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☐ Case Report ☐

Gastric Varices: Diagnosis with Duplex Doppler Ultrasonography
-A case report-

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The diagnosis of gastric varices may be difficult due to their anatomic location and morphology. In this abstract we describe a case of gastric varices, of which a duplex Doppler sonogrphy was useful in the diagnosis, that was initially suggested as submucosal tumor of the stomach by barium studies and endoscopy.

Key Words: Gastric varicies, Doppler ultrasonography

The diagnosis of gastric varices may be difficult due to thier anatomic location and morphology, especially when esophageal varices are not present. If not looked for carefully, these varices can be missed or misdiagnosed. Gastric varices have been misdiagnosed occasionally for neoplasms (Anderson and Dunnick 1977; Okuda *et al.* 1973; Sarin and Kumar 1989; Smookler 1956), and deep endoscopic biopsy of a varix may result in a major hemorrhage (Swischuk 1967). The various techniques frequently employed for the diagnosis of gastric varices include barium studies, endoscopy, and splenoportography (Sarin and Kumar 1989). In recent years, duplex Doppler sonograpy consisting of real-time ultrasonography and a pulsed Doppler flowmeter has been developed. A number of recent reports have documented its clinical utillity in the diagnosis of portal hypertension (Kim *et al.* 1991; Kim *et al.* 1988; Kim *et al.* 1987; Kim *et al.* 1990; Moriyasu *et al.* 1986; Ohnishi *et al.* 1985; Ralls *et al.* 1988; Taylor *et al.* 1985), but rarely in the diagnosis of gastric varices.

Herein we describe a case of gastric varices, of which a duplex Doppler sonography was useful in a diagnsis that was initially suggested as submucosal tumor of the stomach by barium studies and endoscopy.

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CASE REPORT

A 77-year-old female presented with a history of hematemesis and melena. Past medical history was significant for chronic viral hepatitis B, hypertension, congestive heart failure, and peptic ulcer disease complicated by one episode of upper gastrointestinal bleeding. Physical findings were unremarkable except for pale conjunctiva. Laboratory data revealed anemia (hemoglobin 8.3 gm/dl) with mild hyperbilirubinemia (total bilirubin 3.5 mg/dl). Fibergastroscopy showed esophageal diverticulum and a large, polypoid round mass with central umbilication just below the esophagocardiac junction on the posterior side (Fig. 1). Under the impression of a submucosal tumor, barium study was performed, which showed a 5×4 cm sized fungating lesion in the upper body and cardia of stomach (Fig. 2). The ultrasonogram, taken after the patient had drunk 500 ml of water, showed a round, echo-free structure within the submucosa of the upper stomach near the esophagogastric junction, which was connected with serpinginous collateral vessels (Fig. 3). There was a 5 cm sized hyperechoic mass on the

Fig. 1. Fibergastroscopic picture showing lobulated tumor with central umbilication near the esophagogastric junction. The overlying mucosa looks like normal in color and texture.

posterior superior subsegment of the right lobe of the liver, highly suggestive of hepatocellular carcinoma.

On duplex Doppler sonography, the gastric submucosal mass noted on the barium study and endoscopy was proven to be portal venous radicles, identified as gastric varices with the flow signal, which was similar to the waveform for the portal venous system (Fig. 4).

For the diagnosis of the liver mass noted at ultrasonography, hepatic artery angiography was performed with the result of hypervascular tumor staining during arterial phase. Infusion of ^{131}I-lipiodol and embolization with Ivalon was also performed. The gastric varices filling was noted on the venous phase of the angioraphy (Fig. 5).

DISCUSSION

Gastric varices may present as radiological filling defects in the stomach. The characteristics of these

Fig. 2. Barium study showing large, polypoid, and lobulated mass with central umbilication in the fundus and cardia.

