Hepatic Encephalopathy Associated With Spontaneous Portosystemic Shunts

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A 70-year-old woman with a history of cirrhosis secondary to nonalcoholic steatohepatitis initially presented as an outpatient with a rapid accumulation of ascites. Over the ensuing 3 months, despite optimal doses of furosemide and spironolactone, she began requiring therapeutic paracentesis every 3 days. After months of biweekly procedures, the frequency of her required paracenteses slowly decreased despite no substantial changes in medical therapy. Around the same time, she developed progressive cognitive decline; given her known history of cirrhosis, hepatic encephalopathy (HE) was suspected. The differential diagnosis at time of hospital admission included infection, electrolyte abnormality, gastrointestinal (GI) tract bleeding, medication effect, and inadequate medical management.

The patient was afebrile without leukocytosis, and a paracentesis sample showed no signs of spontaneous bacterial peritonitis. Results of a comprehensive metabolic panel were largely unremarkable, with the exception of a sodium level of 134 mEq/L (reference range, 136-145 mEq/L) and an elevated serum ammonia level of 67 µmol/L (reference range, 11-51 µmol/L). Thyroid function test results were within normal limits, no signs of GI bleeding were present, and the patient’s hemoglobin level remained stable at her baseline of 9 to 10 g/dL over the ensuing days. A thorough review of her medications and social history revealed no likely offending agents and no recent alcohol or drug use.

Imaging results included an unremarkable noncontrast computed tomography (CT) scan of the head; however, an abdominal CT scan with contrast showed findings consistent with spontaneous splenomesenteric shunts (Figures 1 and 2) and intrahepatic shunts (Figure 3). Initially, medical management of her HE was attempted, but grade 2 to grade 3 encephalopathy ed infection, electrolyte abnormality, gastrointestinal (GI) tract bleeding, medication effect, and inadequate medical management.

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persisted despite adequate dosing of lactulose and rifaximin.

In the absence of any additional precipitating factors, and with a lack of response to medical management, the decision was made to attempt to occlude the patient's portosystemic shunts. Using coil-assisted retrograde transvenous obliteration (CARTO), each shunt was occluded separately to avoid a rapid increase in hepatic portal pressure (Figure 4). The patient did not experience any apparent complications from these procedures, but a noncontrast CT scan completed weeks after initial embolization showed findings consistent with a persistent spontaneous portosystemic shunt (SPSS) (Figure 5).

The decision was made to forego further attempts at intervention. Despite continued optimization of medical therapy and attempted procedural occlusion of her shunts, the patient's HE persisted, and she was ultimately discharged to hospice care, where she died 1 month later.

Discussion. HE is a debilitating complication of decompensated cirrhosis. Apart from being a burden on patients and caregivers, it is disproportionately costly to the United States health care system. In 2009, HE contributed to only 0.33% of US hospital admissions but had a much larger financial impact, costing more than $8 billion.1 Much of this cost is related to refractory HE, a problem often linked to SPSS. Studies suggest that up to 71% of patients with HE that is refractory to medical therapy have a radiographically evident SPSS.2 This is a point of interest, given that procedural shunt occlusion provides a therapeutic option for individuals with refractory encephalopathy. While this may appear to be a promising possibility, outcomes from a limited number of studies have been mixed. Additionally, no clearly defined guidelines are available for selecting candidates for procedural intervention.3

As portal hypertension increases in advanced liver disease, otherwise insignificant portosystemic microvasculature becomes more prominent as a means of offloading portal pressure. This principle is the basis for the prevailing concern that shunt reversal can potentially lead to a rapid return of portal hypertension in the form of de novo or recurrent ascites and variceal bleeding.2 For this reason, this patient's portosystemic shunts were embolized separately. As these shunts develop, the liver is bypassed, allowing
neurotoxins from portal circulation to be shunted back into systemic venous circulation, leading to type B HE. This proposed mechanism of SPSS formation closely matches the above clinical presentation and emphasizes the importance of considering shunt formation as a cause of refractory HE in the proper setting.

Most studies of SPSS reversal were without substantial complications and showed no statistically significant increase in sequelae of increased portal hypertension following embolization. However, the theoretical risk remains a point of concern, since there have been multiple reports of postprocedural incidents of increased or new-onset ascites. Despite disagreement in the literature regarding the risks of developing sequelae of increased portal hypertension after shunt occlusion, what appears to be a point of agreement is the concept that SPSS predispose patients to more severe and refractory HE.

It remains unclear why this patient’s condition did not clinically improve, given that several embolization studies have shown promising results. Based on a 2013 study, a Model for End-Stage Liver Disease (MELD) score of 11 or lower was associated with better outcomes following embolization. Another study of 14 patients with refractory HE showed a significant decrease in encephalopathy in 93% patients; however, shunt reversal was only attempted on patients with a Child-Turcotte-Pugh (CTP) score of 10 or lower. Similarly, An and colleagues showed that patients with preprocedural MELD and CTP scores of 10 or lower had an increased likelihood of resolution of HE for up to 2 years after intervention. Considering that the patient in this case had MELD and CTP scores of 14 and 12, respectively, at the time of SPSS diagnosis, her ultimately poor outcome is consistent with previously published outcomes. Although she had only been diagnosed with cirrhosis within a year of shunt embolization, there is evidence that SPSS can accelerate liver damage through chronic hypoperfusion as a result of blood being shunted away from the liver. A MELD score of 14 corresponds to relatively preserved synthetic function, so it is unclear why these patients’ conditions do not show as much symptomatic improvement as those with lower MELD scores. While no formal guidelines exist regarding screening or management of SPSS, it has been proposed that patients with refractory HE should have imaging performed to rule out SPSS. Modestly elevated MELD scores in these patients should further raise clinical suspicion.

Of particular interest in this patient’s case was the incidental finding of what appeared to be a persistent SPSS on repeated imaging. No further embolization attempts were made, and although the value of further procedures was questionable, this offers another explanation for the patient’s lack of symptomatic improvement and underscores the importance of considering dedicated postembolization imaging, especially if HE remains refractory after intervention.

In summary, when evaluating patients with refractory HE, especially those with relatively preserved hepatic function, underlying SPSS must be considered. Shunt occlusion seems to be safe in most circumstances, although the available literature suggests statistically insignificant but still considerable rates of exacerbation of portal hypertension following shunt obliteration. Patients with lower CTP and MELD scores tend to have better outcomes, and in patients who do not show improvement in HE following embolization, repeated imaging to assess for incomplete shunt occlusion should be considered.

REFERENCES:

Limited field of view sagittal noncontrast CT image demonstrating persistent enlargement of the extrahepatic portal systemic shunt approximately 1 month after embolization.