



Thrombosis and Paradoxical Embolism in Transjugular Intrahepatic Portosystemic Shunt Procedure

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Abstract

Oesophageal or gastric varix bleeding is a serious complication in cirrhotic liver disease with portal hypertension. Transjugular intrahepatic portosystemic shunt (TIPS) is a well-established modality for decreasing portal hypertension. Although the resultant shunting of portal venous flow to the systemic circulation helps reduce the portosystemic gradient and alleviate bleeding, thrombosis during TIPS procedure might be a potential source of emboli and could cause stroke in patients with undiscovered right-to-left shunt. In the study, we reported a case of paradoxical embolism associated with TIPS procedure, as indicated that it is imperative to screen potential risk of stroke before TIPS procedure.

Keywords: Oesophageal bleeding, Transjugular intrahepatic portosystemic shunt, Paradoxical embolism, Stroke

Introduction

Oesophageal or gastric varix bleeding is a serious complication in cirrhotic liver disease with portal hypertension. Transjugular intrahepatic portosystemic shunt (TIPS) is a well-established modality for decreasing portal hypertension [2]. The resultant shunting of portal venous flow to the systemic circulation helps reduce the portosystemic gradient and alleviate bleeding.

In clinical practice, the most common indications for TIPS are acute variceal bleeding, secondary prevention of bleeding, refractory ascites and portal hypertensive gastropathy. Less conventional indications include hepatic hydrothorax, hepatorenal syndrome, Budd-Chiari syndrome, hepatopulmonary syndrome, and complications in cirrhosis that need major abdominal surgery [2]. Thrombotic occlusion of the portal vein is not a contraindication for TIPS. Acute portal vein thrombosis, is rather a common indication for TIPS. In this scenario, thrombosis during TIPS procedure might be a potential source of emboli and could cause stroke in patients with undiscovered right-to-left shunt.

In the study, we reported a case of paradoxical embolism associated with TIPS procedure, as indicated that it is imperative to screen potential risk of stroke before TIPS procedure.

Case Presentation

A 30-year-old woman was admitted to another hospital because of hematemesis and black stool. The patient had been well until 9 days before this admission, when hematemesis and black stool developed after she ate food.

On arrival at the emergency room of the other hospital, the patient answered questions appropriately and was oriented to person, place, time, and situation. The temperature was 36.8°C, the pulse 100 beats per minute, the blood pressure 121/89 mmHg, the respiratory rate 18 breaths per minute, and the oxygen saturation 99% in room air. On auscultation of the heart, tachycardia was present with a regular rhythm. The radial pulses were normal. The lungs were clear, without crackles, rhonchi, or wheezes. The abdomen was soft and nondistended without tenderness. The

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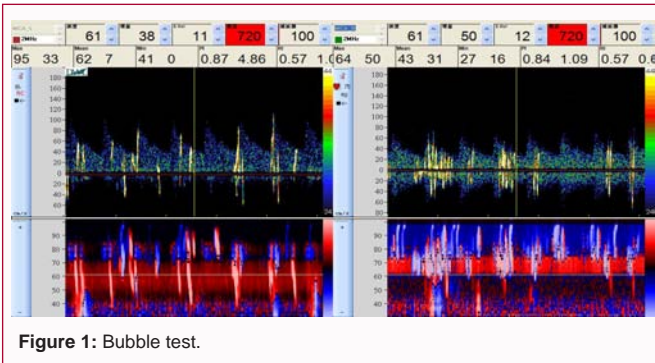


Figure 1: Bubble test.

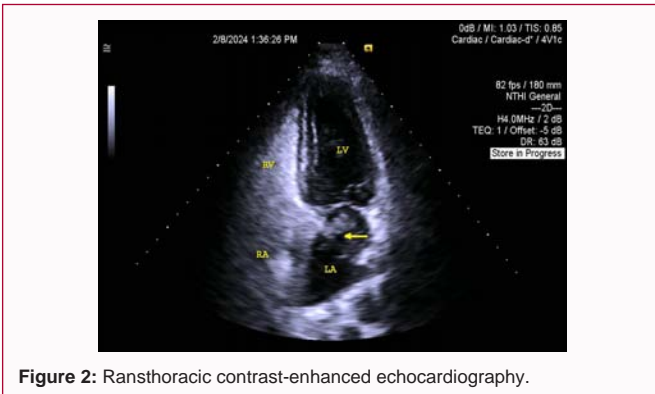


Figure 2: Transthoracic contrast-enhanced echocardiography.

skin was warm. On neurological examination, no positive signs were found.

During the hospitalization, extensive tests were performed to identify the potential etiology of gastrointestinal bleeding. Blood routine test showed anemia. Abdominal ultrasound indicated portal hypertension. Contrast-enhanced computed tomography (CT) scan demonstrated hepatocirrhosis, spleen enlargement and ascites. Gastroscopy indicated esophageal and gastric varices. CT angiography revealed no thrombosis of the portal vein. Transthoracic echocardiography showed no heart disease. Liver biopsy indicated cirrhosis due to hepatic veno-occlusive disease (HVOD).

