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RADIOLOGY CASE REPORTS

Case Report

Use of the gun-sight technique to create a parallel transjugular intrahepatic portosystemic shunt☆,☆☆

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ABSTRACT

A parallel shunt (PS) is often necessary to regain portal decompression in a dysfunctional transjugular intrahepatic portosystemic shunt (TIPS). Here, we successfully utilized the gun-sight technique to create a PS. An 81-year-old male with decompensated NASH cirrhosis and recent TIPS placement presents with recurrent ascites and pleural effusions in the setting of a persistent portosystemic gradient. Due to a lack of access to endovascular ultrasound and complex patient anatomy, a gun-site technique was approached to create a PS (left portal vein [PV] to left hepatic vein [HV]). After the right HV and existing TIPS were accessed via the right internal jugular vein access, the left HV was accessed. Following a left portal venogram, 10 mm snares were placed into the left HV and the left PV. An 18-gauge needle was then fluoroscopically placed through and through both snares. A 0.035 Glidewire was snared with the help of both snares, establishing access from the left HV via the left PV to the right PV. After serial dilation, a roadrunner wire and catheter were placed into the main PV and superior mesenteric vein, followed by stent dilation. Post-TIPS portal venogram showed prompt flow of contrast from the main PV to the right atrium without any stenosis through both TIPS stents in the left and right PVs. Initial and postprocedural TIPS gradients were 24 mm Hg and 6 mm Hg, respectively. Gun-site technique is a valuable technique in creating a parallel TIPS shunt.

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Background

Transjugular intrahepatic portosystemic shunt (TIPS) is an indispensable technique that has proven to be safe and effective in the management of portal hypertension [1,2]. However, oftentimes, a TIPS may become dysfunctional secondary to stent thrombosis, stenosis of proximal or distal vasculature, intimal hyperplasia of the hepatic vein outflow, or even pseudo-intimal hyperplasia within the TIPS parenchymal tract [3–5]. While various recanalization modalities (ie, thrombolysis and balloon angioplasty) exist, certain cases are unamenable to treatment [6]. In these scenarios, a parallel shunt (PS) is necessary to properly regain portal decompression [7].

Many experts agree that most cases of TIPS (and PS) failure occur at the step involving transhepatic puncture into a portal vein branch [8]. While several alternatives have been documented to guide this intrahepatic needle pass, few studies have reported on the gun-site approach: a technique first illustrated in transcaval portosystemic shunt (DIPS) which involves transhepatic puncture through snares in the inferior vena cava and portal vein (PV), followed by snaring of a wire to obtain through-and-through access, balloon dilation of the TIPS parenchymal tract, and subsequent stent insertion [9,10]. In literature, this technique has shown success in settings of challenging patient anatomy and limited access to resources (ie, endovascular ultrasound) [9]. Few studies, however, have reported the use of this approach in establishing a portosystemic PS. Here, we describe the successful utilization of the gun-site technique to establish such a shunt in a patient with a persistent portosystemic gradient.

Case presentation

An 81-year-old male with a history of decompensated NASH cirrhosis and recent TIPS (right portal vein [PV] to the right hepatic vein [HV]) presents with recurrent ascites and pleural effusions in the setting of a persistent portosystemic gradient and fully patent TIPS confirmed on recent portal venogram (Fig. 1). Due to the lack of access to endovascular ultrasound and complexity of the patient's anatomy, a gun-site technique was approached to create a parallel TIPS shunt (left PV to left HV). Right internal jugular vein (IJV) was patent and accessed with a micropuncture needle under ultrasound guidance. Next, a 10-Fr sheath was placed over a 0.035 Amplatz wire. After measuring the right atrial pressure, the right HV and existing TIPS were then accessed. Portal venogram was then performed and the pressure was measured (Fig. 2). A second 10-Fr sheath was placed to the right IJV under ultrasound guidance (Fig. 3). The left HV was accessed and then a left hepatic venogram was performed. Following this, a left portal venogram was performed via the catheter placed within the existing TIPS. About 10 mm snares were then placed into the left HV and left PV (Fig. 4). An 18-gauge needle was then placed under fluoroscopic guidance through and through both snares (Fig. 4). A 0.035 Glidewire was then snared with the help of both snares, establishing access from the left HV via the left PV to the right PV (Fig. 5). Serial dilation was next performed with a 4 mm balloon (Fig. 6). The sheath was advanced into the portal vein. A Roadrunner wire and catheter were later placed into the main PV and superior mesenteric vein (Fig. 7). The stent was dilated with an 8 mm balloon. Repeat portal venography was then performed and hemodynamic assessment was done in the PV as well as the right atrium (Fig. 8). A nontunneled

