

International Journal of Radiology and Diagnostic Imaging



E-ISSN: 2664-4444
P-ISSN: 2664-4436
www.radiologypaper.com
IJRDI 2021; 4(2): 42-45
Received: 20-02-2020
Accepted: 24-03-2021

Dr. Nischal Kundaragi
Assistant Professor,
Department of Interventional
Radiology, Sapthagiri
Institute of Medical Sciences
and Research Centre,
Bangalore, Karnataka, India

Dr. Girish BV
Associate Professor,
Department of Interventional
Radiology, Sapthagiri
Institute of Medical Sciences
and Research Centre,
Bangalore, Karnataka, India

Dr. Puneeth Kumar KN
Assistant Professor,
Department of Interventional
Radiology, Sapthagiri
Institute of Medical Sciences
and Research Centre,
Bangalore, Karnataka, India

Corresponding Author:
Dr. Girish BV
Associate Professor,
Department of Interventional
Radiology, Sapthagiri
Institute of Medical Sciences
and Research Centre,
Bangalore, Karnataka, India

Shunt embolization and balloon-occluded retrograde transvenous obliteration procedures to treat hepatic encephalopathy

Dr. Nischal Kundaragi, Dr. Girish BV and Dr. Puneeth Kumar KN

DOI: <http://dx.doi.org/10.33545/26644436.2021.v4.i2a.198>

Abstract

Introduction: Hepatic encephalopathy (HE) develops in up to 50% of patients with decompensated cirrhosis. Balloon-occluded retrograde transvenous obliteration (BRTO) has been shown to be effective in controlling gastric variceal bleeding.

Materials and Methods: This is a descriptive and hospital based study conducted at Department of Interventional Radiology, Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore. Seven cases of BRTO were identified from January 2020 to December 2020. Patients refractory to medical treatment having treatable porto-systemic shunts were included. Most had gastro-renal shunts. Jugular or femoral approach or both approaches were used to do the procedure.

Results: Out of total 7 cases, in 4 cases we used Amplatzer Vascular Plugs (AVP II) combined with coils and in 3 cases sclerosing agents along with coils. All patients were followed for 3, 6, 9 and 12 months. Five patients showed encephalopathy free duration of more than 6 months. Three patients undergone liver transplantation over period of 2years. Post BRTO there were no renal vein thrombosis noted.

Conclusion: BRTO and shunt embolization show good short-term results in reducing hepatic encephalopathy episodes in patient's refractory to medical treatment.

Keywords: Balloon-occluded retrograde transvenous obliteration procedure (brto), embolization, gastro-renal shunt, amplatzer vascular plug, coils

Introduction

Shunt embolization and Balloon-Occluded Retrograde Transvenous Obliteration (BRTO) procedures were performed to treat large porto-systemic shunts causing hepatic encephalopathy. Various methods have been described to treat these shunts from using coils/vascular plugs to sclerosants and gelfoam. Occlusion balloons are placed in the shunt near its renal vein opening either through femoral or jugular vein access. Through the balloon catheter calculated volume of sclerosant (3% Sodium tetradecyl sulfate/Ethanolamine oleate/polidocanol) mixed with air (sclerosant foam) and contrast medium is injected retrogradely in to the shunt. This causes endothelial damage and thrombosis of shunt leading to obliteration of gastro-renal or gastro-caval shunts and gastric varices. Most cases femoral route is preferred and in some cases jugular route is used.

Materials and method.

This is a descriptive and hospital based study conducted at Department of Interventional Radiology, Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore. This study was approved by the institutional review board of our institution, and written informed consent was taken from all the patients. Cases were identified from the angiography suite log books. Only patients with pre-planning contrast enhanced computerized tomography (CT) were included. Clinical records of the identified patients were reviewed to identify the cause of hepatic dysfunction. Biochemical parameters (INR, platelet, serum total bilirubin, serum ammonia), imaging and technical and clinical outcomes were reviewed and recorded.

Techniques

In all patients contrast enhanced CT scan was performed prior to treatment. All cases are done by an interventional radiologist with experience more than 7years.

Procedures were done with anesthetic team under IV sedation. We initially used femoral route and switched to IJV route whenever wire negotiation was difficult and not able to tract the balloon catheter in to shunt.

