

Recanalized Umbilical Vein in the Presence of Cirrhosis-Induced Portal Hypertension

Audrey Galey RDMS, RVT, Mary Grace Renfro RDSM, RVT, Lindsey Simon, RVT

March 22, 2013

Abstract

A recanalized umbilical vein is a sonographic finding that is common in patients with cirrhosis or portal hypertension. The umbilical vein is developed in the fetus and carries oxygenated blood from the placenta into the fetal liver. This collateral is not normally seen in adult or pediatric patients on abdominal sonograms. However, it is a common collateral that develops in the cases of cirrhosis and portal hypertension. There are several characteristic features that are seen using Doppler when a recanalized umbilical vein is present, which include: hepatofugal flow and lack of phasicity. A transjugular intrahepatic portosystemic shunt or TIPS is the most common treatment to help relieve portal hypertension. This treatment helps reduce the pressure that is being caused by the portal hypertension, and in turn is causing the recanalized umbilical vein.

Keywords: recanalized umbilical vein, portal hypertension, cirrhosis, sonography

Introduction

A recanalized umbilical vein is a common finding in patients with cirrhosis of the liver and portal hypertension¹. There are several distinct findings that will be visualized on sonography when a recanalized umbilical is present. These may include splenomegaly, portosystemic collaterals, and ascites².

Case Report

This case presents a 62-year-old African-American woman with a history of cirrhosis of the liver. The patient has had serial outpatient abdominal sonograms for two years to evaluate the sonographic features and progression of cirrhosis.

The timeline of her care at this healthcare facility includes

- Two abdominal sonograms within eight months without any changes
- A hospital stay for ten days
- A nuclear medicine hepatobiliary iminodiacetic acid (HIDA) scan
- The current abdominal sonogram discussed in this presentation

The patient has a history of gastrointestinal (GI) bleeding, which was her admitting diagnosis to the hospital. During this hospital stay, the patient denied the use of drugs or alcohol. On the day of admittance, the patient had an esophagogastroduodenoscopy (EGD) performed. This procedure diagnosed the patient with esophageal varices and stated that the GI bleeding the patient was experiencing was secondary to the newly diagnosed esophageal varices. Lab tests showed low albumin, high levels of AST and bilirubin, and low levels of white blood cells (WBCs) and red blood cells (RBCs). The nuclear medicine HIDA scan was performed for a history of cholelithiasis and right upper quadrant (RUQ) pain. This test demonstrated

nonvisualization of the gallbladder and suggested chronic cholecystitis since the patient was currently asymptomatic. The patient's sonograms revealed an increased heterogeneous echotexture and nodularity of the liver, suggesting progression of cirrhosis. The sonograms also demonstrated cholelithiasis of the gallbladder with increased common bile duct size of 9 millimeters and splenic measurements of 14-17 centimeters. Based on these findings of cirrhosis and splenomegaly, the radiologists suggested possible portal hypertension.

The abdominal sonogram was performed using a Logiq E9 machine using a C1-5 transducer at a 2.8-MHz frequency with an "Abdomen" preset. This exam was another follow up for the patient's history of cirrhosis. The exam demonstrated a liver that appeared heterogeneous with irregular peripheral nodular contour. The main portal vein demonstrated hepatopedal flow. The findings showed the main portal vein and left portal vein as patent but the right portal vein as not well visualized. The gallbladder appeared collapsed and contained multiple mobile echogenic foci with the common bile duct-measuring 8-9 mm. The radiologist reported that this represented cholelithiasis. The spleen measured 16.2 cm. The radiologist dictated that this represented splenomegaly, suggesting possible portal hypertension. An anechoic tubular structure was seen midline extending from the falciform ligament in the left lobe of the liver. This structure could be seen extending to the umbilicus in the mid abdomen along the anterior surface of the abdomen near the skin line. It was reported that this represented a recanalized umbilical vein. Color Doppler revealed color flow in the umbilical vein that was hepatofugal. Spectral Doppler demonstrates a slightly phasic waveform in the vein. Based on these sonogram findings, the radiologist diagnosed hepatic cirrhosis with portal vein hypertension and recanalization of the umbilical vein, as well as cholelithiasis. No follow up information could be

obtained on this patient because she was an outpatient. She has not had a follow-up sonogram or diagnostic exam at this facility since her diagnosis.

Discussion

The umbilical vein develops in the fetus and is used to carry oxygenated rich blood from the placenta, through the umbilical cord, and into the fetal liver³. As the umbilical vein enters the umbilicus, it courses superiorly and enters the liver, and this intraabdominal portion is known as the ligamentum teres in the adult³. A recanalized umbilical vein is usually associated with cases in which the patient presents with cirrhosis or portal hypertension¹. Portal hypertension is the increase in pressure in the portal venous system and is most commonly caused by cirrhosis⁴. Cirrhosis is the scarring of the liver that results in decreased liver function, and it is considered a chronic disease⁵. A recanalized umbilical vein is the second most common collateral that develops in the body in cases of cirrhosis and portal hypertension⁶. The umbilical vein is anechoic, tubular structure and is located in the ligamentum teres and runs along the skin line and travels to the umbilicus by way of the falciform ligament⁷. Doppler will demonstrate blood flow away from the liver when the umbilical is patent⁸. Esophageal varices and bleeding are commonly found in patients who have a patent umbilical vein⁶. As pressure increases in the portal venous system in portal hypertension, the varices enlarge to help blood flow bypass the liver and reduce pressure in the portal venous system⁶. A patient with portal hypertension may present with GI bleeding, ascites, increased WBCs, hepatic encephalopathy, and reduced platelets⁴. Hepatic encephalopathy is when the brain no longer functions normally because the liver is no longer able to remove toxic substances from the blood⁹. As the cirrhosis and portal hypertension continue to worsen, the portal vein will eventually become hepatofugal, where blood flow is flowing away from the liver instead of demonstrating the normal hepatopetal flow