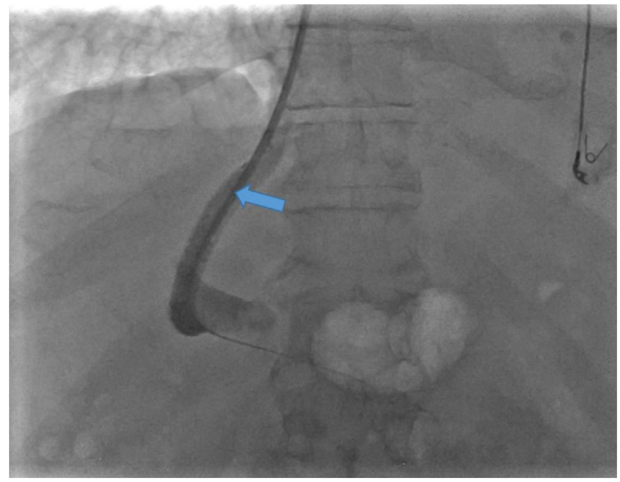

Fig. 1 – Portal venogram shows that the patient's prior right-sided TIPS (blue arrow) was patent with a persistent portosystemic pressure gradient of 26 mm Hg.

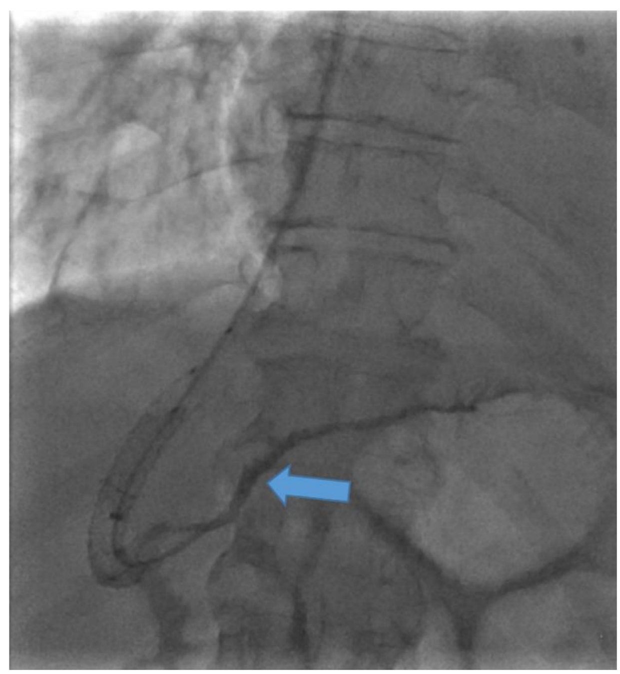

Fig. 2 – To help plan for the placement of a TIPS stent, contrast material was injected in the hepatic vein to identify the portal venous system (blue arrow=portal vein).