Femoral or jugular vein were punctured with 18G needle and accessed by inserting 5F sheath (Cordis, Hialeah, FL). Then with the help of J curved 0.035" Glidewire (Terumo, Tokyo, Japan) and 65cm, 5F catheter (Cobra, Cordis, Miami Lakes, FL) shunt Venogram done by injecting nonionic contrast at the rate of 5-7ml/sec. Glide wire and Catheter are negotiated as much as possible in to the shunt and then glidewire was removed and replaced with 260cm, 0.035" Amplatz super-stiff wire for stability and putting long sheath and balloon catheter. Either 10-French Rösch-Uchida introducer sheath (Cook) or 9-Fr Mullins transeptal introducer sheath (Cook Inc., Bloomington, USA) composed of 59cm sheath were used. In five cases of shunt embolization 10F sheath was tracked as much as possible into the shunt then Amplatzer Vascular Plugs (AVP II) were deployed in desired positions. In one case, 80cm length, 6 Fr occlusion balloon catheter (Terumo Medical Corporation, Tokyo, Japan) was used to do BRTO. In one case we used 12-Fr Mullins transeptal introducer sheath (Cook, France) with Reliant balloon (46 mm, Medtronic, Minneapolis, USA). And in one case used 4cm, 12mm, 0.035-Inch Rival PTA balloon (Bard Peripheral Vascular, Tempe, AZ) as

shunt was small in caliber and straight orientation. 3-5ml of contrast mixed saline (2:1) was injected to inflate the 6 Fr occlusion balloon catheter (from 18mm to 28mm) and 16ml injected to inflate Reliant balloon (upto 27mm).

Large branch collaterals were embolized with 0.035" coils (Nester; Cook). Small collaterals were embolized with micro coils (Cook Medical Inc., Bloomington, IN) whenever required using 2.7F microcatheter (Progreat 2.0; Terumo, Tokyo, Japan). Tiny collaterals without significant shunting were not embolized.

In shunt embolization cases Amplatzer Vascular Plugs (AVP II, Abbott Vascular, Santa Clara CA) were used with diameter 16mm to 22mm (Figure 1). In all cases of BRTO volume of foam sclerosant required was calculated by injecting contrast through inflated balloon catheter. Arch of shunt or gastric varices opacification is considered as end point for calculation of amount of foam required. Then foam sclerosant was prepared by mixing sclerosant (3% Sodium tetradecyl sulfate) with room air (in 3:2 ratio), which was injected retrogradely in to the shunt. After putting the mixture of sclerosant balloon was kept inflated the balloon for minimum of one and half hour for all patient. Before deflating balloon, 1-2ml of contrast was put to confirm the thrombus formation and then slowly balloon was deflated (Figure 2). Post balloon deflation renal Venogram done to rule out renal vein thrombosis.

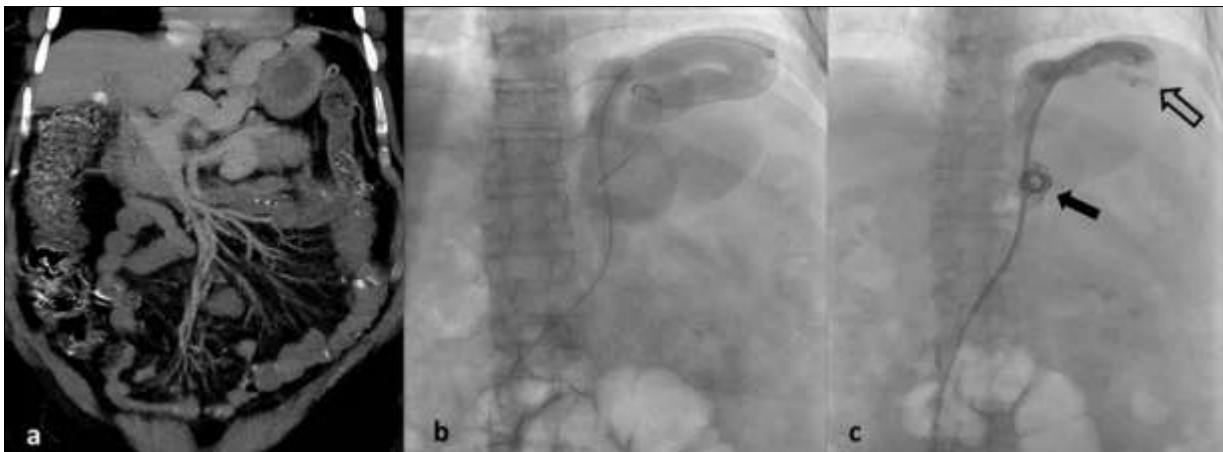


Fig 1: Known case of refractory Hepatic encephalopathy. CECT Coronal MIP shows large porto-systemic shunt (a). Transfemoral access and venogram of porto-systemic shunt (b). Shunt embolization by (Black open arrow) and coils (Black arrow). Long Mullins sheath was used (c).

