

Balloon-Occluded Retrograde Transvenous Obliteration (BRTO) for Gastric Varices (GV) in Interventional Radiology (IR)

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BRTO Procedure

- Minimally invasive procedure that uses an endovascular approach to treat gastric variceal bleeding
- BRTO is an effective treatment performed for portal hypertensive gastric varices (Kim et al., 2018)
- Basic principle of the BRTO procedure is to occlude the gastrosplenic shunt
- Procedure performed via transfemoral or transjugular approach (Kim et al., 2018)
- After access is gained with a micropuncture needle a sheath is placed and the gastrosplenic shunt is catheterized
- Balloon catheter is inserted into a draining vein of the varix
- Guidewire is used to advance the balloon catheter (Long, Rollins, & Smith, 2019)
- Retrograde injection of sclerosing agent through the catheter during balloon occlusion to fill GV (Ahmed et al., 2020)
- Sclerosing agents used can be gelfoam mixed with contrast media or sodium tetradecyl sulfate (STS)
- The purpose of the balloon is to prevent leakage of the sclerosant into systemic circulation (Kim et al., 2018)
- Procedure requires long post-procedural monitoring
- Complications can occur such as balloon rupture or adverse effects from sclerosing agent (Kim et al., 2018)
- Confirmation of obliteration can be seen using CT (Kim et al., 2018)

Gastric Varices (GV)

- Dilated veins that occur as a result of portal hypertension
- Blood flows through GV into systemic circulation
- GV drain directly into large veins resulting in high blood flow and mortality due to greater blood loss when varices rupture (Thapa et al., 2020)
- Can occur in combination with esophageal varices (Kim et al., 2018)
- Less common than esophageal varices (Thapa et al., 2020)
- More difficult to obliterate than esophageal varices (Thapa et al., 2020)

Alternative BRTO Method: Plug Technique

- Modified approach performed the same way as the BRTO procedure that uses a permanent vascular plug rather than the balloon
- Can be used along with occlusion balloon or performed by only using the vascular plug
- Size of the vascular plug is decided based on measurements from CT scans of the narrowest part of the shunt (Gwon, Ko, Kwon, Yoon, & Sung, 2018)
- Usually, a plug is used that is 20-30% larger than the size of the shunt to prevent migration of the sclerosant (Kim et al., 2018)
- Mixture of gelfoam and contrast media is injected to embolize gastric varices and collateral veins
- After vascular plug is deployed the sclerosing agent is injected until the small collateral veins are filled and early filling of gastric varices is seen (Kim et al., 2018)
- No risk of balloon rupture in cases where only the plug is used
- Reduces procedure time (Kim et al., 2018)
- Reduces post-procedure monitoring (Kim et al., 2018)
- Mostly used in practice (Kim et al., 2018)