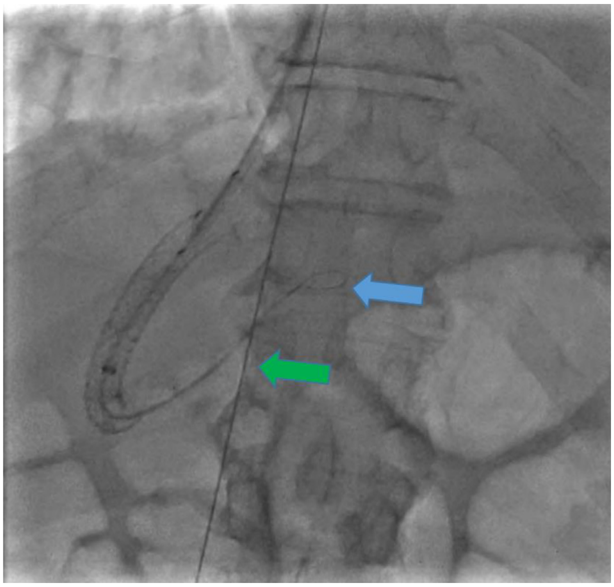

Fig. 3 – In the second access of the inferior vena cava (IVC), a second 10-Fr sheath was placed over a 0.035 Amplatz wire (green arrow), extending from the right internal jugular vein to the IVC. The first snare that was placed in the left portal vein (blue arrow) is shown.

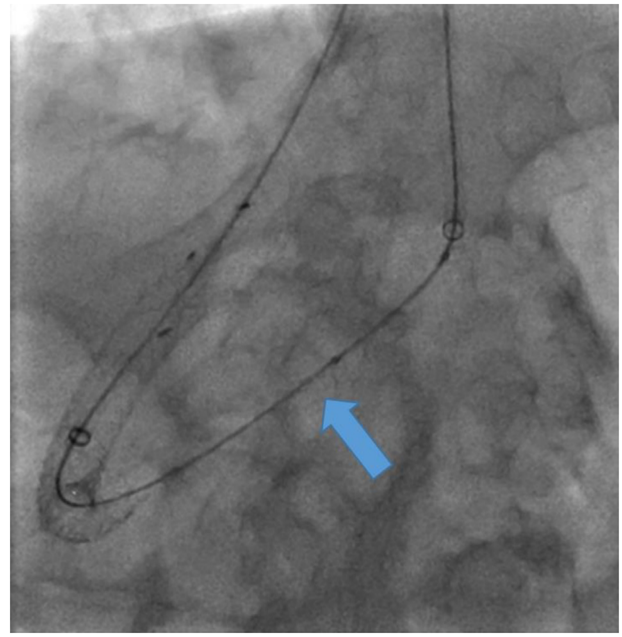

Fig. 5 – A 0.035 Glidewire (blue arrow) was then snared with the help of both snares, establishing through and through access from the left HV via the left PV to the right PV.

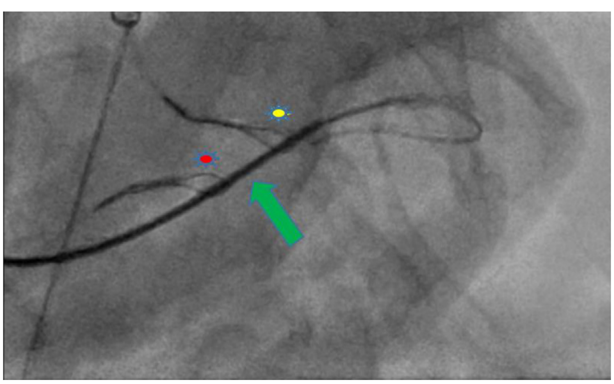

Fig. 4 – After the placement of two 10 mm snares in the left HV (yellow star) and left PV (red star). An 18-gauge needle (green arrow) was then placed under fluoroscopic guidance through and through both snares.