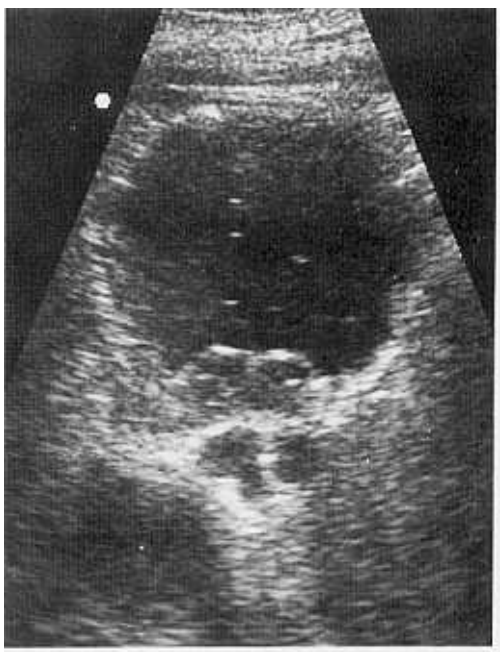

Fig. 3. Ultrasonography showing the multilobulated, round, and echo-free structures within the submucosa of the stomach, which were connected with collateral vessels of extragastric portions.

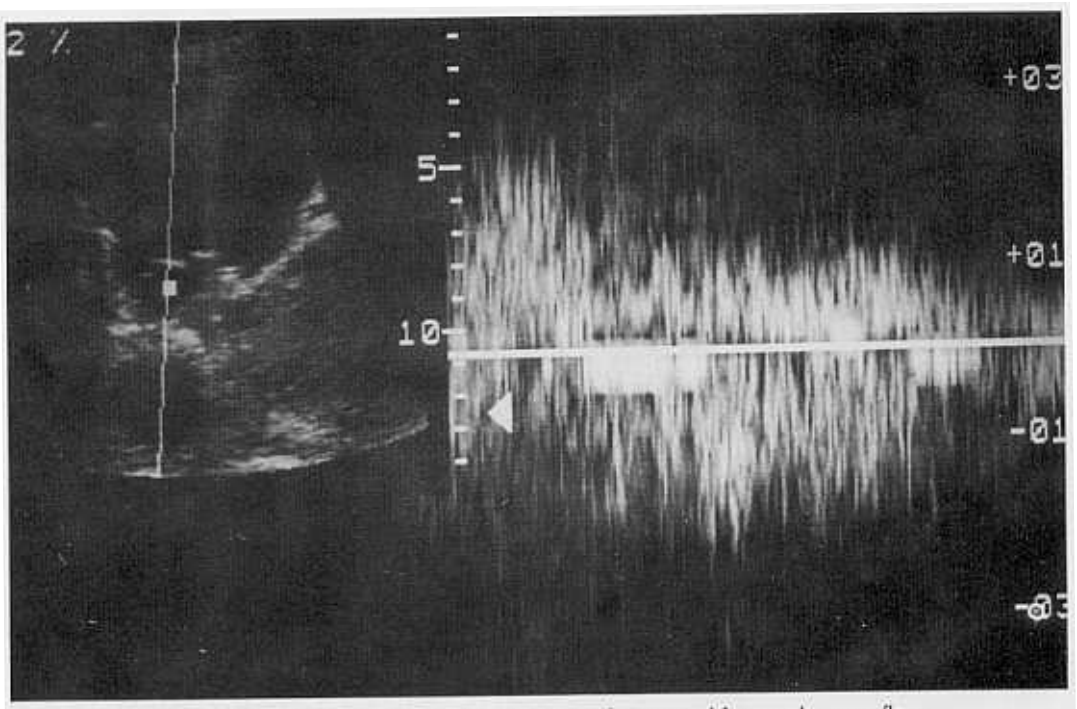

Fig. 4. Doppler ultrasonography showing the waveform typical for portal venous flow.