Because the recurrent episodes of bleeding from esophageal varices, the patient requested an intervention to treat portal hypertension. She had no contraindication to TIPS. The right jugular vein was used to insert a transjugular guiding catheter into the liver vein. Under sonographic guidance the right portal vein was punctured intrahepatically approximately two centimeters proximal of the portal vein bifurcation. A 10 × 100 mm bare metal stent and a 10 × 100 mm endoprosthesis were placed between the right hepatic vein and the left branch of the portal vein. During the procedure, a contrast defect caused by a thrombus in the portal vein was detected. Immediately, urokinase was used for contact thrombolysis (60,000 U) and twenty minutes later contrast-scan showed a complete bypass through the TIPS. During the TIPS procedure, severe gastric varices were embolized to prevent ongoing variceal bleeding as well.

After the end of the TIPS procedure, the patient complained of severe headache. Vital signs were stable and peripheral oxygen saturation was 98% in room air. No local neurological deficit was identified on examination. No symptoms or signs of infection were evident. Blood ammonia was normal. Brain CT indicated stroke with multiple hypodensity lesions in bilateral hemispheres. The patient was transferred to our hospital for clarifying the potential etiology.

A comprehensive investigation for etiology of stroke was carried out. Brain magnetic resonance (MR) imaging indicated multiple lesions in both infratentorial and supratentorial infarctions with hemorrhagic transformation. Ultrasound/Doppler study of the carotid arteries, MR-angiography of intracranial artery and Holter monitoring were unremarkable. A hypercoagulable state was ruled out. Due to the potential risk of variceal bleeding, transesophageal echocardiography could not be performed. However, bubble test indicated large right-to-left shunt (Figure 1). A transthoracic contrast-enhanced echocardiography demonstrated the presence of patent foramen ovale (PFO) (Figure 2). Computed tomography pulmonary angiography (CTPA) was performed and pulmonary arteriovenous fistula was ruled out. Ultrasonography showed a patent portal vein at 8 days from derivative procedure. Oral anticoagulation with rivaroxaban was started. During the subsequent three months follow-up, the patient did not experience any significant clinical events.

Discussion

TIPS is a well-established percutaneous modality for decreasing portal hypertension. The major clinical indications include secondary prevention of variceal hemorrhage and refractory ascites.

Complications from a transjugular intrahepatic portosystemic shunt can be broadly categorized into immediate, procedure-related clinical complications and longer-term complications. To the best of our knowledge, although there were some case reports, stroke has not been reported to be associated with TIPS placement.

In the study, we report on a case of paradoxical embolism in TIPS procedure. Paradoxical embolism refers to the thromboembolism originating in the venous vasculature and traversing through an intracardiac or pulmonary shunt into the systemic circulation [3]. The clinical diagnosis of paradoxical embolism requires a venous source of embolism, an intracardiac defect or a pulmonary fistula, and evidence of arterial embolism. For this patient, the presence of thrombosis in the portal vein during TIPS procedure was potential source of embolism. In addition, contact thrombolysis with urokinase could breakdown a larger thrombus into smaller ones, thus spreading of thrombotic material following the portocaval shunt could occur. Meanwhile, transthoracic contrast-enhanced echocardiography showed the presence of PFO, which serves as a conduit of a thrombus from the venous system to the left cardiac cavities. In addition, the elevated pressure in right atrium after opening of the porto-systemic shunt will further increase the chance of a right-to-left cardiac shunt. This latter mechanism could be exacerbated by a coexisting pulmonary embolism or a pre-existing porto-pulmonary hypertension. Brain MR imaging indicated multiple infarctions in both anterior and posterior circulation with hemorrhagic transformation, which was consistent with the characteristics of embolic stroke. Finally, the patient satisfied all three key components of paradoxical embolism and indicated the need to pay enough attention to the triad in TIPS candidate patients.

Transesophageal echocardiography has been accepted as the reference diagnostic technique for PFO [4]. However, this examination could not be conducted because of the risk of bleeding in the presence of esophageal varices. Bubble test and contrast enhanced echocardiography are validated technique for the detection of PFO and have the advantage of being inexpensive, safe and widely available. During contrast echocardiography, PFO is diagnosed if any microbubbles are visible in the left-sided cardiac chambers within 3 cardiac cycles from the maximum right atrial enhancement (Figure 2).

In addition, contrast echocardiography could provide additional information, such as the presence of intra-pulmonary functional or anatomical shunts. On this basis, the authors suggested to perform Bubble test or/and echocardiography in TIPS candidate patients in order to identifying patients with risk of paradoxical embolism.

It is unclear about the safety and efficacy of percutaneous closure of a PFO before a TIPS placement. Further randomized controlled trials are warranted to test the safety and efficacy of the closure of a PFO before a TIPS.

Conclusion

TIPS is an effective method to decrease portal pressure, but it may be associated with minor or major complications. This case report stresses the potential risk of paradoxical embolism associated with TIPS procedure in patients with unidentified right-to-left shunt. We therefore propose to screen the potential risk and inform patients with stroke prior to performing TIPS intervention.

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