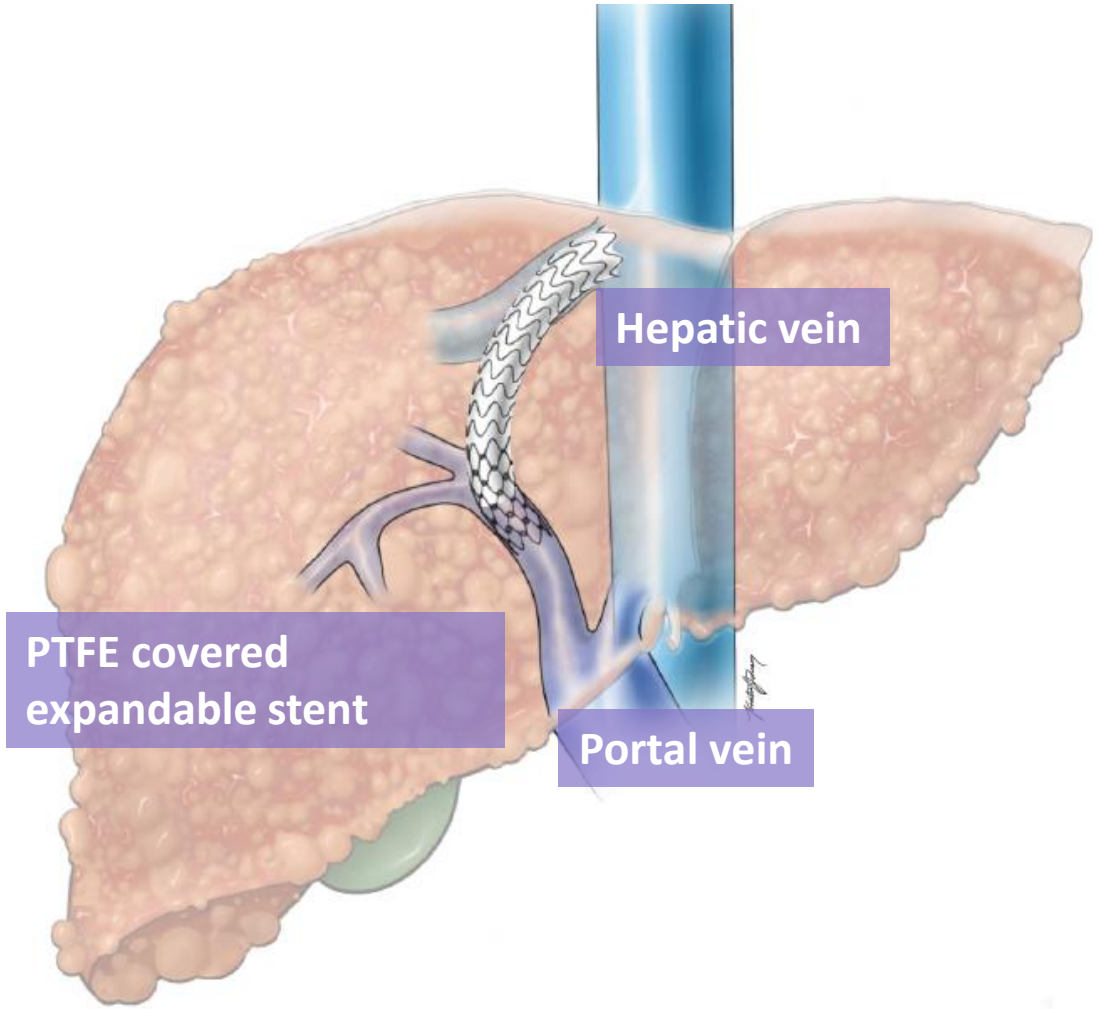


Portosystemic collaterals in portal hypertension



Transjugular intrahepatic portosystemic shunt (TIPS)

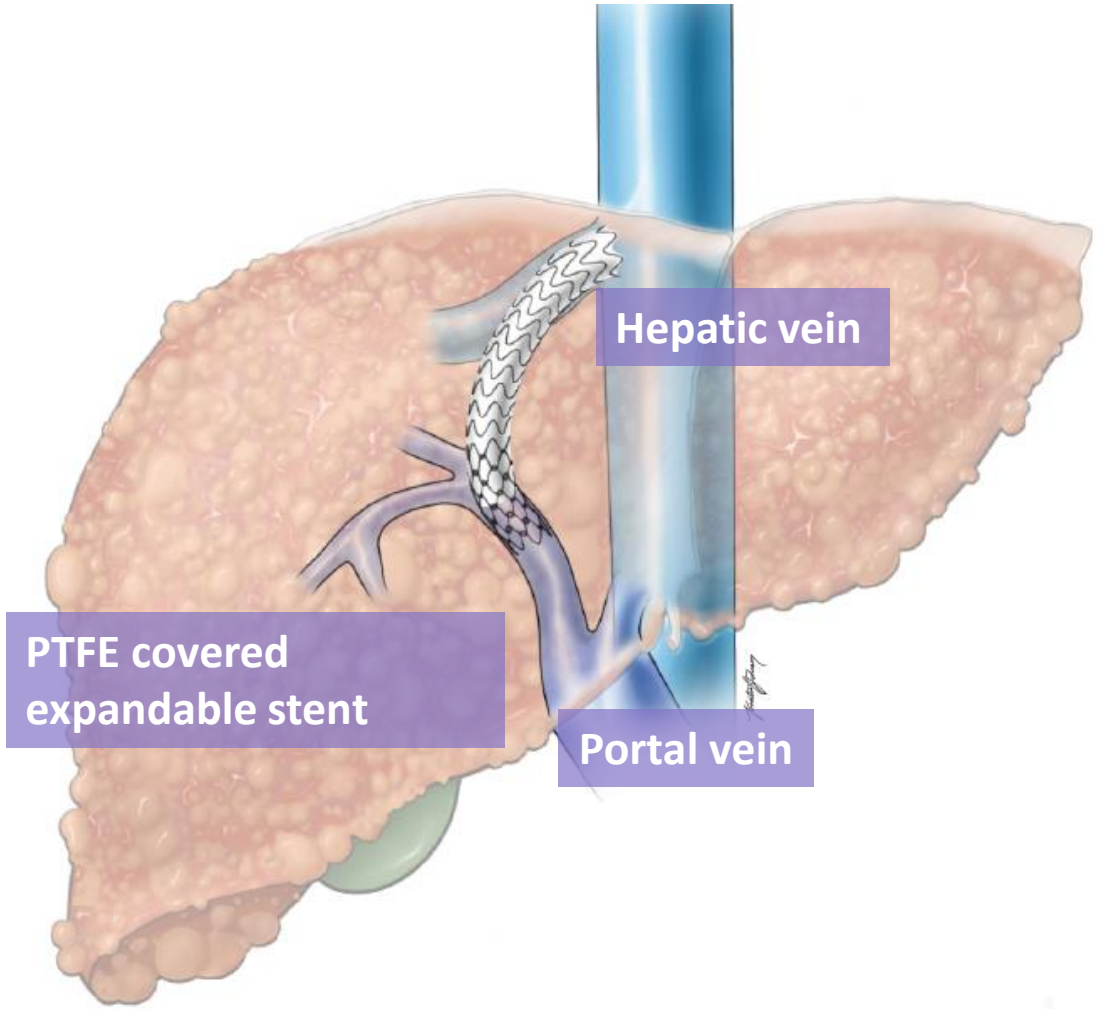


PTFE: Polytetrafluoroethylene

- ~ 50-100 ↑ in right atrial pressure
- ~ 10-15% ↑ in cardiac output
- ~ ↑ right ventricular pressure, pulmonary arterial pressure and pulmonary capillary wedge pressure

