# CAVERNOUS TRANSFORMATION OF THE PORTAL VEIN - SONOGRAPHIC FINDINGS

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*ABSTRACT*

***Cavernous transformation of the portal vein may be seen following portal vein thrombosis. Ultrasound is a useful non-invasive procedure for demonstrating many abnormalities of the portal vein and surrounding structures[1,2]. Two cases of cavernous transformation of the portal vein, diagnosed by ultrasonography, are presented.***

***Keywords:*** *Cavernous transformation, portal vein thrombosis, collateral vessels*

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## INTRODUCTION

Portal vein thrombosis may be followed by the formation of multiple thin-walled collateral vessels in the porta hepatis.

Various imaging techniques can be used to diagnose cavernous transformation of the portal vein. These include ultrasound - both real-time and doppler, dynamic CT scanning, portal venography and magnetic resonance imaging[3].

Modern real-time ultrasound systems provide a detailed, non-invasive, inexpensive and rapid method of demonstrating abnormalities of the portal vein and is thus an ideal screening tool for evaluation of portal hypertension[1,2].

Two cases of cavernous transformation of the portal vein, diagnosed on "routine" ultrasound for portal hypertension, are presented.

## CASE REPORTS

### Case 1

A 42-year-old male presented with repeated episodes of hemetemesis and melaena since the age of 15. He underwent an operation then (the nature of which he was unable to recall) but subsequently defaulted follow-up until his symptoms recurred.

An endoscopic examination revealed extensive oesophageal varices involving the gastric fundus as well. This finding was confirmed with a barium swallow. Injection sclero-therapy was performed.

Ultrasound showed a small liver. The normal portal vein was not identifiable. There were increased echoes in the porta hepatis (Fig 1a, 1b), with multiple anechoic sinuous structures which were devoid of echoes and represented collateral veins (Fig 1c). These findings are consistent with cavernous transformation of the thrombosed portal vein. The spleen was not located and previous splenectomy was likely.

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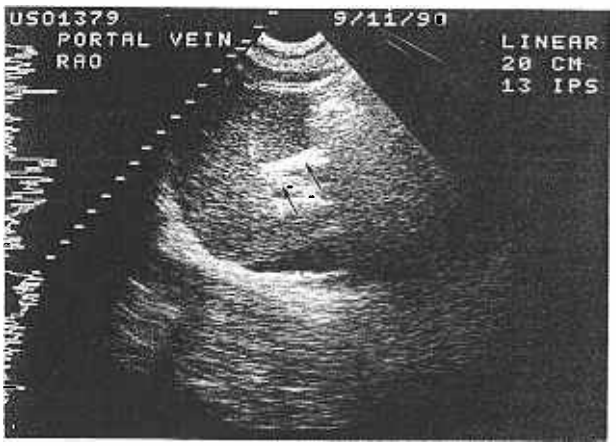
**Fig 1a - Real-time transverse scan through the liver showing prominent echogenic areas in the porta hepatis (arrows). The portal vein was not visualised.**


**Fig 1b - Longitudinal scan of the liver. The echogenic areas in the porta hepatis (arrows) are due to fibrosis of the portal vein branches.**




### Case 2

A 76-year-old female was admitted with a five-day history of hemetemesis. She is a known diabetic and also has a past history of ischaemic heart disease. The patient was anaemic and required blood transfusion.

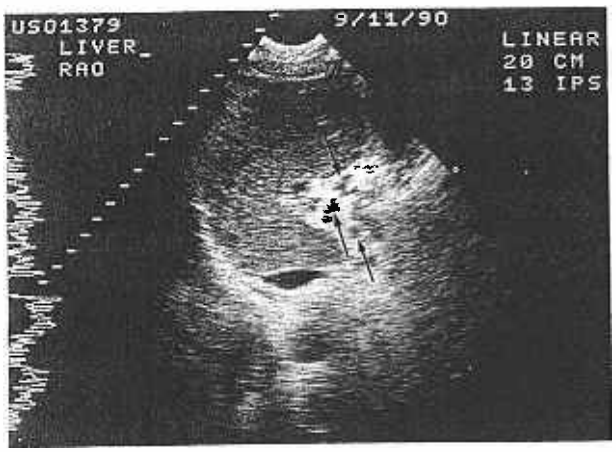
Gross oesophageal varices were noted on endoscopy but were not actively bleeding. Injection sclerotherapy was done. The patient later developed acute pulmonary edema from fluid overload.