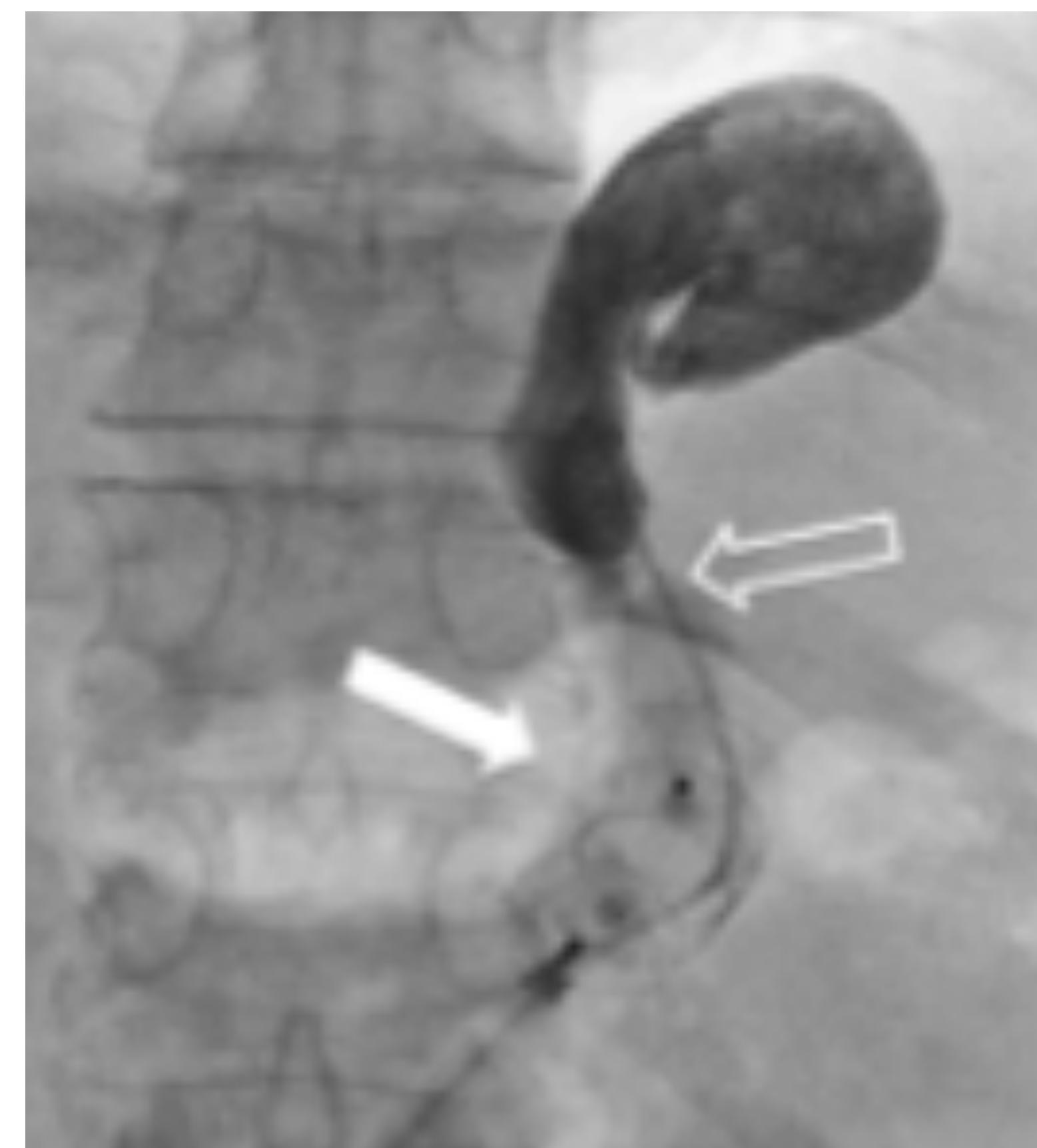


Image: Vascular plug (white arrow) deployed at gastrosplenic shunt after positioning the catheter (open arrow) in the GV (Kim et al., 2018, p. 840)

Alternative BRTO Method: Coil Technique

- Modified approach performed the same way as the BRTO procedure that uses coils and a gelfoam slurry instead of the balloon
- Catheter is advanced into the narrowest part of the shunt and coils are deployed (Kim et al., 2018)
- Once the coils completely occlude the shunt the sclerosant is injected
- Can be used when the vessel is too tortuous or when the shunt angle is not compatible to use a balloon or plug
- Can be performed in larger shunts whereas the plug technique is limited to the diameter of the available plugs (Kim et al., 2018)
- Can be used along with occlusion balloon or by only using coils and sclerosant
- Coils can be deployed through occlusion balloon
- Once the shunt is completely occluded the occlusion balloon can be removed (Kim et al., 2018)
- Procedure time is longer and can be more costly (Kim et al., 2018)

