Retrograde–Antegrade Accelerated Trap Obliteration: A Modified Approach to Transvenous Eradication of Gastric Varices

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ABSTRACT

This series presents a hybrid technique for obliteration of gastric varices (GVs) termed retrograde–antegrade accelerated trap obliteration that employs sclerosant agent instillation under concurrent inflow and outflow vessel occlusion with coils or plugs. Six patients (mean age, 56 y) with GVs were treated in 2014 and 2015. Technical success rate was 100%. Five patients completed 30-day follow-up. There were no procedure-related complications, and clinical success rate was 100%, with no bleeding recurrence over a mean follow-up of 298 days ± 178. GV obliteration rate was 100% (n = 4) at a mean of 157 days ± 158. This limited experience suggests that the described technique represents a viable approach to GV obliteration.

ABBREVIATIONS

BATO = balloon-occluded antegrade transvenous obliteration, BRTO = balloon-occluded retrograde transvenous obliteration, CARTO = coil-assisted retrograde transvenous obliteration, GRS = gastrorenal shunt, GV = gastric varix, LGV = left gastric vein, PARTO = plug-assisted retrograde transvenous obliteration, PGV = posterior gastric vein, TIPS = transjugular intrahepatic portosystemic shunt

Recently, balloon-occluded transvenous obliteration has gained traction as a viable interventional approach for the management of gastric varices (GVs). The original forms of this procedure included balloon-occluded retrograde transvenous obliteration (BRTO) and balloon-occluded antegrade transvenous obliteration (BATO) (1,2), and more recent adaptations include coil-assisted retrograde transvenous obliteration (CARTO) (3) and plug-assisted retrograde transvenous obliteration (PARTO) (4,5). Although all are associated with high efficacy rates ranging from 90% to 100% (1–5), these procedures are subject to technical pitfalls, including the possibility of incomplete sclerosant agent filling into all afferent feeding vessels in the case of BRTO, risk for systemic spill of sclerosant agent in the setting of BATO, and equipment compatibility issues, primarily pertaining to balloon-occlusion device and large coil or plug compatibility (6), with CARTO or PARTO. The present series aimed to assess the outcomes of a hybrid technical approach to GV obliteration—termed retrograde–antegrade accelerated trap obliteration—which was conceived to potentially overcome some challenges of BRTO, feature benefits of BATO, and showcase advantages of the accelerated, balloon-free obliteration of CARTO and PARTO.

CASE SERIES

Patients

Institutional review board approval is not required for retrospective case series at the author's institution. The study cohort included six patients with liver cirrhosis and bleeding GVs who were treated by a single physician (with 8 y attending experience) between December 2014 and December 2015. The patient sample included two men (33%) and four women (67%) of mean age 56 years ± 12 (range, 44–78 y). Causes of liver cirrhosis included alcohol (n = 4; 67%), hepatitis C virus (n = 1; 16%), and nonalcoholic steatohepatitis (n = 1; 16%), and the mean Model for End-stage Liver Disease score was 14 ± 3

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(range, 9–16). Varices included type 1 (n = 5; 83%) and type 2 (n = 1; 17%) isolated GVs (7,8), all diagnosed via esophagogastroduodenoscopy. Five patients (83%) had acute GV hemorrhage, and one (17%) had experienced a previous hemorrhage. All patients were in hemodynamically stable condition, and each patient underwent preprocedural contrast-enhanced computed tomography (CT) or magnetic resonance (MR) imaging for variceal anatomic delineation and procedure planning.

Procedure Technique

Procedures were performed under general anesthesia with the use of retrograde and antegrade GV access. For retrograde access, the right internal jugular vein was punctured by using a 21-gauge needle (Micropuncture Introducer Set; Cook, Bloomington, Indiana). A 7-F, 45-cm-long sheath (Flexor Ansel Guiding Sheath; Cook) was placed and advanced into the gastrorenal shunt (GRS). For antegrade access, a 10-mm stent-graft transjugular intrahepatic portosystemic shunt (TIPS) was uneventfully created via a second jugular access by using standard technique (9) or percutaneous transhepatic or transsplenic access was attained by using ultrasound-guided puncture with a 21-gauge needle (Micropuncture Introducer Set; Cook) and exchanged for a 6-F (Brite tip; Cordis, Hialeah, Florida) or 4-F (Pinnacle; Terumo, Somerset, New Jersey) sheath, respectively.