- Shunts blood away from the liver
- ↓ in renin and angiotensin levels
- ↑ improvement in renal function

Transjugular intrahepatic portosystemic shunt (TIPS)



PTFE: Polytetrafluoroethylene

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PTFE-coated TIPS stents should be considered standard of care

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When the indication for TIPS is variceal hemorrhage (treatment of acute hemorrhage or prevention of recurrence), TIPS should be progressively dilated (starting at 8 mm of diameter) to the minimum diameter needed to achieve a portosystemic pressure gradient below 12 mmHg

Transjugular intrahepatic portosystemic shunt (TIPS)

3. **In patients whose portosystemic pressure gradient does not decrease below 12 mmHg despite maximum dilation of TIPS (10 mm), nonselective beta-blockers should be added to further decrease portal pressure**

4. **Bland portal vein thrombosis does not preclude creation of a TIPS. Referral to experienced centers should be considered**

5. **In patients with large spontaneous portal systemic collaterals, collateral embolization at the time of TIPS placement may be considered since it may decrease the risk of hepatic encephalopathy**

Contraindications

Absolute

- Congestive Heart Failure (EF <50%)
- Severe pulmonary hypertension (mPAP>45 mm Hg)
- Severe uncontrolled hepatic encephalopathy
- Uncontrolled sepsis

Relative

- MELD : no specific MELD threshold
- CTP score >13
- Age >75 y
- Untreated biliary obstruction
- Severe coagulopathy
- Tumors/polycystic liver

Complications

Hepatic Encephalopathy

- ~ 30-50% (8% severe)
- Risk factors
  - Previous encephalopathy
  - Older age
  - Advanced liver dysfunction
  - Kidney dysfunction
  - Hyponatremia
  - Sarcopenia
  - Post TIPS low PSPG

Deterioration in Liver function

- No increase in liver failure related death

Cardiac volume overload

- ~ 20% cardiac decompensation
- ~ 5% related mortality
- ~ 4% new pulmonary hypertension

Complications

6

In patients undergoing elective TIPS for prevention of variceal rebleeding, rifaximin 550 mg BID started within 14 days before TIPS placement and maintained for 6 months may reduce the risk of post-TIPS hepatic encephalopathy and can be considered when feasible

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In patients with refractory hepatic encephalopathy despite post-TIPS optimal medical therapy (combination of lactulose and rifaximin), endovascular reduction of TIPS diameter should be attempted.

Follow up of TIPs

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In TIPS placed for variceal hemorrhage, a follow up doppler ultrasound at 1-4 week, 3 months, 6 months and every 6 months thereafter to assess TIPS patency is suggested

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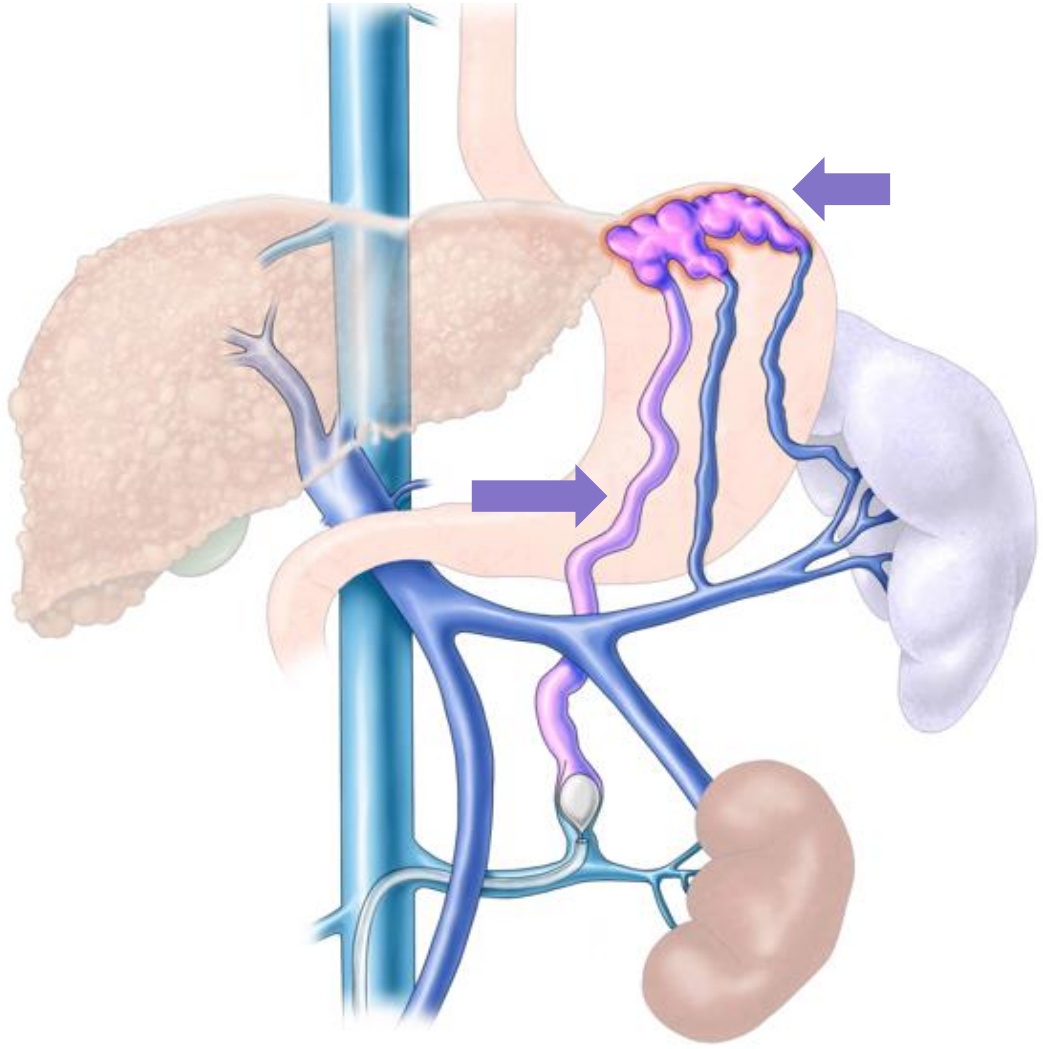
A mean maximum flow velocity (mVPmax) at the portal vein <28 cm/s when flow is hepatofugal or mVPmax <39 cm/s when flow is hepatopetal should trigger venography and pressure measurements to confirm TIPS dysfunction.

