Small-Bowel Enema
An Underutilized Method of Small-Bowel Examination

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The results of 88 consecutive small-bowel enemas were compared retrospectively with the results of 52 routine small-bowel series and 50 barium enemas done in the same patients. Ninety-six percent of the diagnoses made by small-bowel enema were correct, as compared to only 65% made by routine small-bowel series. The incorrect studies were mostly false negatives and the abnormalities missed included regional enteritis, small-bowel obstruction, and intestinal lymphoma. The barium enema failed to achieve ileal reflux in 26% of patients and had a 23% false negative rate when reflux was achieved. Because small-bowel series as done by conventional methods was significantly less accurate, we believe small-bowel enema should be considered in patients with suspected small-bowel disease when other studies are negative.

The small intestine is one of the most difficult areas of the gastrointestinal tract to evaluate. Barium contrast studies have traditionally played a major role in examination of the entire gut, but fiberoptic endoscopy of the esophagus, stomach, duodenum, and colon has now greatly improved the diagnostic accuracy in these areas. Endoscopic visualization of the small intestine, however, is not possible and barium contrast studies remain the primary diagnostic tool.

The small-bowel series (SBS) is usually the initial examination performed for suspected small-bowel disease. Unfortunately, the SBS has several problems which predispose to inadequate studies and compound each other in the distal small bowel where the majority of pathology is found. First, the pylorus interrupts the flow of barium into the small intestine and may prevent adequate distention of all the loops, resulting in inability to accurately evaluate stenotic areas. Secondly, the passage of barium depends upon peristalsis which is unpredictable in individual patients. Arbitrarily timed SBS films often show multiple overlapping loops that prevent adequate visualization of the small bowel and barium in the right colon that may obscure the terminal ileum. Nevertheless all over the country small-bowel radiographs are routinely obtained at arbitrarily timed intervals. They are then viewed by a radiologist. If a suspicious area is seen, the patient must be again fluoroscopyed and spot films obtained. For logistic and practical reasons, the time between viewing radiographs and obtaining directed spot films may be lengthy, so that the SBS as routinely done will not always yield maximum information.

These technical problems have resulted in a relatively high incidence of false negative studies. If small-bowel pathology is strongly suspected, there are few options available. A barium enema (BE) with reflux into the terminal ileum may be adequate in some patients with suspected distal small-bowel disease. However, the ability to achieve reflux is unpredictable, and it is difficult to distend the distal ileum enough to maximize the diagnostic accuracy in this area.

The small-bowel enema (SBE), also referred to as enteroclysis (1), was first described in 1929 (2).
Difficulty in passing a tube into the duodenum limited the acceptance of the SBE until 1967 when the Bilbao-Dotter tube was introduced (3) and allowed predictable and rapid intubation of the duodenum. This tube is passed nasally into the duodenum and used to introduce barium which is followed fluoroscopically until it reaches the cecum. Controlling the infusion rate of barium and manipulating the abdomen with paddles allows close inspection of all loops and special attention can be given to any area of abnormality. This procedure minimizes the technical problems of the SBS and, of greatest importance, allows complete distention of small bowel loops. Not only because of minimized technical factors but because the SBE requires a radiologist to perform and monitor the entire study with fluoroscopy, the SBE is by nature more likely to yield greater information than SBS done in the conventional way. A comparison of the two techniques is likely to be biased in favor of SBE.

Two large series using this technique have been published. Sanders and Ho (4) reported 87% accuracy in a series of 140 SBE examinations but only 10% had documentation of the final diagnosis. Seventeen percent had previously undergone a SBS but new or additional information was obtained from the SBE in half of them. The other series evaluated the results of 350 SBE examinations (5). Of the abnormal studies, 80% showed regional enteritis (RE), but only 5% had a SBS prior to the SBE and a detailed correlation between the SBS and SBE results was not given. Only 20% of the 350 patients had documentation of the final diagnosis, and the accuracy was 89%. Both of these studies concluded that the SBE was more accurate than the SBS, but the comparison of the two techniques was limited by the small numbers (17%, 5%) of SBS which had been done.

In this study we have compared the results of 88 consecutive SBE examinations, done during a 4-year period, with the results of any BE or SBS done in the same patients. Over 50% had more than one x-ray procedure, allowing cross-comparison in a large number of patients. In 30%, x-ray results could be directly compared with a documented diagnosis.

MATERIALS AND METHODS

Records of all 88 consecutive patients undergoing SBE from February 1976 to August 1980 were reviewed retrospectively. All procedures were performed under radiology staff supervision (M.K.B. or R.C.) at the Oregon Health Sciences University, and over 80% of SBE studies had been interpreted by one radiologist (M.K.B.) without knowledge of the final diagnosis. The final SBE interpretation was obtained from the dictated report in the medical record. Data used to document the final diagnoses in patients undergoing a SBE were obtained from operative notes, pathology reports, and endoscopy reports. All follow-up data available in the medical record regarding the clinical course and response to therapy of the patients were reviewed for compatibility with the SBE diagnosis.

Of the 88 patients, 27 (31%) had surgical exploration or other definitive diagnostic studies after the SBE was performed, and they are referred to as patients with a documented diagnosis. Twenty-five patients underwent laparotomy, and the results of the SBE could be compared with direct observation, and in some cases biopsy, of the small bowel. Some of the patients were operated on for reasons unrelated to the small bowel, but this afforded an opportunity for direct small-bowel examination. In two patients, endoscopy visualized the area of small bowel in question.

When more than one barium contrast study was performed on the same patient, the results of all studies were compared. The results of SBS or BE examinations were obtained from the x-ray report. The BE was performed in the standard fashion using single contrast in all cases. The SBS was performed in association with an upper gastrointestinal series in nearly all cases. The patient was given an additional 225 ml of barium orally and an abdominal film was obtained after 15 min. Depending on the progression of the barium through the small intestine, abdominal films were taken at 15- to 45-min intervals until the barium reached the cecum. Suspicous areas were investigated with paddles under fluoroscopy and spot films were taken. Spot films of the terminal ileum were routinely taken. The average fluoroscopy time was approximately 5 min. The SBS required an average time of 90 min.

The SBE technique has been described in detail elsewhere (3, 6). At the Oregon Health Sciences University, the patient was fasted overnight, given local nasopharyngeal anesthesia, and a Bilbao-Dotter tube was passed through the nose and positioned with the tip in the distal duodenum. The radiologist injected barium into the duodenum and followed the progress of the barium under fluoroscopy. The radiologist was present during the entire examination, and fluoroscopy was used intermittently as needed to visualize each loop of the small intestine in sequence until the cecum was reached. The average fluoroscopy time was 10 min but occasional patients required more time. The SBE takes 45 min of room time and approximately 1000 ml of barium are used. Double contrast was used occasionally when it seemed appropriate. Metoclopramide was not used in any of these procedures.

In a separate study, to independently assess the accuracy of SBS at our institution, we reviewed the records of all patients having a SBS and a subsequent abdominal exploration during the period from July 1979 to October 1980. There were 29 cases with sufficient information in the operative notes to document the presence or absence