After splenoportography was performed, obliteration was pursued. First, GV complex inflow vessels were embolized via a 10-F, 40-cm-long TIPS sheath (RUPS-100; Cook) or the transhepatic or transsplenic sheaths to consolidate inflow into the GV complex to a single dominant afferent vessel from which to inject sclerosant agent. Embolization involved catheter (MPA; AngioDynamics, Latham, New York) and coaxial microcatheter (Renegade STC; Boston Scientific, Marlborough, Massachusetts) selection of GV inflow vessels, generally the left gastric vein (LGV) and posterior gastric vein (PGV), followed by embolization with the use of metallic coils (MicroNester; Cook) or plugs (AMPLATZER Vascular Plug; St. Jude Medical, St. Paul, Minnesota). Venography was performed via the sole remaining inflow vessel to confirm single inflow and outflow vessels from the GV complex.

The GV complex was then trapped and obliterated. For antegrade obliteration, metallic plugs (AMPLATZER Vascular Plug; St. Jude Medical) or coils were first deployed into the GRS for GV complex outflow occlusion to prevent systemic loss of sclerosant agent. The sole remaining inflow vessel into the GV complex—typically the short gastric vein (SGV)—was then catheterized with the use of a 5.5-F, 80-cm balloon-occlusion catheter (Fogarty; Edwards Lifesciences, Irvine, California) and coaxial microcatheter (Renegade STC; Boston Scientific). The inflow vessel balloon catheter was inflated, and a sclerosant mixture consisting of carbon dioxide, sodium tetradecyl sulfate, and Lipiodol (Guerbet, Villepinte, France) at a 3:2:1 ratio was injected. When the GV complex was filled with sclerosant agent, metallic coils (MicroNester; Cook) were immediately advanced via the microcatheter under persistent balloon occlusion for SGV closure, and the balloon was then deflated. For retrograde obliteration, the inflow vessel was first embolized with metallic coils, with subsequent retrograde sclerosant agent injection via a GRS occlusion balloon (Fogarty; Edwards Lifesciences) and microcatheter (Renegade STC; Boston Scientific) system followed by GRS coil embolization (MicroNester; Cook) and immediate balloon deflation. Fluoroscopy confirmed stasis of sclerosant agent within the GV complex. Final splenoportal venography was then performed. The jugular venous accesses were then removed, and hemostasis was achieved. Transhepatic and transsplenic accesses were removed, and embolization of the parenchymal tract was performed with microfibrillar collagen (Avitene; CR Bard, Murray Hill, New Jersey).

Clinical Outcomes and Statistical Analysis

The outcome measures included procedure technical success, clinical success, and variceal obliteration rate. Technical success was defined as the successful administration of sclerosant agent into GVs with embolic occlusion of inflow and outflow vessels. Clinical success was defined by absence of recurrent bleeding. Variceal obliteration was delineated on follow-up contrast-enhanced CT or MR imaging by complete absence of contrast medium–filled variceal channels identifiable within the gastric wall. Study population features and procedure clinical outcomes were assessed with descriptive statistical analysis performed with Excel (Microsoft, Redmond, Washington).

RESULTS

The Table summarizes procedure technical details. In cases of antegrade TIPS access, shunts were created in the same procedure session as obliteration in three of four cases (75%) and 2 days earlier in the other (25%) as planned. Procedure technical success was achieved in all six cases (100%; Fig). No GV rupture was encountered.

One patient was lost to follow-up at 8 days after the procedure and was excluded from clinical outcomes analysis. Among the remaining five cases, there were no complications within 30 days of obliteration procedures, although one patient required TIPS reduction 65 days after shunt creation as a result of hepatic encephalopathy. Clinical success rate was 100% (five of five), with no cases of recurrent bleeding over the course of 298 days ± 178 (range, 124–515 d) of clinical follow-up. Four of five patients (80%) underwent follow-up cross-sectional imaging (one patient was followed clinically but could not undergo cross-sectional imaging because of insurance restrictions). The GV obliteration rate was