

Crohn's Disease of the Small Bowel Examined by Double Contrast Technique: A Comparison with Oral Technique

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Abstract. The combination of orally administered barium is an old method which has come into use again. The technique is simple to perform and the examination is of short duration. In order to evaluate the applicability of this method it was compared with the oral technique in 43 patients with Crohn's disease of the small bowel who were examined by both methods. The tube technique revealed more clearly all pathologic changes except fistulas. The proximal extension of the changes and their demarcation from healthy intestine appeared more distinctly with the tube technique.

Key words: Small intestine, radiography – Small intestine, Crohn's disease.

The conventional method of oral administration of barium for roentgenologic examination of the small bowel, with the few films taken every hour or half hour, provides static and incomplete information about the morphology and physiology of the small bowel. The method is in general use and is even recommended in modern textbooks [1]. Since 1972 the revived method, recommended by Sellink [2], of administering the contrast medium directly in the bowel *via* a duodenal tube has been performed at the Malmö General Hospital. Due to technical improvements and availability of new plastic catheters, the method is easier to perform now than it was some years ago. One important reason for using this method is that the disintegrating effect of the gastric contents on the contrast medium is avoided and there is better visibility of the small bowel loops distended with larger volume of contrast material. Marshak's large dose method [1] is based on the same principle.

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Material and Method

The method of examination has been described earlier in detail [2–4]. A soft tube with a guide wire was inserted under fluoroscopic control *via* one nostril into the distal part of the duodenum close to the level of Treitz's ligament. The contrast medium, Barytgen® (Fushimi Pharmaceutical, Japan), 600 g powder to which was added 1300 ml water, was allowed to flow rapidly into the tube. As a result of distention of the duodenum, a strong peristaltic activity occurred. In most cases 600 ml of contrast medium was used. Air was insufflated via a Clyso pump when the contrast medium column had reached the cecum.

In the conventional oral technique for investigation of the small bowel, the patients were given 250 ml Mixobar diluted so as to contain 0.4 g BaSO₄/ml and the films were taken every half hour with spot film demonstration of the terminal ileum.

The material comprised 43 cases. The criteria for being included in the series were that the patients had been examined with both methods and that they had not been operated upon between the two studies and their clinical symptoms should not have undergone any significant change. The interval between the examinations varied between 4 days and 4¹/₂ years. Approximately 60% of the patients were examined with shorter intervals than 1 year. Approximately 70% of the cases had had the disease longer than 5 years and 80% had undergone some form of surgery. Thirty percent had an ileostomy.

Results

In an attempt to make an objective comparison of the two methods, the length of the terminal ileum, as observed on the film series of each examination, was measured (Table 1). It was quite clear that the "tube-method" provided better information about the terminal ileum.

Since the right colon is often involved in Crohn's disease, an investigation was also made to determine whether there was any difference in information with the two methods (Table 2). The right colon was significantly better demonstrated with the tube-technique. An evaluation of different pathologic changes was made with regard to how well the changes had been

Table 1. Definable length of distal ileum as shown by the two methods

	Number of cases	
	Oral examination	Tube examination
< 15 cm	32	13
> 15 cm	11	30

Table 2. Demonstration of right colon

	Number of cases	
	Oral examination	Tube examination
Demonstration	20	31
No demonstration	15	4

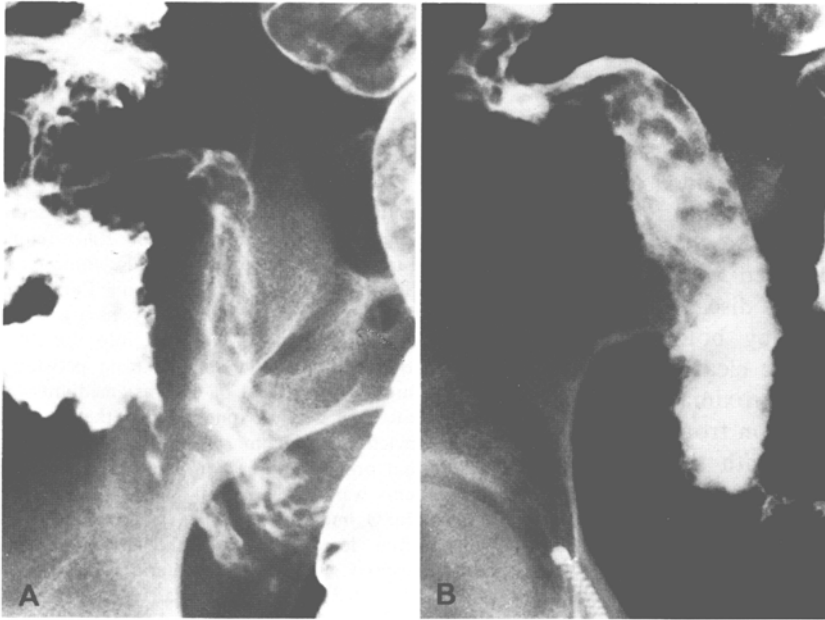


Fig. 1.