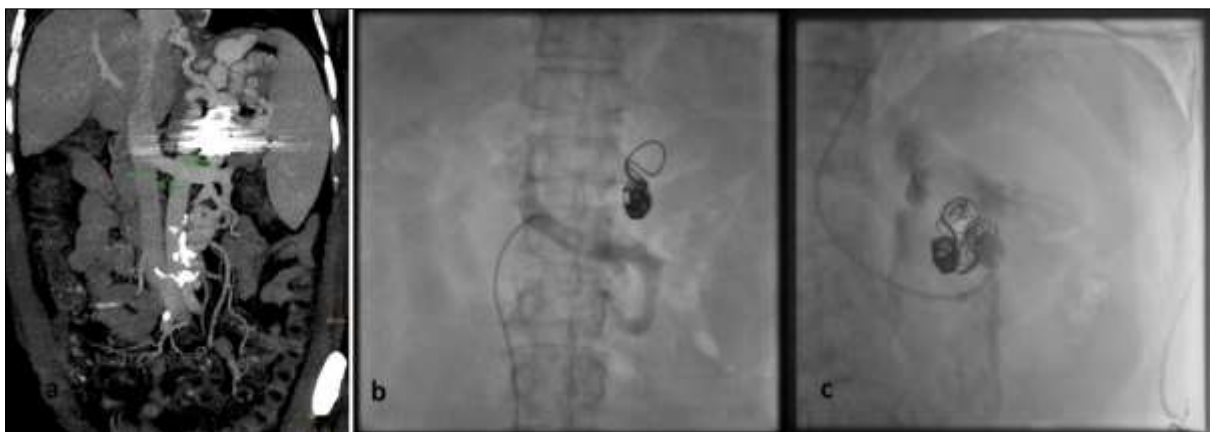


Fig 2: Known case of recurrent Hepatic encephalopathy. Failed shunt coiling. CECT Coronal MIP with metallic coil artefact in shunt (a). Transfemoral access tried initially, showing left renal vein and Porto-systemic shunt (b). Transjugular access with easy shunt negotiation and balloon inflation. Long curved sheath / Mullins sheath used. Performed coil assisted BRTO (CARTO). Post procedure staining of shunt seen during deflation of balloon (c).

Results

All patients had pre-procedural CECT scan. Seven cases of recurrent or refractory hepatic encephalopathy (grade III, West Haven Criteria) due to large porto-systemic shunt. Most of them were having gastro-renal shunt from left gastric vein to left renal vein. Our study group had a higher male predominance with a male to female ratio of 12:1. The mean age of the study population was 70 years: (range 23 – 80 years). Cause and type of shunts are enumerated in Table 1. Two young adult patients (23 years and 37 years) had portal hypertension secondary to extra hepatic portal venous obstruction. No established cirrhosis was found in both patients. Rest of the patients had established cirrhosis of liver induced by alcohol in 3 patients, Hepatitis B and NASH in 1 patients each. Two patients had recurrent hepatic encephalopathy. 3 cases had gastro-renal shunts, one patient had isolated spleno-renal shunt, one patient had recanalized umbilical vein, one patient had large meso-caval shunt and one patient had both gastro-renal and spleno-renal shunt with common drainage in to left renal vein.

Table 1: Patients characteristics

Clinical Data	
Male-female ratio	12:1
Mean age (Years)	70
Portal hypertension	2 patients
Cirrhosis of liver	3 patients
Hepatitis B and NASH	1 patients
Recurrent hepatic encephalopathy	2 patients
Gastro-renal shunts	3 patients
Isolated spleno-renal shunt	1 patients
Recanalized umbilical vein	1 patients
Meso-caval shunt	1 patients
Gastro-renal and spleno-renal shunt with common drainage in to left renal vein	1 patients

In four patients we used Amplatzer Vascular Plugs (AVP II, Abbott Vascular, Santa Clara CA) were used with diameter 16mm to 22mm. In 3 patient with recurrent/refractory hepatic encephalopathy (grade III, West Haven Criteria), we performed coil assisted BRTO. Both 0.035 inch and micro coils were used. Balloon was kept inflated for 2hrs post foam sclerosant injection. By day 3, the encephalopathy had improved and there was reduction in serum ammonia levels. Procedure was successful in all patients with no immediate procedure related complications. Minor leak with contrast extravasation was noted during the procedure in 2 patients. No obvious retroperitoneal hemorrhage seen on intraprocedural ultrasound. No major leak or vein rupture seen in any patient.