or towards the liver⁶. When an umbilical vein is seen and the flow becomes hepatofugal, it is usually seen flowing in the right portal vein⁷. The portal vein may appear dilated and demonstrate a lack of phasicity or respiratory variations when Spectral Doppler is used⁶. A dampened waveform of the portal vein can also indicate hepatocellular damage¹⁰. Splenorenal varices are the most common varices seen with cirrhosis and portal hypertension⁶. There are also other signs seen with portal hypertension that include: ascites, splenomegaly, and portosystemic collaterals². If the cirrhosis and portal hypertension are not too severe, the umbilical vein may never be seen. Also, with cirrhosis, the liver causes a large amount of attenuation making vessels and structures hard to identify. Therefore, it may be difficult to see the portal vein within the liver for Doppler. If the sonographer is inexperienced, they may invert the color scale, therefore, making the flow appear hepatopetal, when it should be hepatofugal. In the majority of cases, the patient will present with portal hypertension caused by cirrhosis. The patient may have many different collaterals, including, esophageal varices, GI bleeding, and a recanalized umbilical vein, as well as splenomegaly. This particular case presented with many findings that are present in most cases of portal hypertension, including GI bleeding, splenomegaly, and a recanalized umbilical vein.

The most common procedure used to help relieve portal hypertension is a transjugular intrahepatic portosystemic shunt (TIPS)². This shunt is placed from the right hepatic vein to the intrahepatic vein to bypass the liver². This shunt helps reduce the pressure on the liver, stomach, bowel, and esophagus that the patient experiences from portal hypertension⁴. This procedure is successful in 90% of cases by stopping bleeding from varices immediately⁴. There are complications that occur with TIPS. These complications can include: occlusion or stenosis of the shunt and hepatic vein stenosis². Another procedure that can be performed in a patient with

portal hypertension is distal splenorenal shunt (DSRS)⁴. In this procedure, the splenic vein is detached from the portal vein and is attached to the left renal vein⁴. This procedure helps reduce bleeding and pressure with the varices, however, our patient did not appear to have splenorenal varices, therefore, this was probably an unlikely procedure for her.

Conclusion

In conclusion, the patient was an African-American woman in her sixties with a history of cirrhosis of the liver. Serial abdominal sonograms demonstrated a progression of cirrhosis with associated splenomegaly, suggestive of possible portal hypertension, and a current recanalized umbilical vein. Sonographically, the recanalized umbilical vein appeared as an anechoic tubular structure with echogenic walls within the area of the falciform ligament and continuing to the umbilicus. The vein demonstrated phasic, hepatofugal flow. The final diagnosis was portal hypertension with the recanalized umbilical vein acting as a portal venous collateral. As this case presents with a history of cirrhosis, GI bleeding, splenomegaly, and a recanalized umbilical vein, it demonstrates typical findings of portal hypertension seen in other cases. This patient did not have any documented follow-up or treatment. However, a possible treatment option commonly used could be a TIPS to relieve pressure in the portal venous system. Another option includes a DSRS to reduce pressure and bleeding from varices. It is important for sonographers to pay close attention in the documentation of a recanalized umbilical vein to better evaluate for the best treatment option for the patient's portal hypertension⁴.

References

1. Wu S, Zhang J, Liu G. Comparison of decompensated cirrhosis with and without patent paraumbilical vein. *Journal of Diagnostic Medical Sonography*. 2010;26(3):143-146
2. Rumack C, Wilson S, Charboneau JW, Levine D. *Diagnostic Ultrasound*. Vol. 1. 4th ed. Philadelphia, PA: Mosby Inc; 2011.
3. Rumack C, Wilson S, Charboneau JW, Levine D. *Diagnostic Ultrasound*. Vol. 2. 4th ed. Philadelphia, PA: Mosby Inc; 2011.
4. Portal hypertension. http://www.medicinenet.com/portal_hypertension/article.htm. Updated 2012. Accessed November 11, 2012.
5. PubMed Health. Cirrhosis. <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001301/>. Updated October 116, 2011. Accessed on November 20, 2012.
6. Andrew A. Portal hypertension: a review. *Journal of Diagnostic Medical Sonography*. 2001;17(4):193-200
7. Owen C, Meyers P. Sonographic evaluation of the portal and hepatic systems. *Journal of Diagnostic Medical Sonography*. 2006;22(5):317-328
8. Zwiebel W, Pellerito J. *Introduction to Vascular Ultrasonography*. Vol. 1. 5th ed. Philadelphia, PA: Elsevier Inc: 2005:594
9. PubMed Health. Hepatic encephalopathy. <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001347/>. Updated October 16, 2011. Accessed November 25, 2012.
10. Guthrie J, Sheikh M, Morrell S, Neal D. A Case-Control Study to Compare the Likelihood of Detecting Liver Disorders Using Coincident Measures of Doppler-Derived Portal Vein Pressure Gradients, Hepatic Venous Waveforms, and the Echogenicity of Liver Parenchyma. *Journal of*

Diagnostic Medical Sonography. 2012: 28(5):211-221