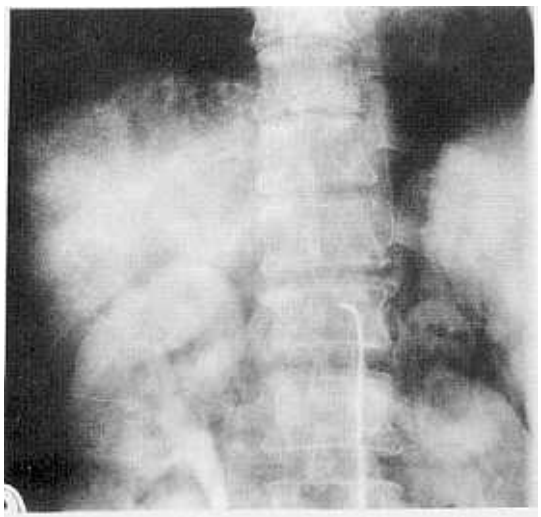

Fig. 5. Venous phase of the hepatic artery angiography showing large gastric varices.

lesions have been well described, but in many instances their differentiation form gastric tumors remains difficult. Indeed, ordinary studies with a barium meal may prove inadequate. Moreover, even the results of endoscopy may be misleading since gastric varices may be mistaken for prominent gastric folds or neoplasms (Sarin and Kumar 1989). Gastric fundal varices may assume either a localized polypoid configuration or produce multiple, rounded, submucosal projections throughout the gastric fundus (Bachman and Brady 1984). So, the possibility of gastric varices needs to be considered in the diagnosis of any mass in the fundus of the stomach.

There are certain limitations in the diagnosis of gastric varices. First, the index of suspicion for varices, particularly, in patients with minimal or no evidence of liver disease, is low. Second, attention is generally directed towards the possibility of malignancy, which the varices can closely mimic radiographically. Third, gastric varices may be located in the deep submucosa or subserosa so that the classic bluish tinge of a soft, tortuous vein usually running towards the cardia may not be appreciated on endoscopy (Marshall *et al.* 1977). Splenoportography provides better visualization of the gastric varices than does transhepatic portography and is, therefore, considered by some as the first method

of examination for detecting gastric varices. However, splenoportography is an invasive procedure and carries the risk of complications. Moreover, the gastric collaterals demonstrated by splenoportography may not always be forming or become identifiable as gastric varices (Stone *et al.* 1978; Rice *et al.* 1977).

The investigation of the vascular system using ultrasonic Doppler-shift technique is rapidly attracting clinical attention. The shapes of the instantaneous pressure/time and flow/time waveform are a function of the mechanical parameters of the vascular system, for example vessel elasticity, lumen and wall thickness, and contain informations about the network above and below the site of observation. A flow at any instant is the product of lumen cross-section and blood-velocity. Thus the velocity/time waveform also contains such information. And the general blood-velocity/time function in a vessel can be monitored continuously by measuring the Doppler-shift produced in ultrasound scattered by red-cells and detected transcutaneously. Despite their common origin, each vessel in the abdomen and pelvis has a different "Doppler signature" that can be used to aid its identification (Kim *et al.* 1990; Taylor *et al.* 1985). Doppler-shift spectrum of the portal venous system is characteristic because the blood flow is of relatively low velocity, the flow lacks turbulence and is laminar, and minimal phasic changes in velocity can be seen (Kim *et al.* 1991; Moriyasu *et al.* 1986). And recent studies have also indicated that Doppler signals, which could aid differential diagnosis, are obtained from tumors of solid organs (Kim *et al.* 1989; Taylor *et al.* 1987).

The sonographic findings in portal hypertenison allow for a presumptive diagnosis based upon ultrasonic imaging alone, but the Doppler ultrasonographic demonstration of characteristic flow signals of the portal venous system in varices adds certainty to the diagnosis, as in our reported case. And Ralls *et al.* (1988) recently reported that they could successfully diagnose gallbladder varices with color flow Doppler sonograpay. So, a duplex Doppler ultrasound could provide an easy, noninvasive, and certain diagnosis of collaterals related to portal hypertension (Kim *et al.* 1988; Medhat *et al.* 1988; Ralls *et al.* 1988). Endoscopic ultrasonography also visualizes a large part of the portal venous system and is a safe and relatively noninvasive technique in the diagnosis of esophageal and gastric varices, but is somewhat bothersome to the patients (Galetti *et al.* 1990).

It is the intent of this case report to alert the physician to emphasize the value of the noninvasive transabdominal duplex Doppler ultrasonogapy in making the diagnosis of gastric varices.

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