A Oral examination shows a slight stenosis and slight edema of distal ileum
B When examined by tube the lumen dilates and there are no stenoses, but there are many small ulcerations with irregular nodular mucosa

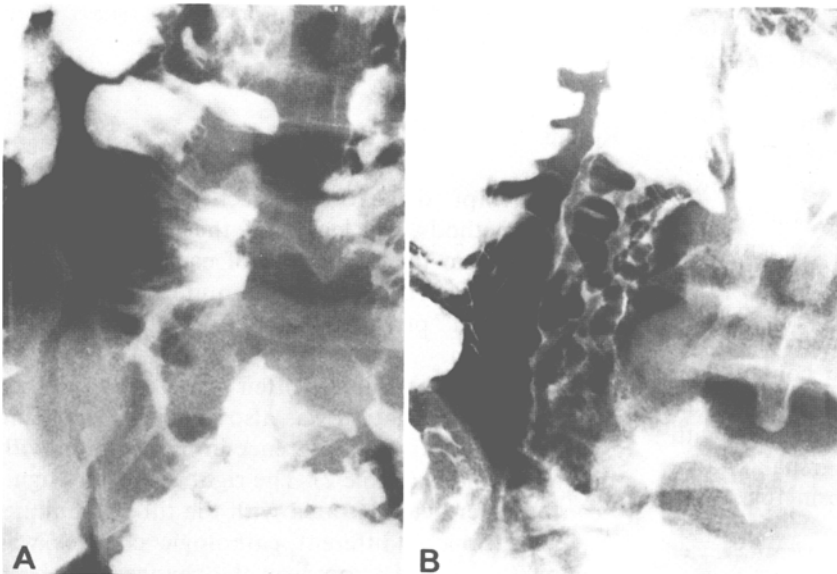


Fig. 2.

A Oral examination. A 10 cm segment of ileum shows irregular areas of narrowing
B When examined by tube and with double contrast the nature of the changes are disclosed: there are longitudinal ulcerations and a cobblestone mucosal pattern

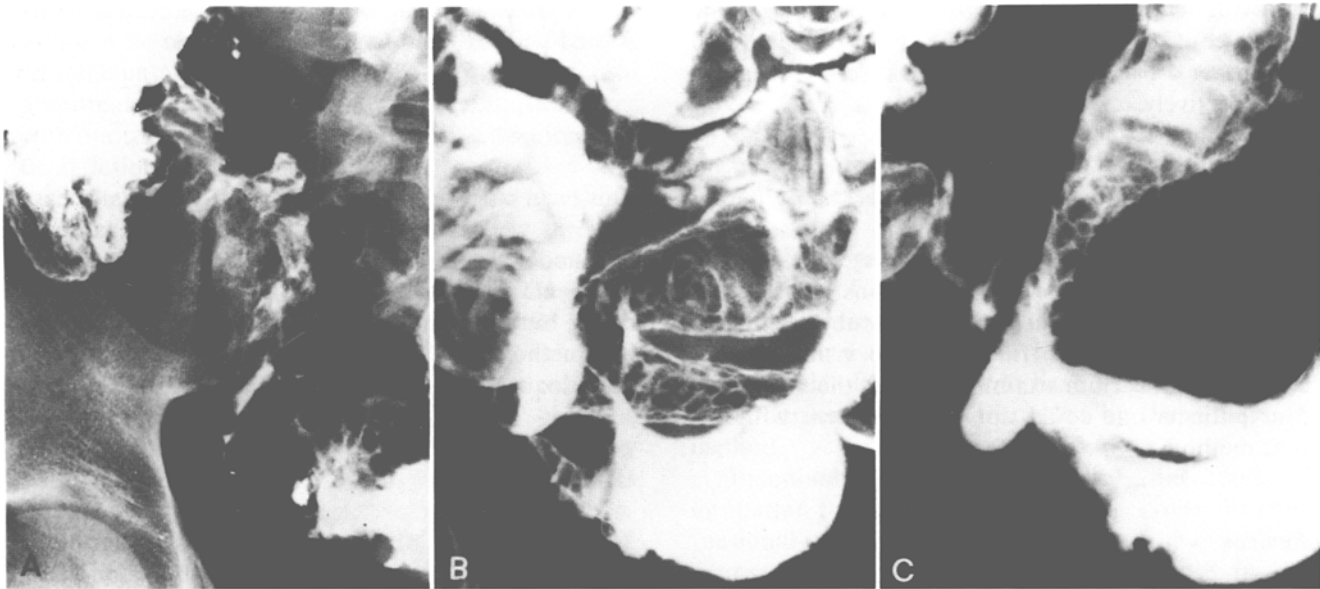


Fig. 3. **A** Oral examination shows disintegration of the contrast medium in the terminal ileum which has a fistula and probably several areas of stricture. **B** and **C** When the patient is examined by tube and with double contrast, extensive and advanced lesions are demonstrated. These include, ulcerations and edema with cobblestone pattern as well as several strictures. The axial extension of the disease is much longer than was disclosed by oral examination