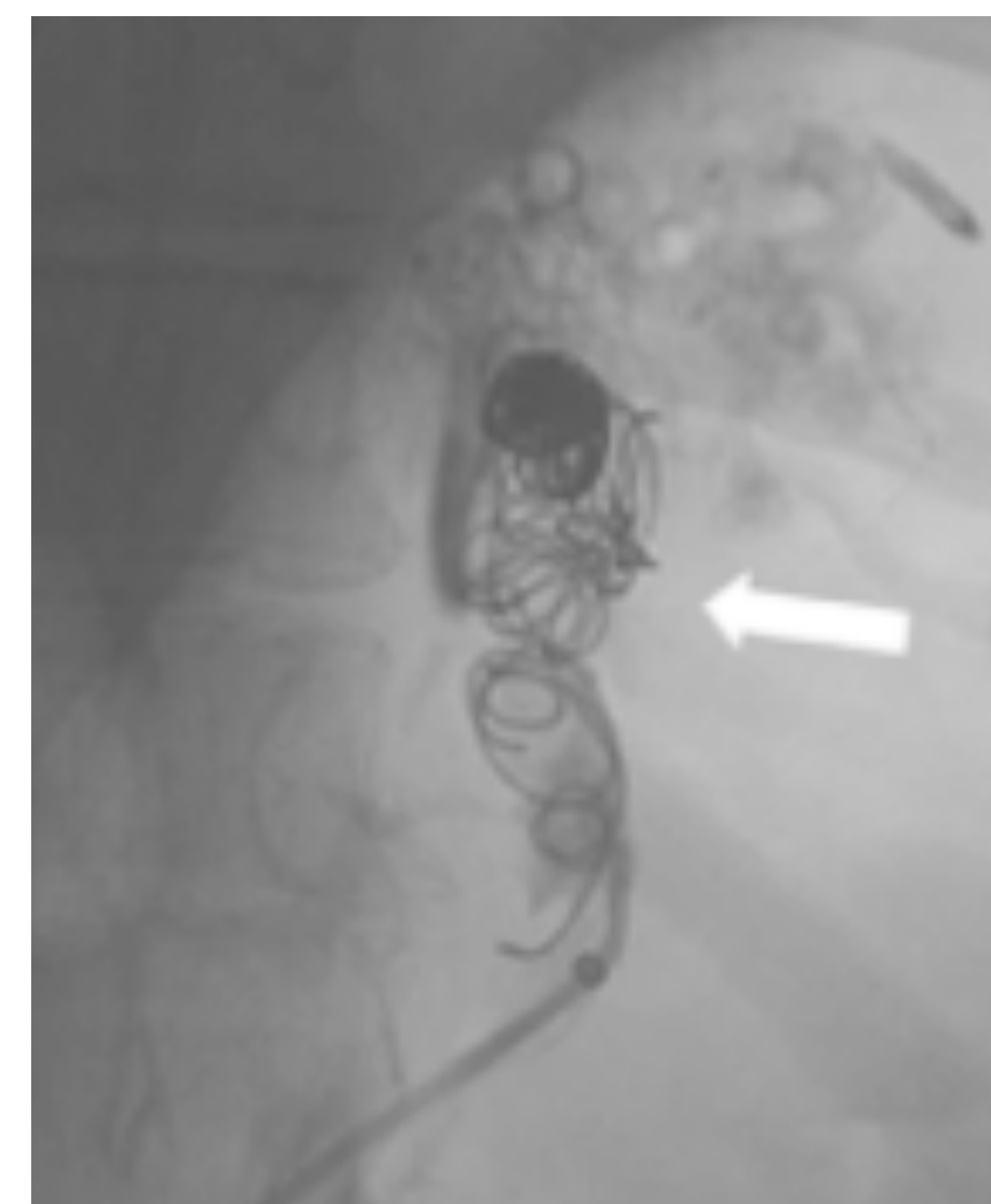


Image: Coil embolization of gastrosplenic shunt after complete occlusion (Kim et al., 2018, p. 843)

Statistics

- Gastric Varices develop in about 20% of patients with portal hypertension (Thapa et al., 2020)
- Recent study of plug technique showed reoccurrence of gastric varices is less common in patients who underwent procedure where sodium tetradecyl sulfate was used (Kim et al., 2018)
- Mortality rate for bleeding of GV is about 55% (Gwon et al., 2018)

Conclusion

- BRTO is:
 - a suitable therapeutic option for controlling GV
 - has a high efficacy for stopping GV bleeding
 - has a significantly lower re-bleeding rate of GV compared to transjugular intrahepatic portosystemic shunts (TIPS) or endoscopic treatments (Gwon et al., 2018)
- Reports show that failure of the BRTO procedure are rare (Thapa et al., 2020)
- Basic principle of procedure is to stop gastric variceal bleeding and preserve hepatic function