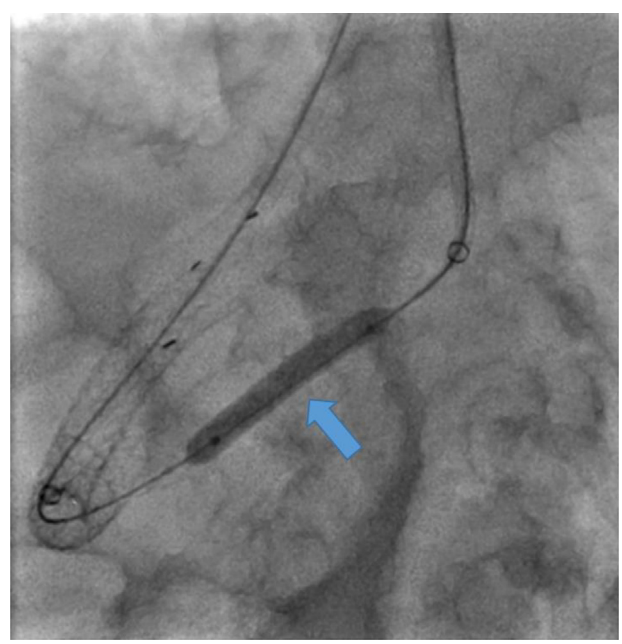

Fig. 6 – Serial dilation was next performed with a 4 mm balloon (blue arrow), going along the tract from the left portal vein to the left hepatic vein.

dialysis catheter was placed over-the-wire through the right IJV after removing one of the sheaths (Fig. 9). Wire and sheath were then removed; pressure was applied for hemostasis. The patient tolerated the procedure well without evidence of immediate complications. Post-TIPS extension portal venogram showed prompt flow of contrast from the main portal vein to the right atrium without any stenosis through both TIPS in the left and right PVs (Fig. 10). Initial and postprocedural TIPS gradients were 24 mm Hg and 6 mm Hg, respectively (Fig. 10).

Fig. 7 – A roadrunner wire and catheter was later placed into the main PV (blue arrow).

Fig. 8 – Repeat portal venography was performed, showing contrast flow through the left portal vein (blue arrow).

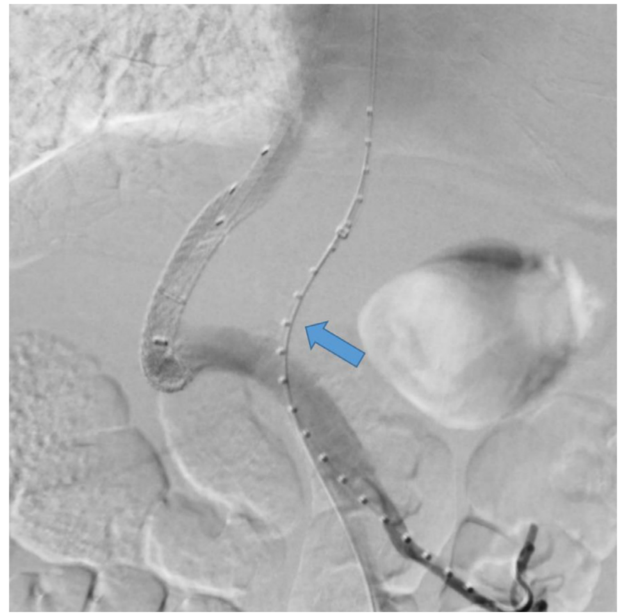

Fig. 9 – A pigtail catheter (blue arrow) was placed over a portal vein guide wire to help measure the tract length of the TIPS parenchymal tract and assist with follow-up portography and pressure measurement.

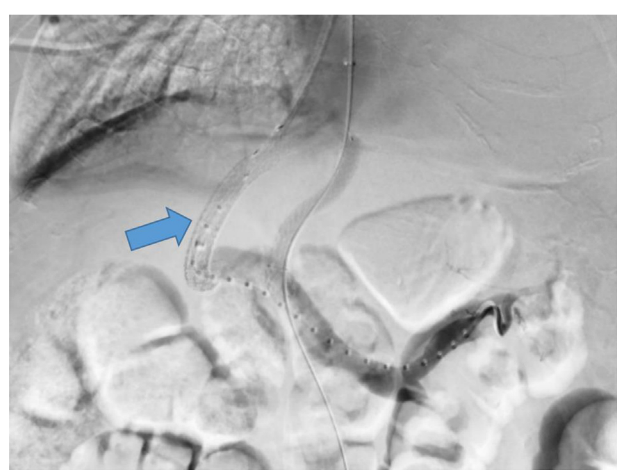

Fig. 10 – Postoperative TIPS extension venogram shows widely patent left-sided TIPS (blue arrow). Initial and postprocedural TIPS gradients were 24 mm Hg and 6 mm Hg, respectively.

