Case Report

Hepatocarcinoma with Congenital Agenesis of the Portal Vein

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The association of congenital absence of the portal vein and hepatocellular carcinoma has been described, but is rare. It is most frequently discovered fortuitously in children. The absence of intrahepatic portal circulation may predispose to the development of hepatocarcinoma.

Key words: hepatocarcinoma – congenital agenesis – portal vein

INTRODUCTION

Congenital absence of the portal vein (CAPV) and its intrahepatic branches is a rare malformation of the splanchnic venous system. Thirty cases have been reported to date (1,2). The association of CAPV and hepatocellular carcinoma (HCC) has been described, but is rare, with only two previously published cases (3,4). The authors report the case of a patient with HCC and CAPV without underlying liver disease, discovered fortuitously during the work-up of the hepatic tumor.

CASE REPORT

A 36-year-old woman with a past medical history of hypoxic insult at birth and microcephaly with subsequent epilepsy treated with phenobarbital was admitted to our hospital gastroenterology department with a decline in general health associated with continuous right upper quadrant pain and abnormal liver function tests. Physical examination disclosed tender hepatomegaly, firm and irregular liver edge and no signs of encephalopathy, portal hypertension or liver failure.

Liver function tests revealed evidence of non-icteric cholestasis without high transaminase enzyme increase: GGT 420 IU/l [normal (N) < 35], ASAT 51 IU/l (N < 35), ALAT 32 IU/l (N < 40), alkaline phosphatase 307 IU/l (N < 110) and total bilirubin 16 mg/dl (N < 19). The ammonia level was normal. Initial α-fetoprotein was 61 IU/ml (N < 5). A search for HBsAg, anti-HBc antibodies and antibodies against hepatitis C virus was negative. Karyotype was 46XX.

Abdominal ultrasound and computed tomography revealed two large, heterogeneous liver masses involving segments V, VI and VII, with absence of the portal vein and without associated renal abnormalities (Fig. 1). Arteriography of celiac and superior mesenteric arteries was performed to determine accurately the absence of portal vein. The hepatic artery angiogram showed a tumor flush in segments VI and VII (Fig. 2). The superior mesenteric and splenic venous drainage bypassed the liver and drained directly into the inferior vena cava (IVC) (Figs 3 and 4). Neither of the angiograms delineated the portal vein. Echocardiography was normal.

A right hepatectomy was performed. The small omentum opening revealed a superior mesenteric vein (SMV) normally sited behind the pancreas and heading for the retroperitoneum to drain directly into the vena cava 3 cm below the quadri-lateral orifice making up a congenital portosystemic shunt. The splenic vein did not join the SMV and formed an anastomosis directly with the IVC. The surgeon noted an accessory right hepatic vein entering directly the right atrium.

Gross examination of the operative specimen revealed a tumor mass (12 x 7 cm) involving segments V, VI, VII and VIII with numerous small peripheral nodules. Microscopic examination demonstrated typical HCC noting the trabecular-sinusoidal structure and resemblance of the tumors cells to normal hepatocytes. The trabeculae were for the most part thicker and reticulin was often scanty. The tumor cells were well differentiated. Hypercellularity and cytological details of small, monotonous hepatocytes with nuclear crowding, decreased cytoplasm, increased nuclear/cytoplasmic ratio and atypical naked nuclei were noted. In places, clear cell carcinomas and an invasion through the tumor capsule were noted. Portal spaces were devoid of portal veins, bile ducts were normal and arterioles appeared ectasic and congestive. On sections adjacent to the central portion of the liver, a poorly differentiated remnant of the portal vein with a thick muscular wall and narrow lumen was noted. Orcein staining confirmed the absence of venous structures in portal spaces of normal liver...
tissue. Non-neoplastic liver tissue revealed no lesions of chronic hepatitis or cirrhosis.

Six months after surgery, liver function tests and \( \alpha \)-fetoprotein were normalized. The patient is at present in good health 2 years after surgery. Follow-up with abdominal ultrasound and assay of serum \( \alpha \)-fetoprotein is performed every 6 months.

**DISCUSSION**

Congenital absence of the portal vein is a rare anomaly and occurs predominantly in females (1). Minimally symptomatic, it is most frequently discovered fortuitously in children and other congenital abnormalities are often associated: cardiovascular (dextrocardia, ventricular or atrial septal defects, patent foramen ovale and ductus arteriosus), skeletal (hemivertebrae, fifth finger anomalies, oculoauriculovertebral dysplasia),

**Figure 1.** Abdominal contrast-enhanced computed tomography showing hepatocellular carcinoma of the right hepatic lobe, splenomegaly and absence of portal vein.

**Figure 2.** Hepatic artery angiogram showing a tumor flush in segments VI and VII.

**Figure 3.** Venous phase of superior mesenteric vein revealing absence of portal vein with direct drainage into the inferior vena cava.

**Figure 4.** Venous phase of splenic vein revealing absence of portal vein with direct drainage into the inferior vena cava.
biliary (biliary atresia) and urinary (5–8). Liver tumors have previously been described in the presence of disturbed portal venous flow and correspond to benign (focal nodular hyperplasia, adenoma) or malignant lesions (hepatoblastoma, HCC) (7–10).

CAPV consists of an absence of the portal vein with abnormal drainage of both mesenteric and splenic veins into the systemic circulation and results from aberrant venous development in early embryonic life. In the process of embryologic development, the portal vein is normally formed in the 4–10-week-old embryo by selective involution of the perirectal vitelline venous loop. Excessive involution results in absence of the portal vein (11–13). The enterohepatic circulation is disrupted, the portal venous blood being shunted systematically. Mesenteric and splenic venous blood drains into the renal veins, the hepatic veins or directly into the vena cava. Strictly, for a malformation to be defined as CAPV, the splenic vein and SMV must not join, but each must form an anastomosis directly with the systemic circulation (9,14). This results in the SMV joining either the intrahepatic IVC or the left renal vein. There are no venous collaterals or other secondary signs of portal hypertension, such as ascites or splenomegaly. Liver function tests and ammonia levels are either normal or mildly elevated.

Although it has long been considered that essentially all HCCs arose from cirrhotic changes, more recent reports show that they can occur in 40% of patients without cirrhosis or chronic liver disease (15,16). Hepatic carcinogenesis is a sequential biological process still poorly elucidated, one stage of which is the appearance of hepatocellular dysplasia, precursor of subsequent HCC (17,18). To date, no genetic alteration specific for HCC arising from non-cirrhotic liver tissue has been described (19). A study of the HCC transcriptome, already carried out for HCC arising from cirrhotic changes, should also be performed in similar cases to determine the different carcinogenetic pathways of hepatic tumors. Indeed, the discovery of early genetic alterations would allow more accurate detection of potentially malignant dysplastic lesions. More appropriate follow-up and management would be possible, notably in the case of this patient with normal residual liver tissue.

Absence of intrahepatic portal circulation and systemic diversion of portal vein flow may have consequences on hepatic development, function and regenerative capacity predisposing to the development of nodular dysplasia, and subsequently hepatocarcinoma or other benign or malignant hepatic tumors. Circulatory disturbance alone may not explain the pathogenesis and some unknown mechanism, possibly genetic, could underlie the process (20).

CONCLUSION

This is the third reported case of HCC associated with congenital absence of the portal vein. A causal relationship between portal vein agenesis and HCC remains to be elucidated. This case emphasizes the value of regular hepatic ultrason surveillance in patients with congenital absence of the portal vein and especially to detect nodule formation of the left hepatic lobe and to recommend precociously liver transplantation.

References