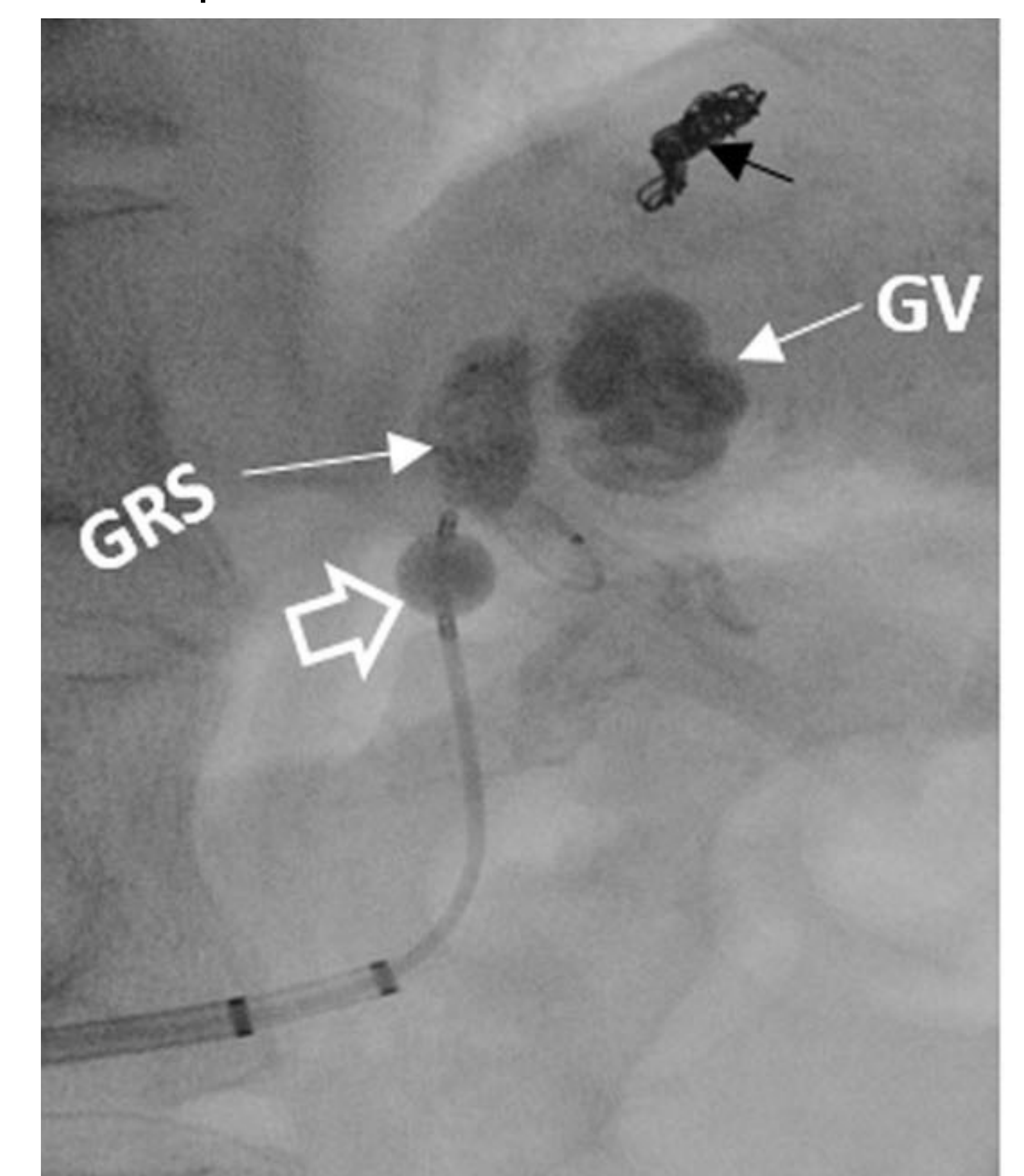


Image: Fluoroscopic image at the end of BRTO showing balloon catheter positioned at gastrosplenic shunt (GRS) and gastric varices (GV) (Ahmed et al., 2020, p. 5)