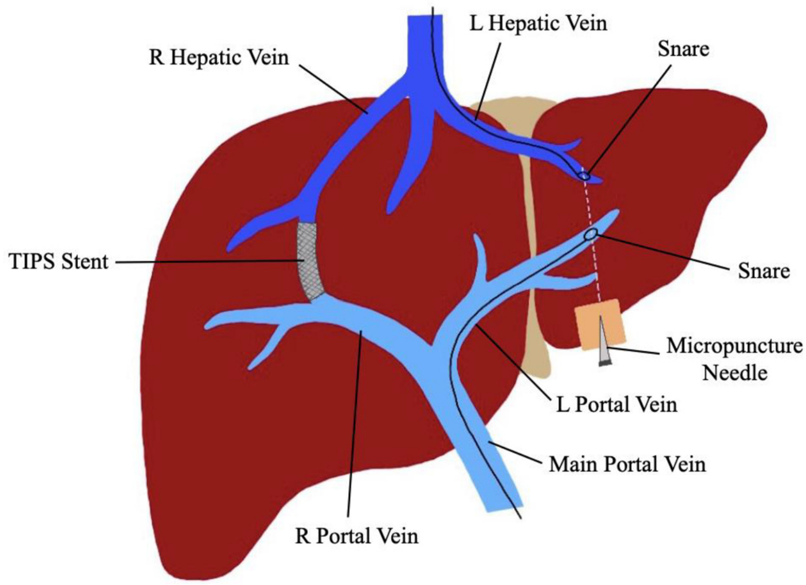

Fig. 11 – Schematic illustration showing gun-sight technique for transjugular intrahepatic portosystemic shunt (TIPS). A. Figure shows transhepatic puncture through snares in the inferior vena cava and portal vein (PV).

Conclusion

In cases of a dysfunctional or insufficient TIPS, a PS is often necessary to restore portal decompression. Similar to a conventional TIPS, a PS requires transhepatic puncture to access a portal vein branch: a difficult and crucial step that may often require multiple needle passes [8]. Fortunately, modern imaging modalities have provided great assistance in this area to increase the success rate of TIPS. For instance, one retrospective study reported that intravascular ultrasound decreased the median number of needle passes required to obtain successful transhepatic access by 4 passes when compared to conventional TIPS [11]. Other imaging modalities that have reported similar benefit, albeit to a lesser extent, include transabdominal ultrasound, percutaneous ultrasound guidance, and fluoroscopy-guided wedged hepatic portography [8]. While a major advantage of ultrasound is the lack of radiation exposure to patients, it, unfortunately, requires a high degree of operator experience, may be unavailable in many facilities, and challenging to utilize in certain settings (ie, transabdominal ultrasound can be difficult to use in morbidly obese patients).

Our successful employment of the gun-site technique for portohepatic TIPS creation offers a valuable alternative in challenging clinical scenarios (Fig. 11). Technical advantages of this method include not requiring high-cost equipment (ie, intravascular ultrasound or a designated TIPS kit) and being amenable to patients with challenging vessel anatomy. As such, this can even allow for a left-sided TIPS creation (as in our case) or trans-splenic access despite complex scenarios. Additionally, the gun-sight method for transhepatic puncture is fluoroscopically-guided and well-designed for single-plane angiographic machines, decreasing the need for additional intrahepatic needle passes required by conventional TIPS. Disadvantages of the gun-site technique include a bleeding risk for percutaneous hepatic punctures and fluoroscopy-associated radiation exposure [12]. Bleeding risk associated with percutaneous hepatic punctures should be outweighed against the bleeding risk of conventional TIPS, which often requires multiple intrahepatic needle passes [13,14]. Additionally, increased operator experience and comfort with any novel approach can only serve to decrease fluoroscopy-related radiation exposure. All things considered, our case here shows that the gun-site technique can serve as a valuable methodology in creating a portosystemic parallel shunt.

Patient consent

Informed consent for this publication was obtained from the patient.

Compliance with ethical standards

Yes

Consent for publication

Consent for publication was obtained for every individual person's data included in the study.

IRB status

IRB Exempt.

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