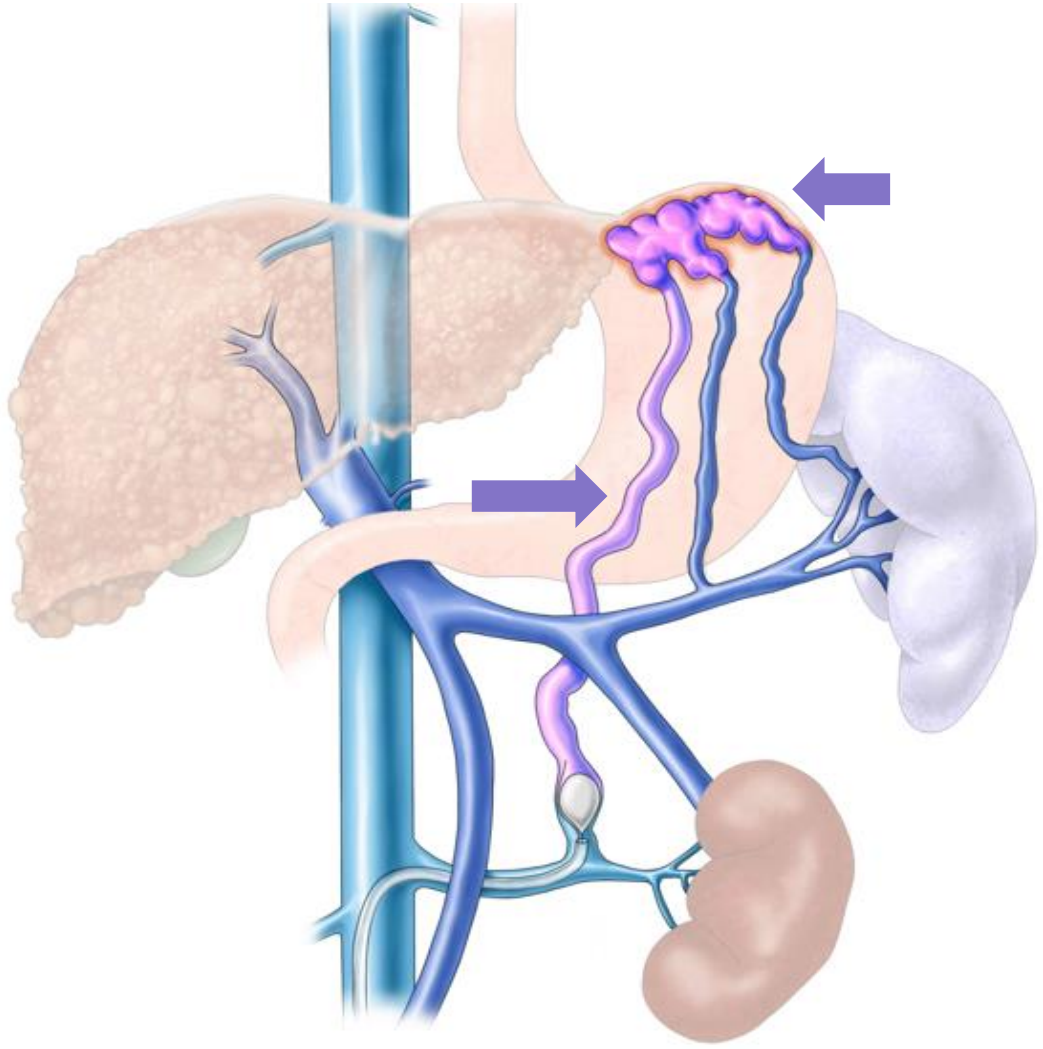
Retrograde Transvenous Obliteration (RTO)



- Redirects flow into the liver: improvement in hepatic function
- ↑ portosystemic pressure gradient
- Can cause progression of portal hypertensive complications
  - Development of varices (60%)
  - Worsening of ascites/hydrothorax (10%)

High success rate: resolution of gastrofundal variceal hemorrhage in 96 – 100% with recurrence rate of < 3% (3-10 year follow-up)

Retrograde Transvenous Obliteration (RTO)



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RTO should be considered as an alternative treatment to TIPS for bleeding gastric or ectopic varices with favorable anatomy (e.g. accessible and occludable gastrorenal shunt)

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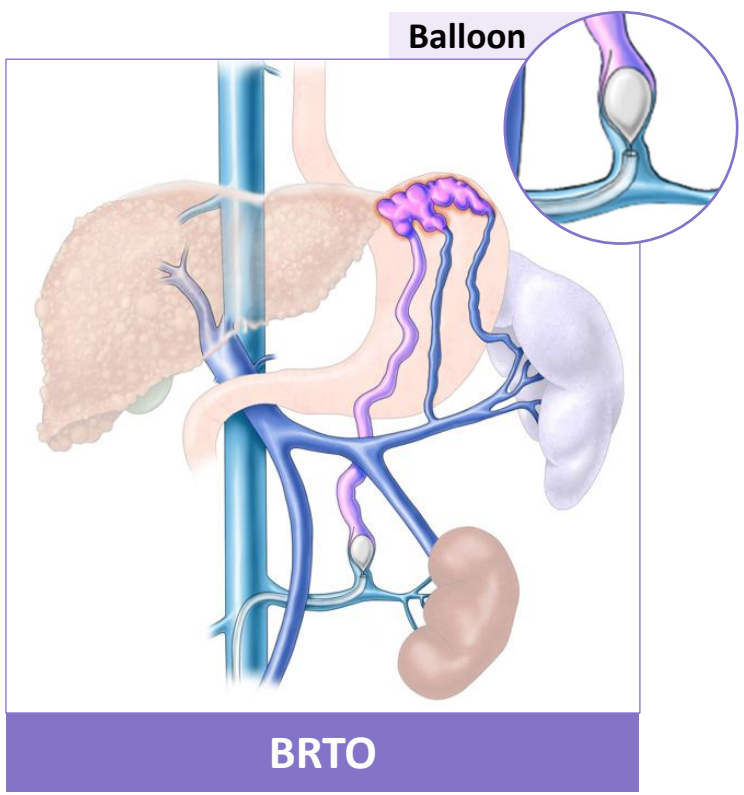
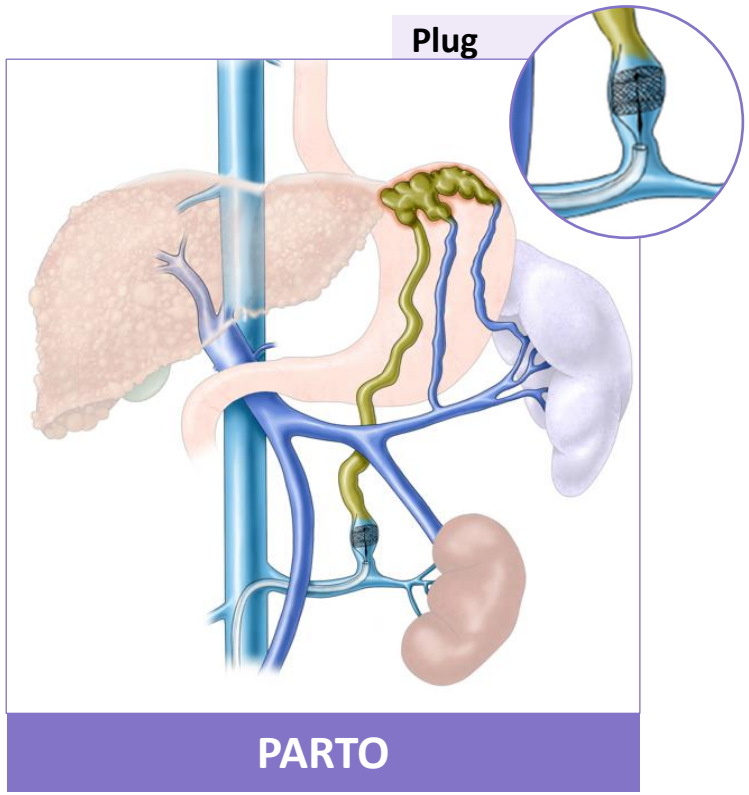
Close surveillance of complications of portal hypertension after RTOs is needed. Potential additional treatments such as TIPS, beta-blockers, or endoscopic treatment of esophageal varices should be considered.

