Technetium Pertechnetate Scintigraphy in an Ileal Duplication of the Stomach and Duodenum

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We report a patient with ileal duplication of the stomach and duodenum that presented with gastrointestinal bleeding. The scan appearance of the duplicated stomach in both shape and temporal course of activity bore a striking resemblance to the patient's homotopic stomach.

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Duplications of the alimentary tract can present a diagnostic challenge. They may be found anywhere from the base of the tongue to the anus, but most often occur in the region of the ileum. Twenty to thirty percent of these will contain ectopic gastric mucosa (*1,2*).

Experience with technetium pertechnetate abdominal scintigraphy has shown that the method is specifically indicated for the diagnosis and localization of ectopic gastric mucosa in Meckel's diverticulum, in gastrointestinal duplications and in Barrett's esophagus (*3*).

CASE REPORT

An 8-mo-old hispanic male infant presented for evaluation of acute onset of painless hematochezia. He had been previously well with unremarkable past medical or family history. On physical exam, he was an alert, pale infant, with growth and development appropriate for age. Abdominal exam was unremarkable except for heme-positive stool. Hematocrit was 21%.

An abdominal radiogram and abdominal ultrasonogram were both interpreted as normal. Technetium-99m-pertechnetate abdominal scintigraphy was then performed.

Cimetidine (20 mg/kg) was administered intravenously 30 min prior to the TcO_4. After administration of the radiopharmaceutical, continuous anterior images at 1-min intervals were obtained for 60 min and stored in a computer for subsequent cine mode analysis. Concurrent anterior images for hard copy were obtained at 5-min intervals. The images were obtained on an LFOV gamma camera equipped with a high-resolution, parallel-hole collimator (*4–7*).

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The images revealed a roughly stomach-shaped structure in the left lower abdomen whose time course of appearance and intensity of labeling very closely paralleled those of the stomach (Fig. 1).

An exploratory laparotomy was performed that revealed an ileal duplication of stomach and duodenum with bleeding mucosal ulcers. The orientation of this abnormality in the patient matched what we had seen on the nuclear images. This was resected and primary anastomosis performed. The child recovered without complication.

The resected bowel showed a duplication with an outpouching at its proximal end that contained gastric mucosa and a pylorus. There was a common membrane separating the duplication from the ileum (Fig. 2). The duplicated gastrointestinal structure more distally contained duodenal mucoa. Three ulcers were identified in the duplicated mucosa.

DISCUSSION

Gastric duplications occur infrequently. They can vary in size from small submucosal cysts to structures larger than the homotopic stomach. Most gastric duplications are attached to the stomach, generally along the greater curvature or posterior wall. Typical clinical presentation includes abdominal distention, vomiting and a palpable mass. Duplications of the duodenum are a little less common than gastric duplications and most commonly occur on the posterior wall of the descending duodenum. Small duodenal duplications can remain asymptomatic for years but more often cause partial obstruction with a palpable mass which may be associated with intussusception (*8,9*).

Pooled data from five large series of gastrointestinal duplications reveal an ileal site in 41%, followed by esophageal in 21%, gastroduodenal in 12% and jejunal in 8% (*10*). Sixty percent of patients were less than 2 yr of age at initial presentation. The most common symptoms were nausea and vomiting, and the most common sign was a palpable abdominal mass. Gastrointestinal duplications may present as intussusception or small bowel obstruction. Gastrointestinal hemorrhage may occur due to the presence of ectopic gastric mucosa within the duplication (*11*).

An interesting case of a miniature stomach attached to the terminal ileal mesentery was reported by Collins in 1972 (*12*).

Technetium-99m-pertechnetate abdominal scintigraphy is widely used in the evaluation of suspected Meckel's

