Glucagon-Induced Small Intestinal Hypotonia Demonstrating Bleeding Lymphoma

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Abstract. While a patient was being evaluated for melena, a glucagon-induced hypotonic examination of the small intestine demonstrated a small ulcerated mass in the jejunum. The tubeless hypotonic examination was performed after multiple gastrointestinal series, small intestinal series, barium enemas, and visceral arteriography— including celiac and superior mesenteric arteriograms—failed to identify a bleeding site. Surgical exploration revealed three ulcerated lymphomatous lesions in the jejunum. The lack of side effects, rapidity of onset, and shortness of duration of intravenous glucagon suggest that this type of hypotonic examination of the small intestine may prove useful as an adjunct to the small intestinal series.

Key words: Glucagon, small intestinal— Hypotonia, small intestinal— Lymphoma, gastrointestinal— Bleeding.

Glucagon induces hypotonia in the stomach, duodenum, small intestine, and colon. The drug has so few side effects [1, 2] that it has made the hypotonic duodenogram and the air-contrast hypotonic examination of the colon almost a routine examination that can greatly enhance the radiologist's diagnostic acumen.

However, hypotonic examination of the small intestine distal to the second portion of the duodenum has received little attention, possibly because of a reluctance to prolong an already tedious examination or fear of distorting the normal and abnormal small intestinal patterns well known to radiologists. The glucagon-induced hypotonic examination of the distal small intestine may facilitate identification of lesions not readily revealed by other techniques.

During a workup for melena a patient had multiple gastrointestinal series, barium enemas, small intestinal series, and angiograms that were considered normal. A glucagon-induced hypotonic examination of the small intestine revealed a jejunal ulcer in a lymphomatous mass 12 to 15 cm distal to the ligament of Treitz.

Case Report

A 51-year-old white male was admitted to the Stamford Hospital for progressive weakness, transient melena, and intermittent periumbilical pain of 12 months' duration. During two prior hospital admissions for melena 10 months and then 1 month earlier, no source of bleeding was identified. There was no history of weight loss, malabsorption, diarrhea, constipation, or intestinal obstruction. The patient was taking no medication. No lymph nodes or abdominal masses were palpable. On admission, the hemoglobin was 8.8 g/100 ml and hematocrit 27. Occult blood was repeatedly found in the stool. Serum protein studies and white blood cell count were normal throughout the illness.

Initial radiographic evaluation had been performed at another hospital 10 months previously and included a gastrointestinal series, barium enema, and small intestinal series, all of which were considered normal. Nine months later at Stamford Hospital, initial evaluation included a barium enema, upper gastrointestinal series, and small intestinal series, all of which were also considered normal. After readmission 1 month later, a visceral arteriogram was performed, including celiac and superior mesenteric arteriograms, which failed to reveal a source of bleeding. A hypotonic duodenogram was then performed with ingestion of 350 cc of E-Z-HD Barium and 6 g E-Z-Gas (E-Z-EM Company, Westbury, N.Y.) and intravenous injection of 1 mg glucagon after barium passed into the jejunum. On compression spot films there appeared to be an area of ulceration in the jejunum 1 to 2 feet from the ligament of Treitz (Fig. 1A). A 2 to 3-cm mass surrounded the ulcer. Review of the superior mesenteric arteriogram showed displacement of jejunal vessels around a 2-cm avascular mass (Fig. 2).

At surgery, that part of the small bowel containing the jejunal mass and a portion of mesentery were removed and an end-to-end anastomosis done. Numerous mesenteric lymph nodes were found to be enlarged but not all were removed.

Three separate but contiguous, roughly rounded, ulcerated, nonperforated, plaque-like mucosal lesions were found, measuring 2 to 3 cm in diameter (Fig. 1B).

Histologically, the plaque-like lesions were composed of sheets of medium to large hyperchromatic lymphocytes and histiocytes, including binucleate forms, whose nuclei were large, lobular, and pale and displayed prominent nucleoli and peripheral chromatin.
Fig. 1. A Compression spot film of the jejunum during hypotonia showing the jejunal ulcer (curved single arrow) and mass (straight arrows). B Close-up of the opened surgical specimen showing the jejunal ulcer clumping. There was marked mitotic activity. Patchy reactive fibroblastic proliferation was present in the underlying muscle layers and serosa. No Reed-Sternberg cells or phagocytic activity was identified. The lymph nodes showed reactive follicular hypertrrophy. The tumor was interpreted as a primary malignant gastrointestinal lymphoma.

After surgery the patient did well initially but was readmitted after 5 months because of weight loss and diarrhea of 2 weeks' duration. A gallium scan and lymphangiogram revealed a nodal mass to the left of the midline in the L-2 area. He then underwent a staging laparotomy during which massive enlargement of mesenteric and para-aortic lymph nodes was found. A large lymph node from the area of uncinate process of the pancreas was resected and a liver biopsy was obtained. He died 3 days after the operation. At autopsy a large lobulated mesenteric mass measuring 20 x 15 x 8 cm was found. The cut surface of the mass revealed matted fleshy lymph nodes. A raised plaque-like lesion 2 cm in diameter was seen in the jejunal mucosa at the anastomotic site. Two discrete tiny nodules were present in the left lobe of liver. Multiple firm rubbery enlarged lymph nodes were also identified in the abdomen and thorax. Microscopic examination of the mesenteric mass, lymph nodes, liver, and jejunum showed infiltration by numerous large mitotically active histiocytes cells showing considerable nuclear pleomorphism with hyperchromasia and focal multinucleation. The final classification of the tumor was malignant lymphoma, histiocytic type, diffuse. The immediate cause of death was acute pulmonary edema, secondary to cardiac failure.

Discussion

Glucagon-induced small intestinal hypotonia may be a valuable tool for the radiologist evaluating a patient with melena. It might also prove useful in detecting occult small neoplasms, early Crohn's disease [3-6], and Meckel's diverticulum. Intravenous administration of glucagon provides rapid onset (1 to 2 min) and short duration (10 min) of action [7], thus allowing numerous intermittent spot films of the static small intestine. The effect is dose related and slightly different for each part of the GI tract [7]. The small intestinal series will not be appreciably prolonged because of glucagon's short duration of action. Furthermore, by relaxing the small intestinal musculature and thereby eliminating muscle spasm, glucagon may enhance visualization of ulcers.

Other attempts to examine the small intestine with