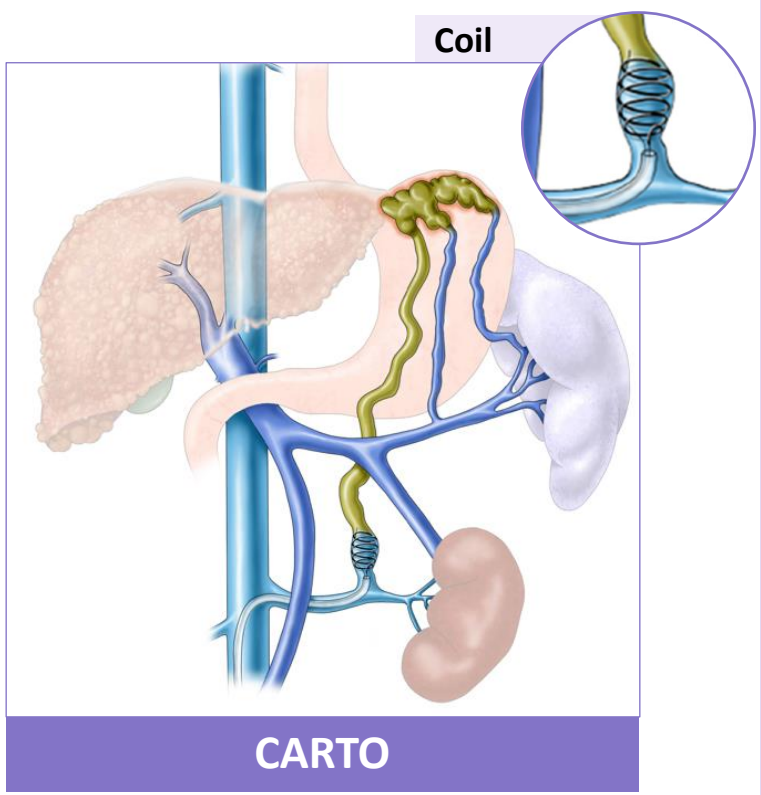
Retrograde Transvenous Obliteration (RTO)



BRTO



PARTO



CARTO

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CARTO or PARTO have lower complication profiles compared to those of traditional BRTO or mBRTO and may be the preferred methods at experienced institutions

Contraindications and Complications

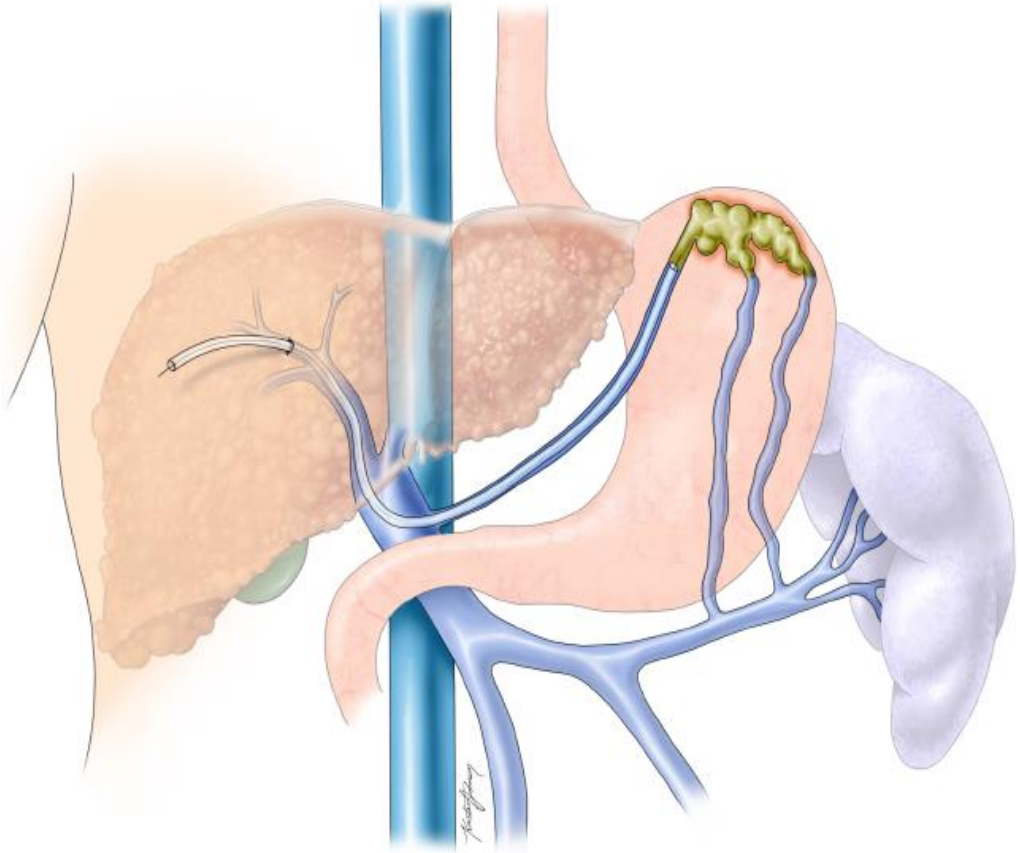
Contraindications

- Severe sepsis
- Splenic/ portal vein thrombosis
- Difficult to control ascites
- Anatomical factors

Complications

- Escape of sclerosing agents
  - Portal/renal vein thrombosis
  - DIC
  - Anaphylactic shock
  - Stroke
- Portal hypertensive complications

Anterograde Transvenous Obliteration (ATO)



Technical success: Complete obliteration of varices and cessation of flow (44-100%)

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Percutaneous, trans-hepatic, trans-splenic or trans-TIPS ATO should be considered as a therapeutic option in esophageal, gastric, or ectopic variceal hemorrhage with a large afferent vein or shunt or with high flow varices

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ATO with complete eradication of entire variceal complex is advisable to minimize recurrent bleeding

Follow up after RTO/ATO

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A contrast enhanced abdominal CT or endoscopic ultrasound should be performed within 2-3 days after RTO/ATO to confirm complete obliteration of the varices

14 18

Follow-up endoscopy should be performed 1-2 months after RTO/ATO to evaluate the development or worsening of esophageal varices. If no varices are seen, future surveillance should be performed according to existing guidance

