CASE REPORT

Successful management of post-TIPSS encephalopathy with a balloon-expandable covered stent: a controllable method to reduce shunt flow

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Introduction

Transjugular intrahepatic portosystemic shunt (TIPSS) is recognized as a useful technique in cases that fail to respond to two endoscopic sessions after acute variceal bleeds.1 TIPSS has been shown to be as effective in managing acute gastric bleeds as in managing acute oesophageal bleeds.2 The major complications of TIPSS procedures are shunt insufficiency and hepatic encephalopathy.1 New or worsened hepatic encephalopathy after TIPSS has been seen in up to 35% of cases, and it has been reported to be refractory to conservative medical treatment in up to 7% of cases,3,4 in whom further intervention has been necessary to reduce flow through the TIPSS. This may be performed by occluding the shunt completely or by using one of a variety of endovascular devices aimed at reducing the calibre of the stent lumen,5 which increases the portosystemic pressure gradient across the stent and improves intrahepatic portal bloodflow. Such techniques often improve the encephalopathy, but they may increase the risk of variceal bleeding, requiring a fine balance between the two.

In this article, we describe a method to increase the portosystemic pressure gradient across the shunt in a controllable way, thus reducing encephalopathy but also minimizing the risks of further bleeding.

Case report

A 69-year-old Caucasian man, known to have alcoholic liver disease, cirrhosis and oesophageal varices, was admitted with dizziness and a 2-week history of dark stools. On admission the haemoglobin (Hb) was 6.8 g/dl but liver function tests (LFTs) were normal. Upper gastrointestinal (GI) endoscopy showed three polypoid lesions in the antrum and a varix in the fundus with a red nipple on it, indicating recent bleeding. After transfusing 4 units of blood, the man’s Hb increased to 11.1 g/dl. His gastric bleeding was considered to be due to the high dose of beta-blocker he was taking, and hence the dose was halved. Since his general condition improved without any further dizzy spells, he was discharged after 9 days in hospital.

Upper GI endoscopy performed at elective follow-up 2 weeks after discharge demonstrated fresh blood in the stomach from the antral polyp and varices in the fundus. The Hb at this time was 6.1 g/dl and LFTs remained normal. After another 4 units of blood transfusion, the Hb increased to 8.7 g/dl. A repeat upper GI endoscopy 1 week after admission, showed fresh clot in the fundus of the stomach and oozing from fundal and antral polypoid erosions. The next day, a mesenteric angiogram was performed; it showed varices of the short gastric veins and marked splenorenal shunting. The patient underwent a TIPSS procedure immediately, with insertion of a Wallstent (Boston Scientific Ireland, Galway, Eire), 9.4 cm long and 10 mm in diameter, which was ballooned to 10 mm. The varices were still widely patent after stenting, and were therefore embolized with multiple coils (William Cook Europe, Bjaeverskov, Denmark).
The post-TIPSS pressure gradient was 4.5 mmHg, and the procedure was completed without complication.

A week after discharge, the man was admitted with grade 1 encephalopathy. As he improved clinically with an increasing dosage of lactulose, he was discharged after 4 days. Within 2 days of discharge he returned, with mounting confusion. CT of the brain ruled out intracranial bleeding or infarction. From grade 1 encephalopathy, his condition worsened to grade 3 encephalopathy within 6 days of admission.

A shuntogram was performed via the left internal jugular vein after US demonstrated thrombus completely filling the right internal jugular vein. A 0.35–3-mm J-wire was passed into the inferior vena cava. The tip of a 12 French TIPSS sheath was placed at the confluence of the hepatic veins. A C1 catheter (Cordis Europa N.V., Netherlands) and 0.35 hydrophilic wire (Terumo Corporation, Tokyo, Japan) were used to cross the stent and enter the portal vein. There was no pressure gradient across the stent. Contrast injections demonstrated closure of the previously dilated and coiled gastric varices and rapid flow of contrast through the shunt into the systemic venous circulation via the TIPSS stent. In order to create a pressure gradient across the stent and reduce the encephalopathy, the decision was made to reduce the calibre of the stent.

**Technique**

Before surgery, a balloon-mountable JOSTENT (Abbott Laboratories, Maidenhead, UK), 6 to 12 mm in calibre, 38 mm long and covered with polytetrafluroethylene (PTFE), was selected; a 10-mm angioplasty balloon was inflated several times and roughened using an alcohol swab (Steret, Seton Health Care Group, Oldham, UK). The JOSTENT was then securely mounted on the balloon. The sheath was positioned with its tip within the intraabdominal TIPSS stent and the 0.35 hydrophilic wire was replaced with a stiff Amplatz wire (Boston Scientific, Miami, USA). The new covered stent was advanced on its balloon mount until approximately 1 cm of its distal end was outside the sheath. The balloon was then inflated to expand only the distal portion (leading end) of the JOSTENT to 10 mm and allow it to gain good purchase against the inside of the existing TIPSS stent. The balloon was deflated and withdrawn so that it lay within the proximal 1 cm of the JOSTENT. The sheath was then withdrawn to allow inflation of the balloon within the proximal part of the JOSTENT, creating an hourglass configuration. Concern had been raised that the JOSTENT might become tightly engaged with the inside of the sheath after initial balloon inflation. If this had occurred, the balloon could have been used to anchor the distal end of the stent and provide counter-traction while the sheath was retracted.

