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 sonography was useful in the diagnosis, that was initially suggested as submucosal tumor of the stomach by barium studies and endoscopy.

Key Words: Gastric varices, Doppler ultrasonography

The diagnosis of gastric varices may be difficult due to their 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 sonography consisting of real-time ultrasonography and a pulsed Doppler flowmeter has been developed. A number of recent reports have documented its clinical utility 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 diagnosis that was initially suggested as submucosal tumor of the stomach by barium studies and endoscopy.

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 serpiginous collateral vessels (Fig. 3). There was a 5 cm sized hyperechoic mass on the
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posterior superior subsegment of the right lobe of
the liver, highly suggestive of hepatocellular carci-
noma.

On duplex Doppler sonography, the gastric sub-
mucosal mass noted on the barium study and end-
doscopy 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 ultra-
sonography, hepatic artery angiography was per-
formed with the result of hypervascular tumor stain-
ing 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 angiography (Fig. 5).

**DISCUSSION**

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

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

*Fig. 2. Barium study showing large, polypoid, and lobu-
lated mass with central umbilication in the fundus
and cardia.*

*Fig. 3. Ultrasonography showing the multilobulated,
round, and echo-free structures within the sub-
mucosa of the stomach, which were connected
with collateral vessels of extragastric portions.*
lesions have been well described, but in many instances their differentiation from gastric tumors re-
mains 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 hypertension 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 sonography. 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 ultrasonography in making the diagnosis of gastric varices.

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