Cavernous transformation of the portal vein a rare phenomenon

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Abstract: Cavernous transformation of the portal vein is a complication of a prior portal vein thrombosis and carries a very poor prognosis. It is associated with portal hypertension, and the massive ascites that develops as a result, mimics other clinical conditions that may puzzle physicians. Elevated levels of Ca-125 is often seen in patients with associated underlying chronic liver disease, which in turn may lead to a wild goose chase for ovarian carcinoma. Portal vein thrombosis in HIV-positive patients, most likely as a result of HIV-associated thrombosis, must be considered in all HIV patients who present with features of portal hypertension and ascites.
Keywords: portal vein thrombosis, cavernous transformation of portal vein, Ca-125 levels, HIV-associated thrombosis

Introduction

Cavernous transformation of the portal vein (CTPV) is characterized by the formation of periportal venous channels within or around a thrombosed portal vein. It is usually a sign of a chronic venous portal vein thrombosis. It was first described in 1869 by Balfour and Stewart as "thrombosis and varicose dilation of the portal vein leading to splenomegaly and ascites."[1]

Acute portal vein thrombosis can occur secondary to portal pyemia, complicated intra-abdominal infections, myeloproliferative disorders, pancreatitis, cirrhosis, malignancy, trauma, medication, e.g., combined oral contraceptives, hypercoagulable disorders like HIV-associated thrombophilia, as well as prolonged venous stasis in cases of constrictive pericarditis.[2-4]

Case

A 33-year-old female patient was referred to Internal Medicine from the gynaecological department for work-up of massive ascites. The patient gave a history of progressive abdominal swelling, weight loss and dyspnoea over a period of four years. The working diagnosis at that stage was that of a possible ovarian mass or malignancy, based on an elevated serum Ca-125 level of 515 kU/L (0-35). Repeated ascites taps were performed that showed no malignant or mesothelial cells, only lymphocytes and red blood cells.

On admission to the Internal Medicine Department the blood results showed the following: Na 140 mmol/l, K 3 mmol/l ,Urea 4.6 mmol/l, Creatinine 58 µmol/l, total protein 76 g/L, albumin 12 g/L, total bilirubin 3 µmol/L, conjugated bilirubin 3 µmol/L, ALT 28 U/L, AST 28 U/L, ALP 218 U/L, GGT 94 U/L, LDH 551 U/L. Alpha feto-protein levels were 4.2 µg/L, CA 125 1281 kU/L. The full blood count showed a haemoglobin of 9 g/dL with an MCV of 120 fL. The platelet count was 120 x 10^9 /L and INR 2. The ammonia level was 77µmol/L, cholinesterase 3848 U/L. A urine protein: creatinine ratio within normal limits excluded nephrotic syndrome as a cause of the low albumin and ascites.

The serum ascites albumin gradient on a repeat tap was more than 11g/L and in keeping with ascites related to portal hypertension. Ascites fluid adenosine deaminase levels (2.4 U/L), as well as Mycobacterium tuberculosis cultures and Gene-Xpert analysis of the ascites fluid were negative.

The transabdominal ultrasound findings showed a liver surrounded by ascites. The surface of the liver appeared irregular. The hepatic parenchyma was coarse and heterogeneous and no hypoechoic liver nodules were demonstrated. The gallbladder wall was thickened and oedematous, most likely related to the extensive ascites. Splenomegaly was present. The portal vein could not be demonstrated. In the porta hepatitis, several small blood vessels were visualized on Colour Flow Doppler in the area where the portal vein is usually demonstrated. This finding was in keeping with cavernous transformation of the portal vein. Thrombus was also noted in the inferior vena cava (IVC). These findings were confirmed on CT scan, with no demonstrable ovarian mass. The CT scan findings were also positive for pulmonary embolism. Oesophageal varices were demonstrated on gastroscopy.

An extensive workup for causes of portal venous thrombosis was performed. Protein C was 74 IU/dL, free protein S levels were 67 %, ANF negative, Lupus anticoagulant and anti-cardiolipin antibodies negative as well as hepatitis serology. Factor V Leiden PCR and Prothrombin G 20210A PCR were negative. JAK-2 PCR was negative as well as flow cytometry (CD 55/59) for Paroxysmal Nocturnal Haemoglobinuria. Human immunodeficiency virus serology was positive with a CD4 count of 155 with a viral load 1245. HIV-associated

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thrombophilia was considered as the most likely aetiology for the portal vein and IVC thrombosis[4-6] The Ca-125 level was ultimately considered to be elevated in view of the chronic underlying liver disease.[7-8]

Figure 1: Sagittal view of the liver ultrasound with Colour Flow Doppler demonstrating serpiginous vascular channels in the area of the portal vein remnant.