Role of TIPS in management of esophageal varices and gastroesophageal varices type 1 (GOV1)

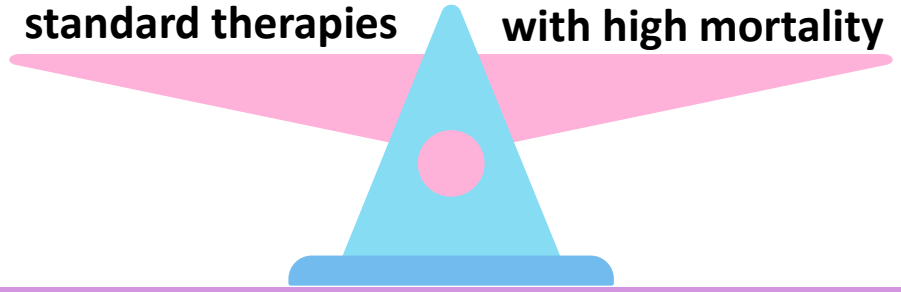
Definitions

Preemptive TIPS (previously called "Early TIPS")	TIPS placed preemptively within 72 hours of the hemorrhage, in patients with hemorrhage controlled with medical/endoscopic therapy and at high risk of treatment failure
Salvage TIPS	TIPS placed in patients with uncontrolled (ongoing) bleeding despite medical and endoscopic therapy
Rescue TIPS	TIPS placed for early (within 5 days) recurrence of variceal hemorrhage
TIPS for secondary prevention of variceal hemorrhage ("elective TIPS")	TIPS placed in patients who have recovered from acute variceal hemorrhage (more than 72 hours after the index bleed)

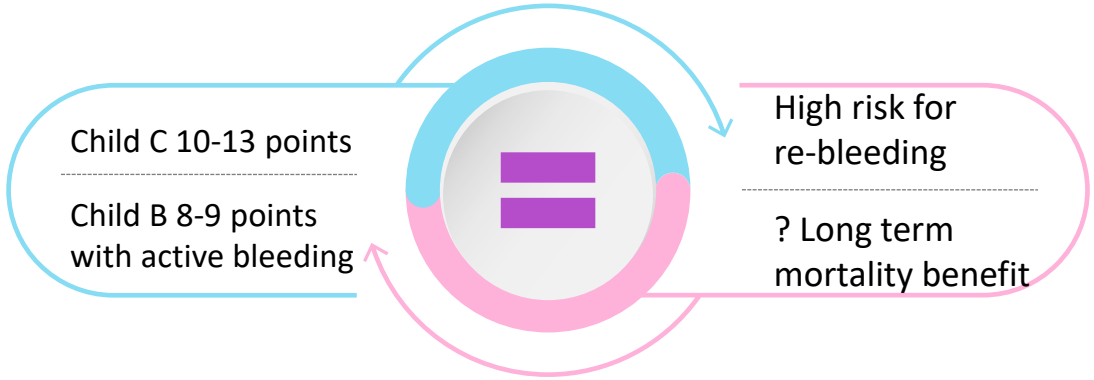
Role of TIPS in management of esophageal varices and gastroesophageal varices type 1 (GOV1)

10-20% rebleed within 5 days despite standard therapies

In Child C patients, TIPS can lead to ACLF with high mortality



Pre-emptive TIPS balances these risks



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TIPS should not be performed for the primary prevention of variceal bleeding

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In patients with acute esophageal variceal hemorrhage, pre-emptive "early" TIPS within 72 h of initial upper endoscopy should be considered in patients who meet any of the following criteria: Child-Pugh class C 10-13 points or Child-Pugh class B 8-9 points with active bleeding at initial endoscopy

Role of TIPS as salvage and rescue treatment and in long term management of bleeding esophageal varices/GOV 1

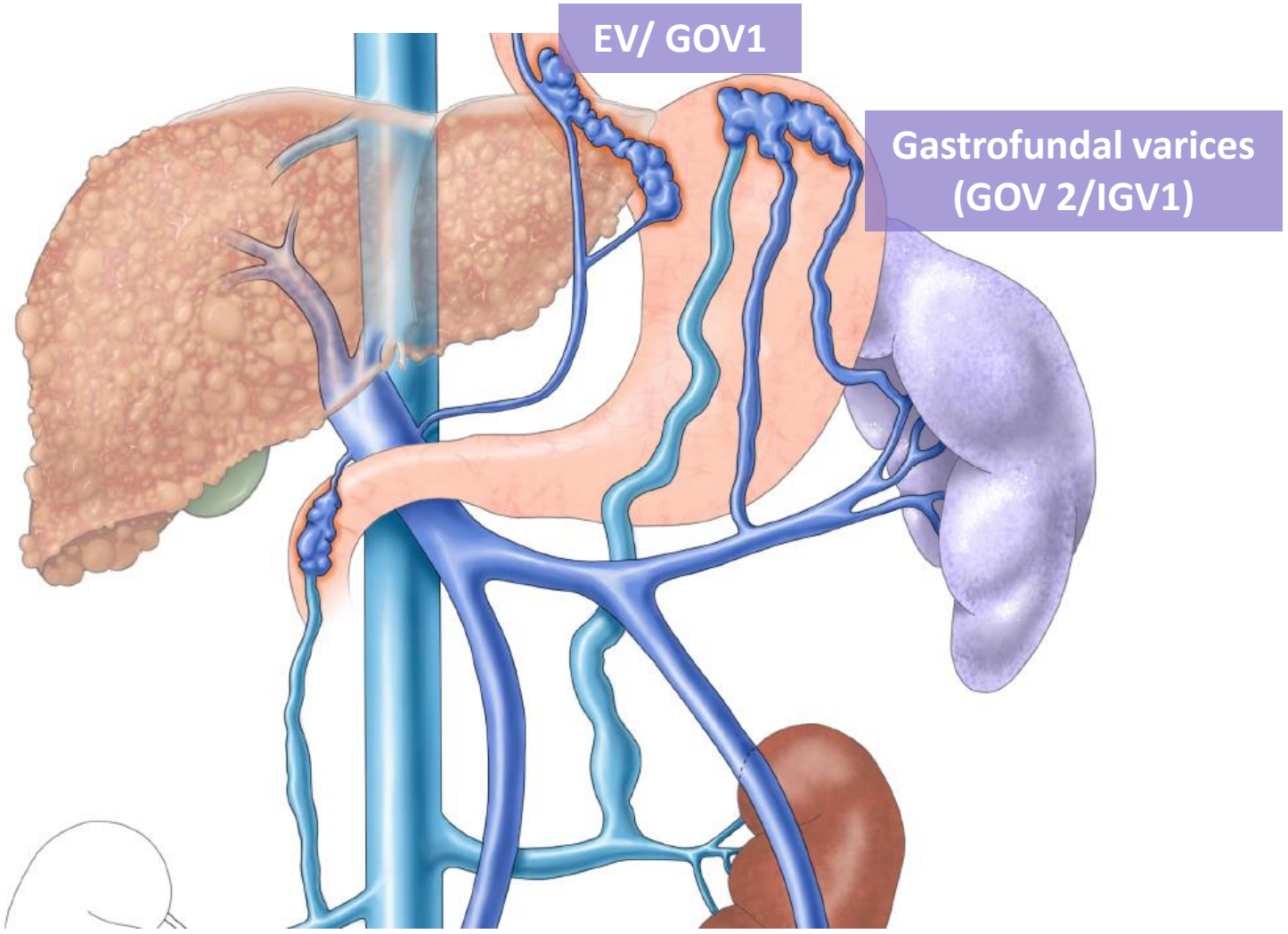
21 **TIPS should be used as salvage treatment in patients in whom variceal bleeding cannot be controlled with medical and endoscopic therapy (failure of standard of care)**