The new portosystemic pressure gradient across the stent was 21 mmHg. The undilated central portion of the JOSTENT was still only 12 F; therefore, to reduce the gradient across the stent, this central portion was serially dilated to a final diameter of 6 mm. This resulted in an acceptable pressure gradient of 8 mmHg.

There were no immediate complications. The man was returned to a general ward for standard post-procedure nursing care. He experienced rapid resolution of the encephalopathy and had no further episodes of gastrointestinal haemorrhage. Following this, his clinical state steadily progressed. On review in the outpatients department 7 months after discharge, he was well, with no evidence of encephalopathy. There has been no further episode of GI bleeding to date. Doppler US showed a patent TIPSS stent and normal direction of bloodflow in the portal vein (Figs. 1–3).

**Discussion**

The main drawbacks of TIPSS are shunt insufficiency and worsening encephalopathy or development of new encephalopathy. In up to 60% of cases, shunt stenosis can be expected as a result of pseudo-intimal hyperplasia, warranting regular shunt surveillance. Hepatic encephalopathy which develops as a result of portosystemic shunting and poor
hepatic function has been observed at some point in
the follow-up of approximately 35% of cases
managed with TIPSS, compared with 20% of those
managed only endoscopically. Therefore,
measures taken to effectively manage post-TIPSS
encephalopathy would improve the morbidity and
might reduce the encephalopathy-related mortality
among these patients. Several reports have
described life-threatening effects, due to sudden,
severe haemodynamic alterations, when perma-
nent shunt occlusion was used to manage post-TIPSS
encephalopathy. However, TIPSS occlusion by
intentional thrombosis can have the advantage of
reversibility if need arises; like a variceal bleed, it
carries the risks associated with sudden occlusion
and thrombus propagation. Techniques using
uncovered constrained stents faced the difficulty
of accurately regulating bloodflow across stents and
inability to immediately measure the pressure
gradient. Use of constrained covered stents has
the advantage of reducing the shunt lumen, with an
immediate measurable increase in the portosyste-
mic gradient. Polyethylene-terephthalate-covered
stents carry the risk of earlier shunt occlusion due
to thrombogenic response to the material, and
PTFE stent grafts may be superior in this situation.

There has been only one earlier report of a PTFE-
covered balloon-expandable JOSTENT graft used in
the successful management of post-TIPSS hepatic
encephalopathy. The technique, which we have
used, is grossly the same as that reported pre-
viously, but there are some differences. By rough-
ening the surface of the balloon, we believe that
any potential loosening between the JOSTENT and
its balloon mount during the procedure can be
avoided; we achieved this by inflating the balloon
several times immediately before surgery and
rubbing its surface with an alcohol swab. The distal
(leading) end of the JOSTENT can be inflated after
either advancing the stent with its balloon mount
until approximately 1 cm of this complex lies
outside the sheath (as we have described), or
withdrawing the sheath and exposing only the distal
1 cm of the JOSTENT and its balloon mount (as
described in the previous report). In our technique,
after the JOSTENT was refashioned into an hour-
glass shape within the existing TIPSS stent, the
portosystemic pressure gradient was still high. In an
effort to avoid total loss of this pressure gradient by
overdilatation of the waist of the JOSTENT, serial
pressure measurements across the JOSTENT and
graduated balloon expansion of the JOSTENT waist

Figure 2 A balloon-mounted covered JOSTENT was
advanced until 1 cm of its distal (leading) end was outside
the sheath, and the balloon was inflated to expand only
the distal portion of the stent to 12 mm.

Figure 3 The balloon after deflation was withdrawn to
lie within the proximal 1 cm of the covered stent, and the
sheath was withdrawn to allow inflation of the proximal
part of the stent, creating an hourglass configuration.
This was followed by serial dilatation of the central,
initially undilated portion of the 12 F stent to 6 mm. This
resulted in an acceptable pressure gradient of 8 mmHg.
were performed. At 6 mm waist diameter a satisfactory portosystemic pressure gradient was achieved. This part of the technique was not described in the previous report.

This method was successful in the management of post-TIPSS encephalopathy, with total neurological resolution of the condition. Before the TIPSS reduction was undertaken, the loss of a pressure gradient across the stent over a period of time could have resulted in the loss of hepatic sinusoidal perfusion. The change in haemodynamic effect across the hourglass stricture created in the new stent restored sinusoidal perfusion, resulting in resolution of the encephalopathy. The opportunity to perform serial pressure gradient measurements across the new stent, and then serial expansions of the central portion of the hourglass stent, allowed precise control of the resulting pressure gradient. To our knowledge, this element of controllability has never previously been reported. The long-term effect of our TIPSS reduction technique in the overall management of the case is yet to be established.

Conclusion

The technique we used to intentionally constrict the TIPSS lumen to a desirable diameter by using a balloon-expandable covered stent, inflated only at its ends, restored the portosystemic gradient pressure. This increased the intrahepatic portovenous flow and successfully resolved the TIPSS-induced encephalopathy. This technique could now be considered in the management of refractory post-TIPSS encephalopathy.

References