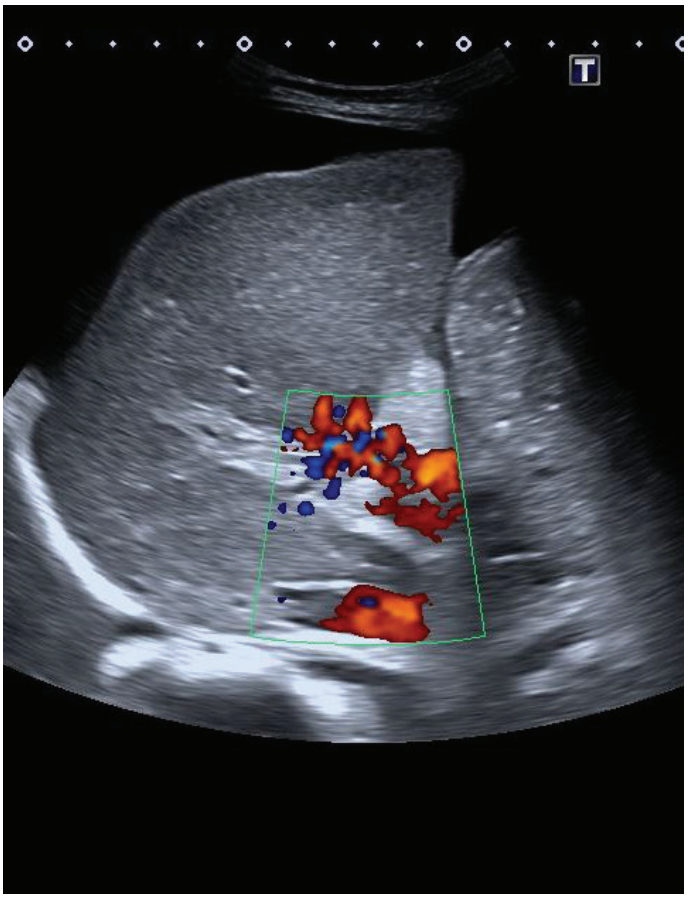
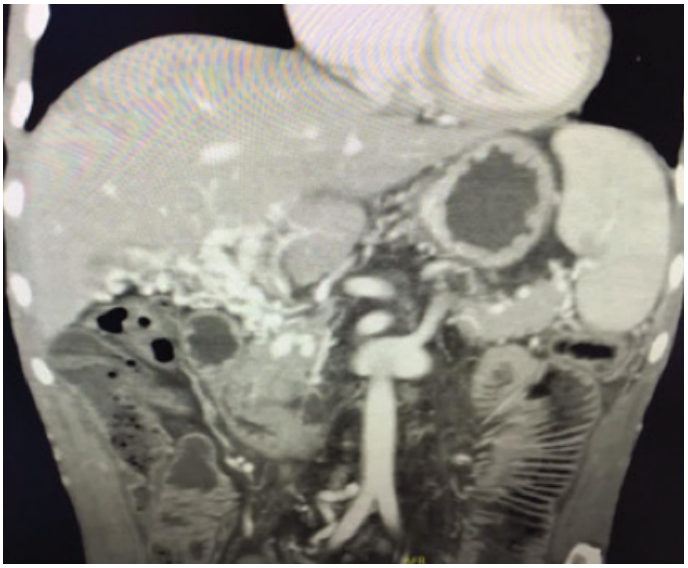
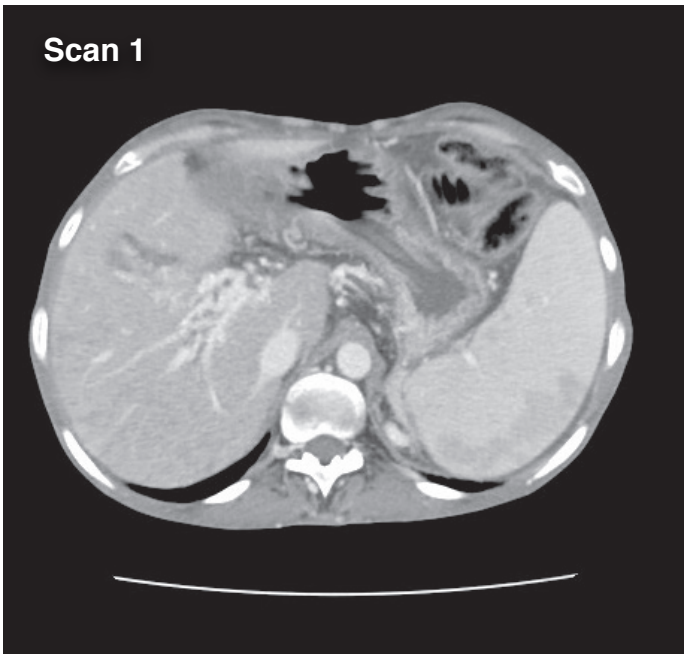
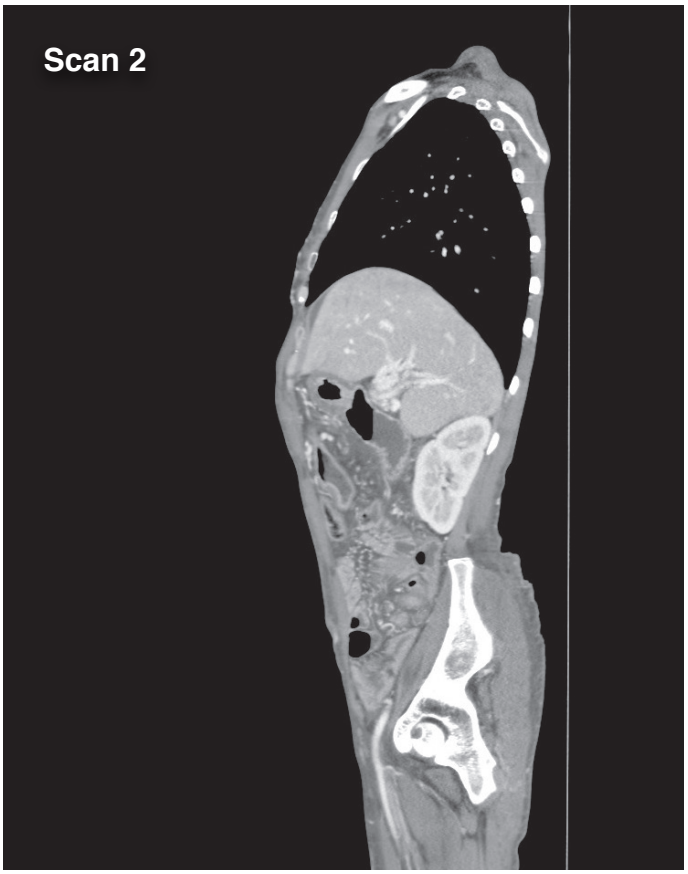