22 **TIPS should be used as rescue treatment in patients with early recurrent variceal bleeding despite medical and endoscopic therapy (failure of standard of care).**

23 **In patients with a MELD score > 30, lactate >12 mmol/L or Child-Pugh > 13 salvage/rescue TIPS should not be used unless TIPS is a bridge to liver transplantation in the short-term**

24 **In patients who have recovered from esophageal variceal hemorrhage and who did not have TIPS placed during admission, TIPS should be used as second-line treatment when rebleeding occurs despite adequate secondary prophylaxis with nonselective beta-blockers and endoscopic therapy**

Gastro-fundal varices



Considerations

- **Location of the varices**
- **Anatomy of efferent and afferent vessels**
- **Presence of shunts**
- **Flow dynamics of circuit**
- **Splenic vein thrombosis**
- **Liver function (Child Pugh Score)**

Indication for pre-emptive TIPS and salvage/rescue TIPS are similar to EV/GOV1

Role of TIPS in management of gastro-fundal varices

25 **Neither TIPS nor RTO should be used to prevent first hemorrhage in patients with gastro-fundal varices**

26 **In patients with acute hemorrhage from gastro-fundal varices, either cyanoacrylate injection, TIPS or RTO can be considered first line therapies to control bleeding and to prevent re-bleeding**

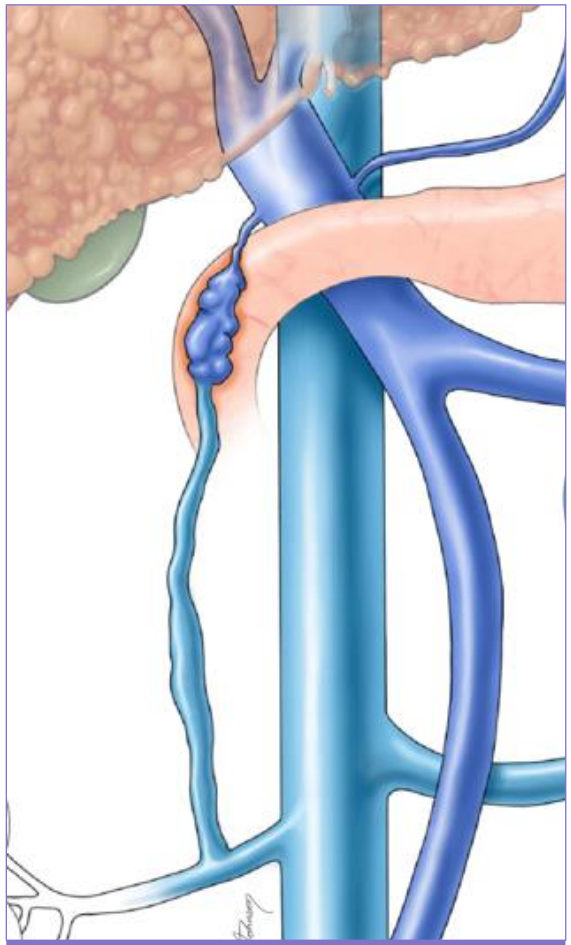
27 **RTO is the first line endovascular option for hemorrhage from gastro-fundal varices in patients with contraindications to TIPS**

28 **In patients with hemorrhage from gastro-fundal varices who are candidates for both RTO and TIPS,**

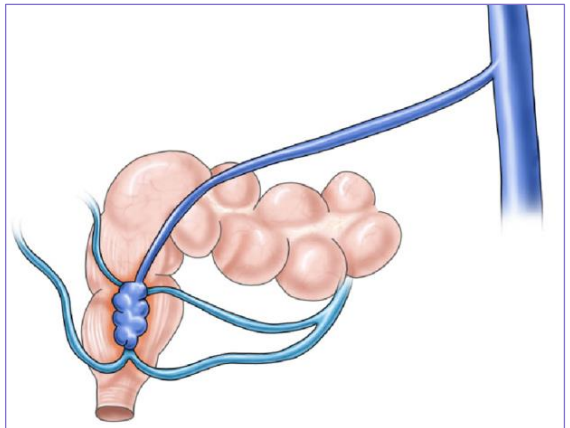
- **RTO : favored in patients with history of overt hepatic encephalopathy or poor liver function**
- **TIPS: favored in patients with other complications of portal hypertension such as large esophageal varices or significant ascites, and in patients with portal vein thrombosis**

29 **On a case-by-case basis, TIPS can be complemented with variceal embolization as this may reduce hepatic encephalopathy and rebleeding**

Ectopic varices



Duodenal varix



Rectal varices

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Management of ectopic varices should be determined by a multidisciplinary team consisting of hepatologists, gastroenterologists, interventional radiologists and surgeons

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Patients with suspected bleeding from ectopic varices should be assessed with comprehensive imaging to define the functional vascular anatomy of the varices, allowing for an individualized treatment approach

Ectopic varices

32

Endoscopic therapy for ectopic varices, when feasible and available, may be used as bridge to more definitive interventional radiology therapies

33

TIPS is the first-line treatment for most ectopic varices and, in most cases, should be performed together with ATO or RTO of the varices