An ultrasound done showed a small and cirrhotic liver (Fig 2). There was gross ascites and a right pleural effusion.

Collateral veins were seen around the porta hepatis as multiloculated anechoic structures. This finding, together with the failure to visualise the normal portal vein, indicated cavernous transformation of the portal vein. The spleen was diffusely enlarged.

The patient later suffered an acute myocardial infarct and had a cardiac arrest. She was successfully resuscitated but succumbed a few days later.

**Fig 1c - Multiple vascular channels are seen in the porta hepatis (arrows).**




## DISCUSSION

Portal vein thrombosis may occur as a result of sepsis of the umbilical vein neonatally, intra-abdominal infection leading to pylephlebitis and thrombosis, pancreatitis or any cause of hemoconcentration.

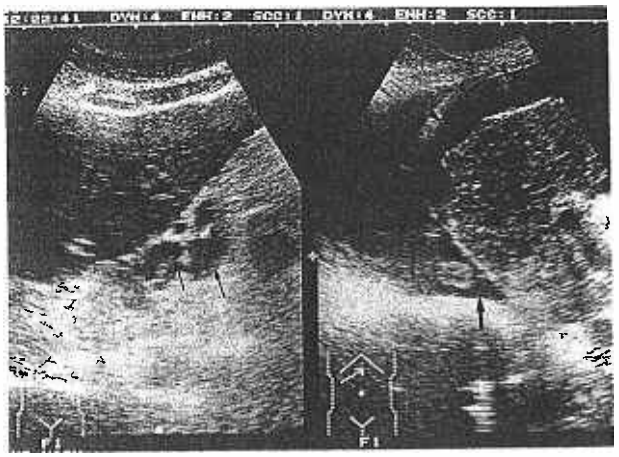
It may be followed by the development of collateral vessels around the thrombosed portal vein. Cavernous transformation of the portal vein was formerly thought to be a primary angiomatous malformation but is now considered to be due to the formation of collateral vessels. It occurs in approximately one-third of patients after portal vein thrombosis[4].

The classical appearance of cavernous transformation is the combination of serpiginous vessels and the thrombosed portal vein. Webb et al[5] described the characteristic sonographic finding of a diamond-shaped, echogenic band that replaces the portal vein and represents periportal fibrosis. Kauzlaric et al[6] described a sonographically diagnostic triad consisting of:

1) failure of visualisation of the extra-hepatic portal vein,
2) demonstration of high-level echoes in the region of the porta hepatis (the "diamond" sign), and
3) visualisation of multiple serpiginous vascular channels around the portal vein.

The sonographic appearance of cavernous transformation of the portal vein on real-time scanning as defined above by Kauzlaric are reliable and reproducible, and real-time ultrasound alone is usually sufficient for the diagnosis. However, duplex doppler sonography may be used to identify the abnormal tubular structures in the porta hepatis as hepatopetal collaterals. This aids identification of the abnormal tubular structures as vascular channels rather than biliary ducts, and hence removes any uncertainty.

**Fig Case 2: Left - Collateral vessels in the porta hepatis are seen as multiloculated structures completely devoid of echoes (thin arrows). Right - the liver is small and cirrhotic. There is ascites (arrowhead) and a right pleural effusion (thick arrow).**



Raby and Meire[7] performed duplex doppler ultrasound scans in 10 patients with proven cavernous transformation of the portal vein. All their cases exhibited absence of normal portal vein lumen on imaging, no demonstrable intrahepatic branches and replacement by numerous tortuous vessels at the porta hepatis. Doppler studies revealed a characteristic "flat" Doppler waveform with a reduction in the time averaged velocity to less than 8 cm/s which was well below the normal range of 12-16 cm/s.

Colour doppler flow imaging allows assessment of the presence, direction and quality of blood flow more rapidly than any other non-invasive technique, even in areas that do not appear as vessels on B-mode examinations. Hence it may facilitate screening for intra- and perihepatic collateral vessels and their distinction from other abdominal fluid-filled structures such as bowel loops or peritoneal spaces that contain ascites[8].

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