Figure 2: CT abdomen images (venous phase) demonstrating the venous cluster of vessels in the area of the portal vein (cavernous transformation).







Discussion

Portal vein thrombosis (PVT) is the leading cause of presinusoidal portal hypertension.[9] In 23 796 autopsies performed in Malmö, Sweden, Ogren et al demonstrated that the population prevalence of PVT is around 1%.[10] Cavernous transformation is usually associated with the severity of the PVT and may suggest chronicity of the PVT.[2,11] Once a portal vein is occluded by fresh thrombus, recanalization and venous collateral formation starts as within a few days with CTPV becoming evident as early as 6-20 days

following an acute thrombosis. Through the process of neoangiogenesis, a "sponge-like" mass develops at the porta hepatis, whereby the portal vein's usual anatomy is no longer identifiable within the cavernoma on transabdominal ultrasound.[12-14]

Intrahepatic extension of the cavernoma is not uncommon, and leads to intrahepatic shunts. A bypass route is established around an obstructed portal vein to patent intrahepatic branches of the portal vein and displays normal resistance patterns on Doppler interrogation. This newly established network of venous channels acts as a porto-portal shunt and the Colour Doppler flow demonstrated in these vessels is hepatopetal. Despite the development of these intra- and extra hepatic shunts, portal hypertension persists in these patients.[12-13]

Clinically, an acute portal vein thrombus presents with nausea, vomiting, and abdominal pain due to intestinal ischemia and congestion, as well as haematochezia. Chronic venous thrombosis tends to be asymptomatic, but patients develop features of portal hypertension e.g. ascites and splenomegaly.[9]

The greyscale ultrasound features that support the diagnosis of CTPV are:

- A demonstrable filling defect in the portal vein that displays hypoechoic in acute PVT and echogenic in cases of chronic thrombosis.[9]
- The absence of flow in the portal vein on Colour Flow Doppler (if the remnant is still visible).[9,12]
- Multiple varicose, venous channels in the porta hepatis that displays hepatopetal flow.[12]
- Concurrent compensatory changes in the hepatic artery. Normally a vessel that displays low resistance flow and pulsatility, it may now show increased flow and an increased hepatic artery resistance index (HARI) >0.7 in response to the decreased portal venous flow and venous congestion. In established cirrhosis with portal hypertension, the HARI decreases to < 0.55.[15]
- Associated ascites and massive splenomegaly.[9,16]

Cavernous transformation of the portal vein is deemed incurable. Treatment options are therefore aimed at early diagnosis and management of the thrombosed portal vein. The management of an acute portal vein thrombosis requires systemic anticoagulation. Surgical procedures and portal vein reconstruction is described with variable success in chronic cases. Patients with chronic portal vein thrombosis are at risk of developing portal cavernous cholangiopathy, whereby portosystemic collateral vessels surrounding the common bile duct cause obstruction in 0.5-1% of cases.[9]

CTPV is an unfortunate fatal complication of portal venous thrombosis. Invariably, it is associated with portal hypertension and its complications e.g. intractable, massive ascites and ultimately gastro-intestinal variceal bleeds. Ultrasound diagnosis of CTPV relies on the presence of multiple Colour Flow Doppler signals in the area of the porta hepatis indicating collateral venous channels, in the absence of a demonstrable portal vein.[9,12]

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