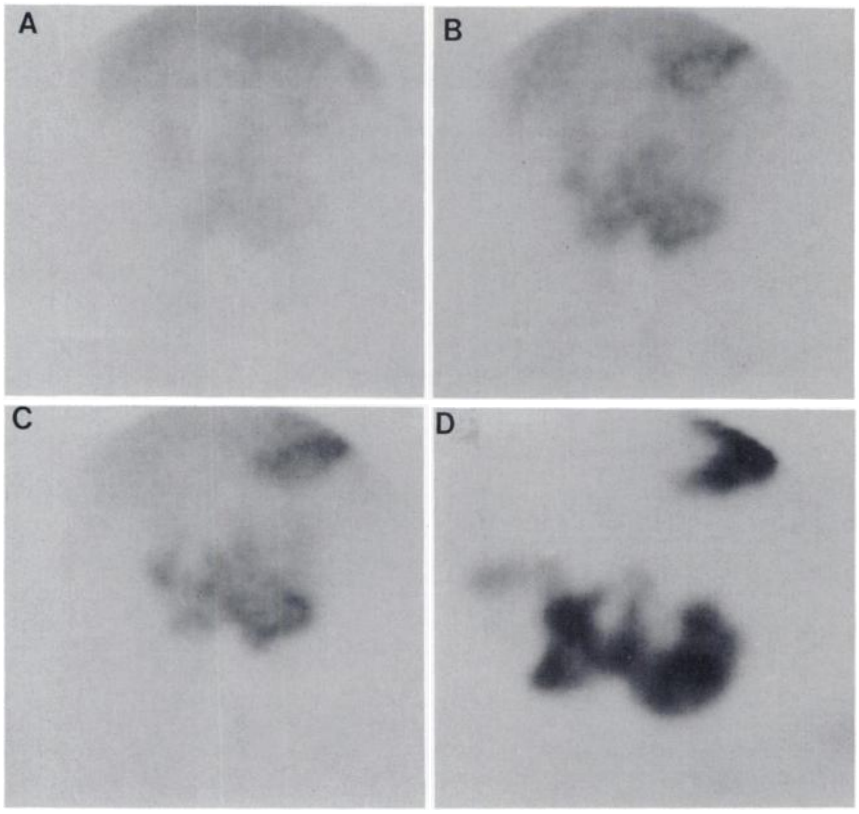
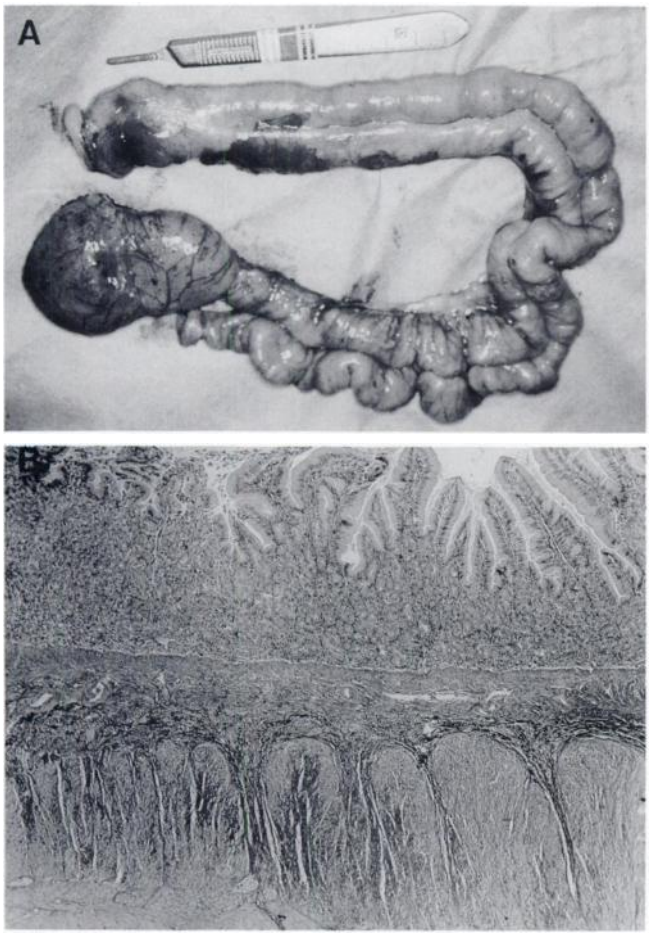


FIGURE 1. Three representative dynamic images (A–C) followed by a composite image (D) show the stomach at upper left. The duplication is seen below the stomach in an approximate stomach shape. Its intensity of labeling over time closely parallels that of the stomach.



diverticulum. There are a few reported cases of abnormal scintigrams in gastrointestinal duplications (*13*).