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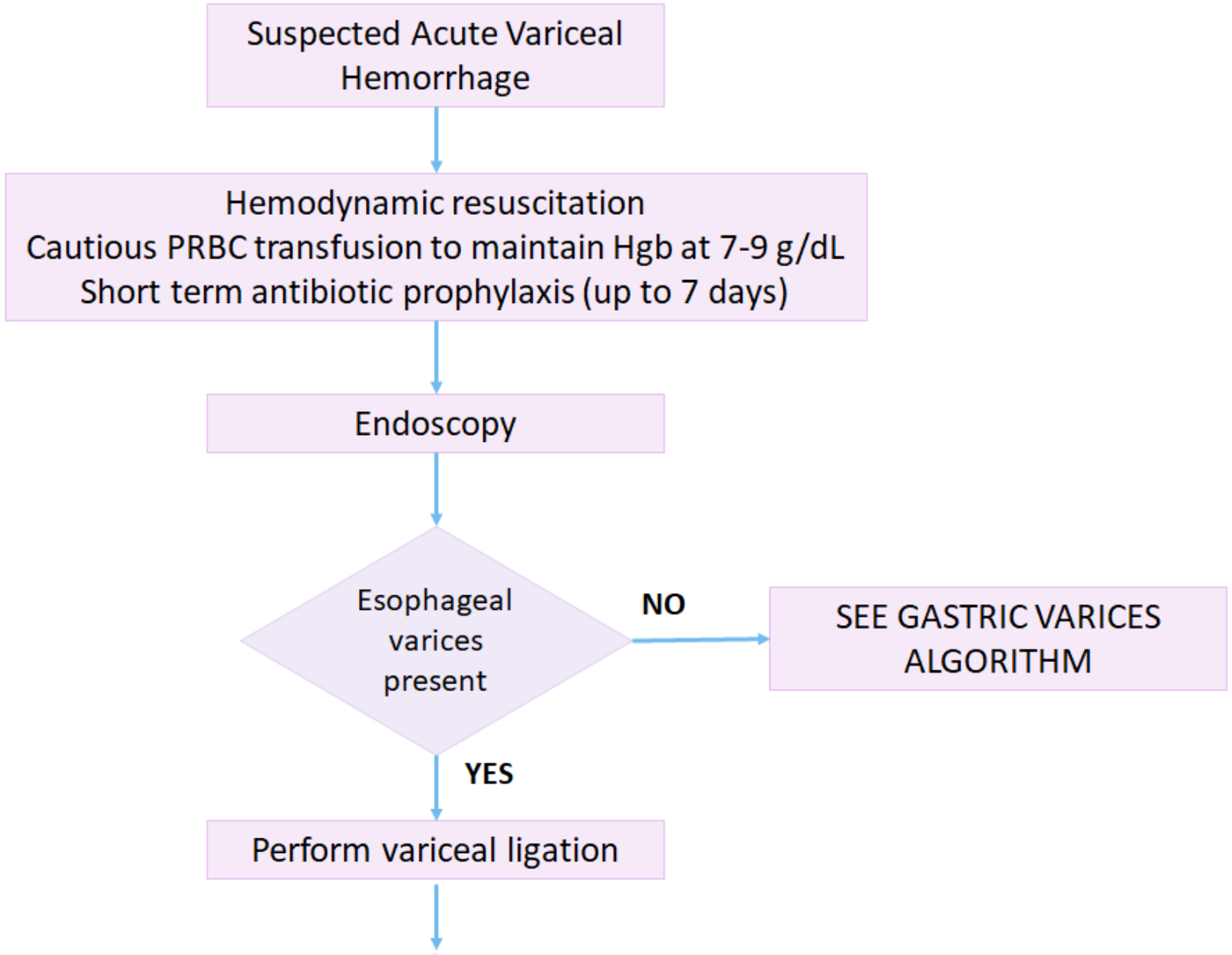
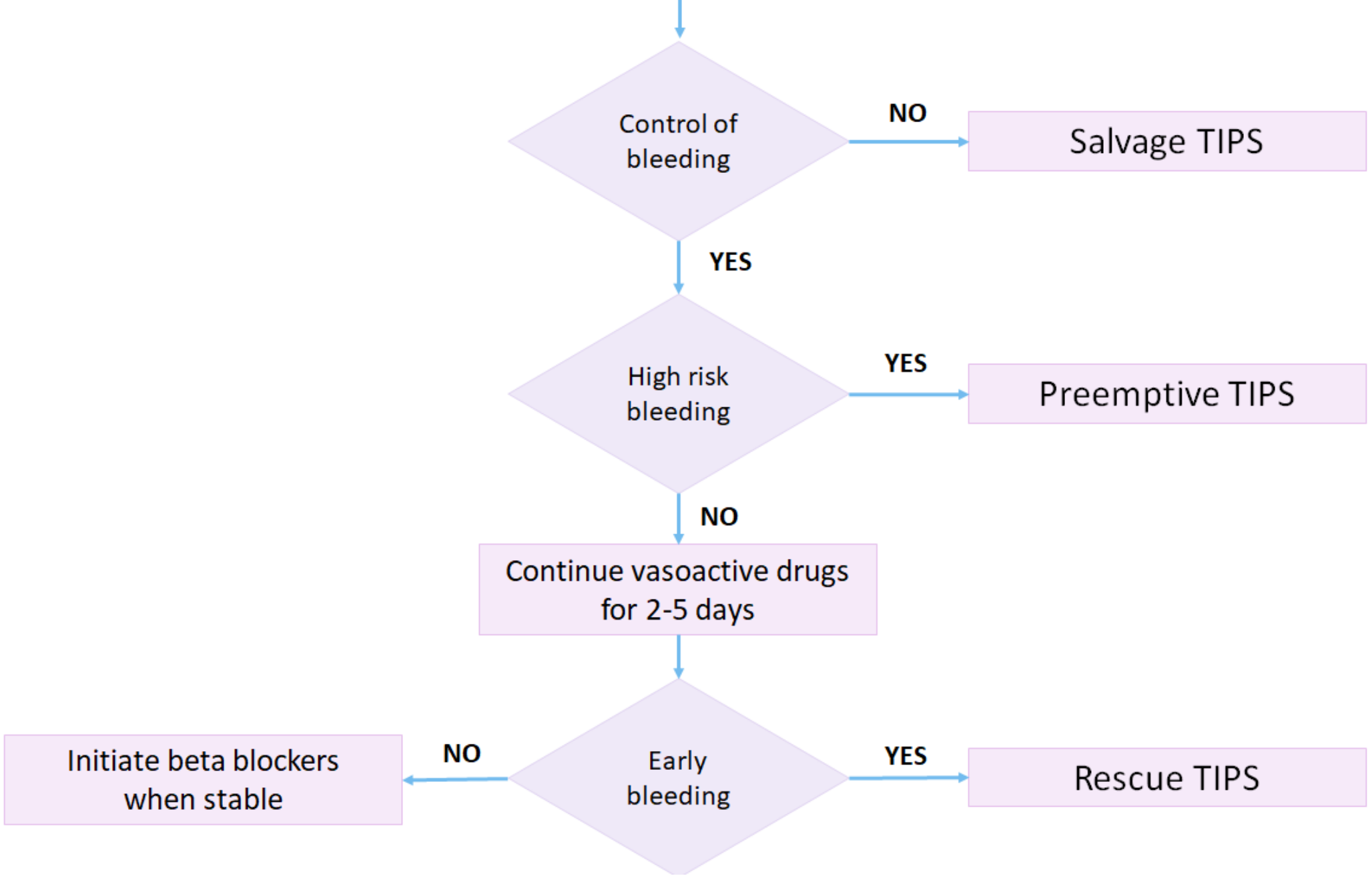
In patients who are poor candidates for TIPS or in patients in whom collaterals feeding varices are small, ATO or RTO alone (without TIPS) may provide sufficient control of ectopic variceal hemorrhage