Post procedure all patients were shifted to surgical ICU for monitoring. All the patients were shifted back to ward on 2nd day and discharge from hospital between the 5th and 7th day.

Discussion

Cirrhosis of liver associated with portal hypertension can develop portosystemic shunts to decompress the portal blood in to systemic circulation. Large portosystemic shunts may result in chronic encephalopathy, that may be refractory to medical management^[1, 2]. An Interventional therapy like shunt embolization and Balloon-occluded retrograde transvenous obliteration (BRTO) are used to treat such Porto-systemic shunts^[3, 4]. In terms of portosystemic shunt closure, a balloon catheter may have a limited role

because balloon inflation per se provides temporary blockage of the shunt flow until forming the thrombotic shunt occlusion by the sclerosant. Instead, use of a vascular plug might provide more stable and permanent shunt occlusion.

Vascular plug-assisted retrograde transvenous obliteration (PARTO) has recently been utilized to treat gastric varices and hepatic encephalopathy in Korea^[5]. While a recent series has been published reporting the use of portosystemic shunt embolization for hepatic encephalopathy^[6]. We present our study mentioning use of vascular embolization and BRTO in treatment of recurrent / refractory hepatic encephalopathy.

BRTO has become an established procedure in the management of gastric varices, particularly in Asia; with the primary indication being either bleeding or refractory encephalopathy due to the presence of a large gastro-renal shunt. It has a technical success rate of around 91% and obliteration rate of gastric varices of technically successful cases around 94%^[7]. BRTO is effective in controlling gastric variceal bleeding with low rebleed rates.

The technique of undertaking vascular embolization and BRTO has been well documented in the literature. The most salient part of the procedure is to obtain a safe and stable access to ensure that the embolic agent does not migrate into the renal vein. The most preferred access is via a transfemoral approach.

We have less evidence in literature to say long term effectiveness of vascular plus embolization and BRTO in treatment of hepatic encephalopathy. Future pooled data from multiple centers can improve our understanding. Further studies are also needed to see whether Vascular plug embolization is better or BRTO and its technical variations are better in treatment of hepatic encephalopathy.

Conclusion

In our experience, shunt embolization and BRTO provide good short term (6months to 12 months) results in controlling recurrent/refractory hepatic encephalopathy.

References

1. Uflacker R, De Silva OEA, Carneiro D'Albuquerque LA, Piske RL, Mourao GS. "Chronic portosystemic encephalopathy: embolization of portosystemic shunts," *Radiology* 1987;165(3):721-725. View at: Google Scholar
2. Chandler JG, Fechner RE. "Hepatopedal flow restoration in patients intolerant of total portal diversion," *Annals of Surgery* 1983;197(5):574-583. View at: Google Scholar
3. Kanagawa H, Mima S, Kouyama H, Gotoh K, Uchida T, Okuda K. Treatment of gastric fundal varices by balloon-occluded retrograde transvenous obliteration, *Journal of Gastroenterology and Hepatology*, 1996;11(1):51-58. View at: Google Scholar
4. Saad WEA, Sabri SS. "Balloon-occluded retrograde transvenous obliteration (BRTO): technical results and outcomes," *Seminars in Interventional Radiology* 2011;28(3):333-338. View at: Publisher Site | Google Scholar
5. Gwon DI, Ko GY, Yoon HK, *et al.* Gastric varices and hepatic encephalopathy: treatment with vascular plug and gelatin sponge-assisted retrograde transvenous obliteration—a primary report, *Radiology*

2013;268(1):281-287. View at: [Publisher Site](#) | [Google Scholar](#)

6. Laleman W, Simon-Talero M, Maleux G, *et al.* Embolization of large spontaneous portosystemic shunts for refractory hepatic encephalopathy: a multicenter survey on safety and efficacy, *Hepatology* 2013;57(6):2448-2457.
7. Sabri SS, Saad WEA. Balloon-occluded retrograde transvesous obliteration (BRTO): Technical results and outcomes. *Semin Intervent Radiol* 2011;28(3):333-338.