In our patient, the duplicated structure is an 8-cm (diameter) stomach connected by a duplicated pylorus to the duplicated duodenum, which is attached to the ileum. We were pleased with the excellent concordant behavior of the duplication with the stomach on the images as well as the gross surgical and subsequent microscopic concordance with the images.

CONCLUSION

We have shown a case of a rare intestinal duplication with excellent concordance of surgical and histologic findings with the nuclear images.

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FIGURE 2. The gross specimen (A) shows the gastric pouch at its lower left. A photomicrograph at 40× (B) shows gastric mucosa and underlying prominent muscularis external compatible with duplicated pyloris.

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SELF-STUDY TEST
Pulmonary Nuclear Medicine

ANSWERS

the worrisome history, the characteristics of the perfusion defects, and the short interval since onset of symptoms. If pulmonary angiography is not performed, the possibility of embolism with reflex bronchoconstriction can be assessed further with repeat ventilation perfusionimaging 18-24 hours later, when ventilation likely would have returned to normal in a patient with embolism.

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Items 11-15: Patterns of Altered Function in Pulmonary Disease

Answers: 11, E; 12, A; 13, B; 14 C; 15, D

Histopathologic studies of the lungs of young smokers demonstrate definite pathologic changes in the peripheral airways. The characteristic lesion is a respiratory bronchiolitis consisting of clusters of brown pigmented macrophages often accompanied by edema, fibrosis, and epithelial hyperplasia in the adjacent bronchiolar and alveolar walls. These abnormalities can be detected in some smokers by measurements of dynamic compliance, closing volumes, and flow-volume loops; however, the changes generally are too subtle to be detected by standard pulmonary function studies. Xenon washout studies have shown mild delay in regional clearance and heterogeneity of clearance time constants in the lungs of young smokers. In long-term smokers, these changes become progressively more severe and irreversible as proteases in the lysosomes of invading macrophages cause enzymatic destruction of the elastin and collagen fibers of alveolar walls. Loss of alveolar integrity resulting from this process increases alveolar volume and regional compliance and decreases the lung's elastic recoil, which is partially responsible for maintaining airway patency. Goblet cell hyperplasia in response to airway irritants in smoke results in increased mucous secretion and further compromise of the airway lumen. The regional xenon clearance time increases as both alveolar compliance and airway resistance increase.

The 25-year-old with a tibial fracture and new acute dyspnea is likely to have suffered a pulmonary embolism. Transiently increased airway resistance can occur in patients with emboli as a result of bronchoconstrictive amines released from the embolus and of changes in alveolar gas composition due to reduction in regional blood flow. Dyspnea is associated with increased depth and frequency of ventilation, two factors that increase global airflow and decrease xenon clearance time.

The 25-year-old man with massive internal injury is at risk for adult respiratory distress syndrome characterized by interstitial edema and alveolar flooding, secondary to increased permeability at the alveolar-capillary interface. This change in permeability would be reflected by an increased rate of pulmonary clearance (reduced clearance time) of inhaled ^{99m}Tc DTPA aerosol, or an increased rate of pulmonary accumulation of intravenously administered ^{99m}Tc albumin. The presence of interstital fluid causes stiffening of the alveolar wall and decreased compliance.

The 40-year-old woman with idiopathic pulmonary fibrosis is likely to demonstrate the typical pathologic features of this disorder, which include increased interstitial deposition of collagen and elastin as a result of chronic inflammation and fibrosis. As a consequence of these changes, alveolar compliance is significantly decreased. Although airway diameter may be slightly reduced, airway patency is maintained by increased lung elastic recoil. Xenon clearance rates vary according to the extent of the disease process in different lung regions, but clearance rates tend to be in the normal range because of the counterbalancing effects on clearance time of reduced complicance and increased resistance.

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Items 16-20 Pulmonary Ga Scintigraphic Patterns

Answers: 16, C; 17, E; 18, A; 19, B; 20, D

Primary lung cancer with mediastinal metastasis would be the best explanation for the finding of a right middle lobe focus of ^{67}Ga uptake and several small mediastinal foci. Although intense uptake in the right middle lobe could be related to a tumor with postobstructive consolidation, a bacterial pneumonia would be the most likely cause of a well-defined lobar uptake pattern. All of the other patterns consist of bilateral gallium localization. Although bilateral primary tumors are possible, they are uncommon. There is

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