Algorithm for suspected Acute Variceal Hemorrhage





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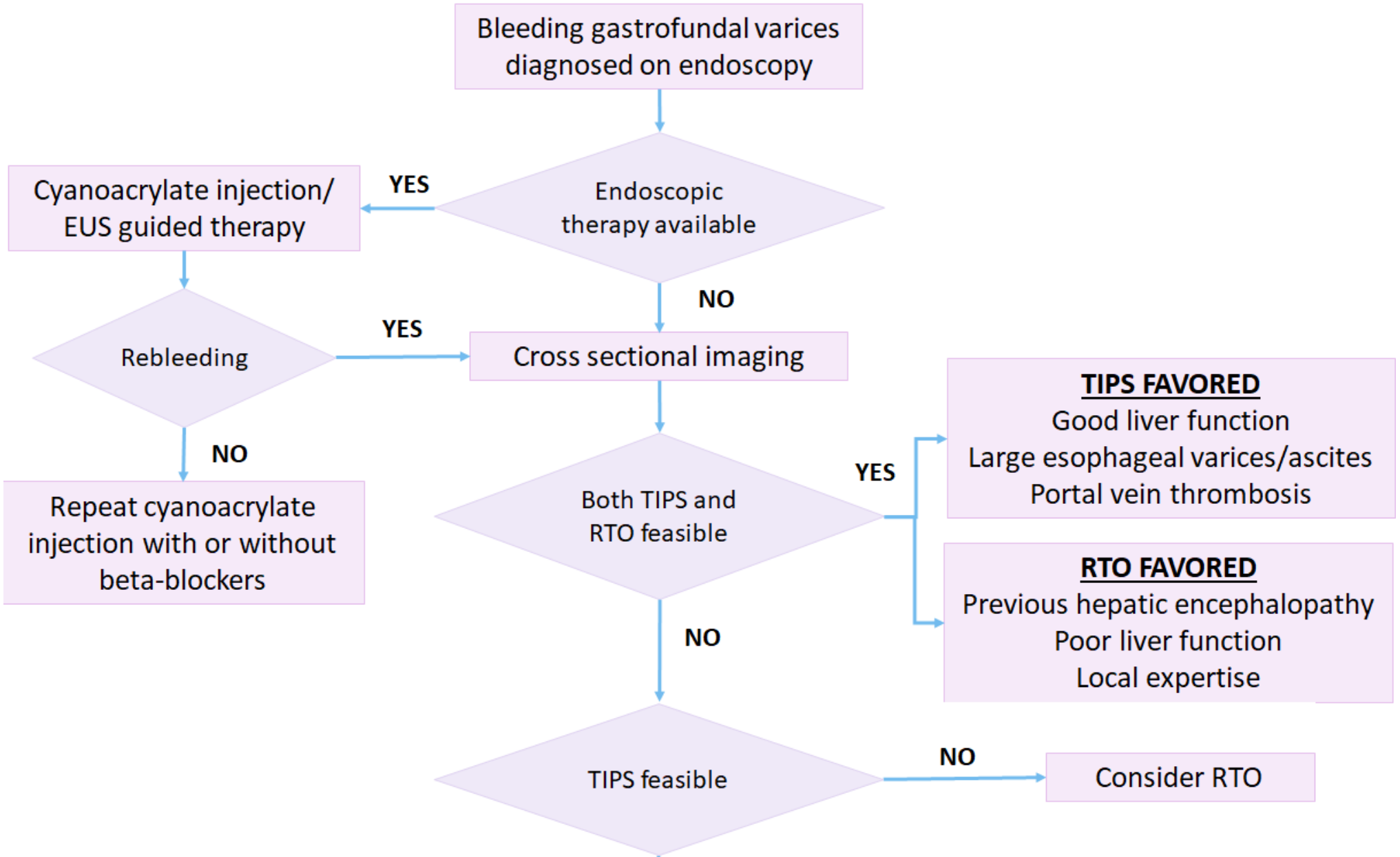
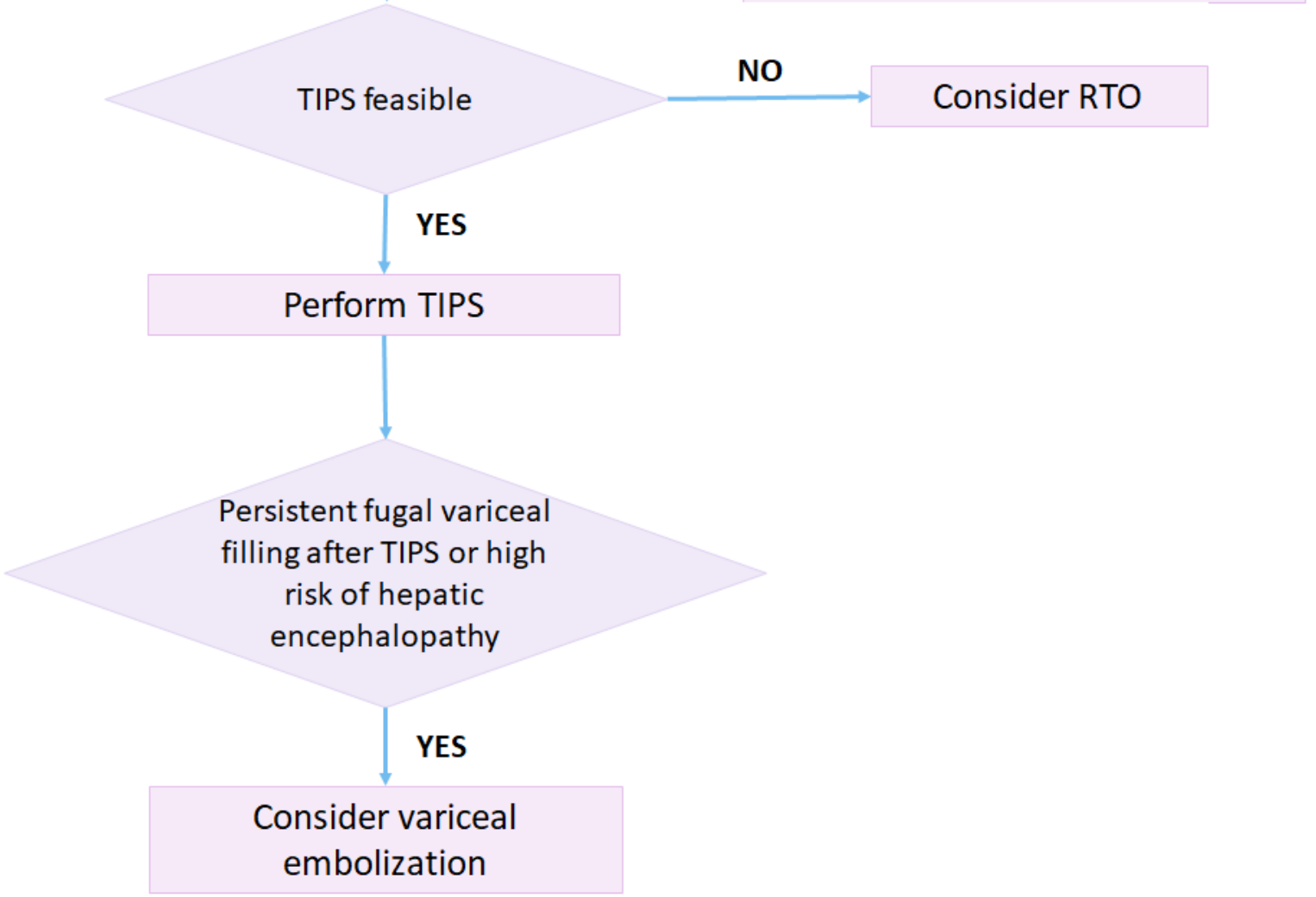
Algorithm for Gastrofundal Acute Variceal Hemorrhage





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Thank you