Valvular-Type Membranous Obstruction of the Inferior Vena Cava With Vertebral Collaterals

Color Doppler Findings

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Membranous obstruction of the inferior vena cava (MOVC) is a rare disorder characterized by obstruction of the inferior vena cava, hepatic vein, or both. Color Doppler findings in this condition are well reported. We report a case of MOVC with valvular-type obstruction.

Case Report

A 53-year-old woman with bilateral pedal edema was referred for abdominal sonography. The sonography was done with an HDI 5000 system (Philips Medical Systems, Bothell, WA). The solid organs were normal. The inferior vena cava was dilated up to the hepatic segment. The obstruction to the hepatic segment of the inferior vena cava was by an echogenic fibrous cord of about 5 mm in thickness (Fig. 1A). On color flow mapping, there was phasic retrograde flow across this web (Fig. 1B). The retrograde flow was seen during the inspiratory phase of respiration. There was no forward flow. These features were also reflected in the spectral tracing (Fig. 1C). In the upper part of the inferior vena cava, there was also phasic retrograde flow during inspiratory phases. All 3 hepatic veins were dilated (Fig. 2A). They showed normal flow toward the inferior vena cava (Fig. 2B). In the lower part of the inferior vena cava, normal forward flow was seen (Fig. 3, A and B). There was normal forward flow in both common iliac veins.
Figure 1. A, Sagittal sonogram showing the dilated inferior vena cava (IVC) and fibrous cord-like web causing the obstruction of the hepatic inferior vena cava. B, Color flow map showing retrograde flow across the web. C, Spectral trace revealing the phasic retrograde flow across the web.

Figure 2. A, Gray scale image showing a dilated hepatic vein. B, Color flow map showing a normal flow direction in one of the hepatic veins.
The retrograde flow in the upper part of the inferior vena cava and forward flow in the lower part of the inferior vena cava were unusual and suggested a major collateral vein draining the middle part of the inferior vena cava. A careful search revealed a large lumbar collateral vein arising from the right posterolateral aspect of the inferior vena cava (Fig. 4A). This vein was traced and found to be connected to dilated veins anterior and posterior to the plane of the right transverse processes of 2 lumbar vertebrae above the level of the collateral vein. Further tracing was not possible. On color flow mapping and spectral analysis, the collateral vein was draining the inferior vena cava into the vertebral veins (Fig. 4, B and C). In the vertebral veins, the flow was in a cephalic direction.

The features were diagnostic of a fibrous cord–like web obstructing the hepatic inferior vena cava, with valvular obstruction allowing only retrograde flow during inspiration. Hepatic veins were not involved. The middle part of the inferior vena cava was drained by a collateral vein, which in turn drained into vertebral collaterals. The patient underwent an inferior vena cavaography, which confirmed the MOVC (Fig. 5). The lesion was perforated with a transeptal needle and further dilated with a balloon. The patient did well after the procedure.

**Discussion**

Membranous obstruction of the inferior vena cava is characterized by obstruction of the hepatic segment of the inferior vena cava by a membrane or fibrous cord of varying length. It is often associated with occlusion of the hepatic veins. The pathogenesis of the obstructive membrane or cord is unknown. Some investigators suggest that MOVC is a congenital lesion or developmental anomaly. Some others have put forth the theory that it is an acquired condition.1–3 Okuda et al4 proposed the theory that the membrane or cord obstructing the inferior vena cava is the outcome of recurrent thrombosis and suggested the term “obliterative hepatocavopathy” to denote the condition. They also suggested that obliterative hepatocavopathy and primary hepatic vein thrombosis are different epidemiologically, pathologically, and clinically.4 Membranous obstruction of the inferior vena cava is very rare in western countries but more frequent in India, South Africa, Japan, and Korea.5

The sonographic findings of MOVC are well described and are as follows: (1) obstruction of the hepatic portion of the inferior vena cava, (2) obstruction of 1 or more hepatic veins, (3) reversed flow in the hepatic veins, (4) an enlarged inferior right hepatic vein, and (5) communicating vessels between the inferior right hepatic vein and the right or middle hepatic vein, or both.6,7 Previous reports have described the color Doppler features of MOVC as absence of flow across the web, reversed flow in the hepatic veins, and flow in the intrahepatic intercommunicating veins.5,8,9 To our knowledge, no report has described retrograde flow across the web. One report described a collateral vein draining the inferior vena cava: the azygos collateral vein.5
In the case reported here, there was phasic retrograde flow across the web during inspiration that was also seen in the inferior vena cava above the collateral vein. There was normal flow in all 3 hepatic veins, draining into the inferior vena cava below the web, but there were no intrahepatic collateral veins, which have been described as uniform findings in all previous reports. Normal forward flow was present in the lower part of the inferior vena cava and both common iliac veins. A large lumbar collateral vein connected the middle part of the inferior vena cava and the vertebral venous plexus. That explains the opposite flow directions in the inferior vena cava above and below. The unusual findings in this case were retrograde flow across the web, normal flow direction in all hepatic veins, absence of intrahepatic intercommunicating veins, and identification of a lumbar collateral vein connected to the vertebral plexus. The improved resolution of images and improved sensitivity of Doppler sonography available in current scanners enable better visualization of such findings.

Figure 4. A, Oblique sonogram at the level of the collateral vein showing the origin of the collateral vein (arrow) from the inferior vena cava (I). B, Color flow map showing the collateral vein connecting the inferior vena cava and the vertebral veins. C, Spectral trace of the collateral vein. A indicates aorta.

Figure 5. Inferior venacavogram showing membranous obstruction of the hepatic inferior vena cava.
References