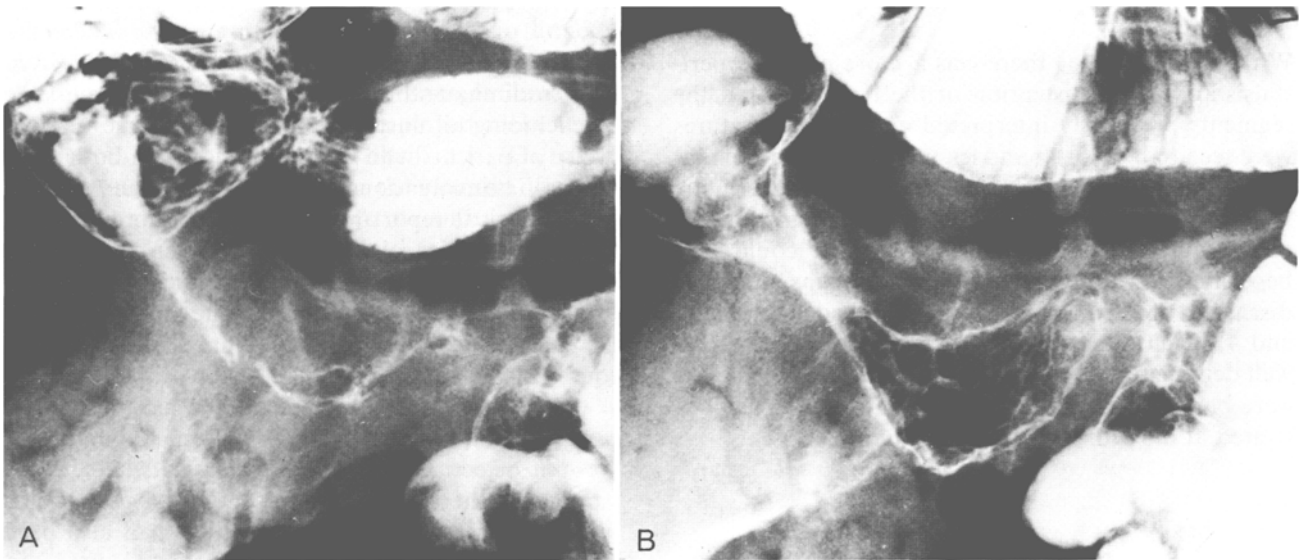


Fig. 4. **A** Status post-ileocecal resection because of Crohn's disease. Oral examination shows "strictures" proximal to the anastomosis. The mucosa cannot be evaluated. **B** When examined by tube and with double contrast technique the lesions are disclosed distinctly. The stenosis is not as pronounced as it was indicated by the oral examination, but there are mucosal ulcerations and edema

demonstrated and whether they had been missed by one of the methods.

Minor Ulcerations

These were observed as small contrast pools, often longitudinal. These were not visible with the single

contrast technique, but were demonstrated with the double contrast method in six cases (Fig. 1 A and B).

Transmural Ulcerations

These were demonstrated more distinctly with double contrast technique and were observed in 20 patients

with this method (Fig. 2B). In 8 of these cases the lesions could also be seen on the conventional study. In another 4 patients the ulcerations were recognized retrospectively.

Cobblestones

The mucosal abnormalities presenting as a cobblestone pattern between deep ulcerations (Figs. 2 and 3) were seen in six patients with the tube technique. In only two cases the findings were visible on the conventional barium examination. In the remaining four patients one could not disclose them with the oral method.

Fistulas

Both the routine barium meal study and the double contrast technique via duodenal tube demonstrated these changes equally well (Fig. 3). Four fistulas were included in this series.

Strictures

With tube technique there was a more effective peristalsis and better distention of the bowel so that the segments previously interpreted as narrow strictures were seen to be shorter and less involved by inflammatory process. Such changes appeared more distinctly with double contrast technique, since the appearance of the mucosa in the strictured section could also be evaluated. Here there were often signs of active disease in the form of ulcerations and edema (Figs. 3 and 4). Eighteen patients had strictures. Three were well demonstrated with oral technique. Eleven lesions were barely observed and four could not be demonstrated at all with the oral technique.

Peristalsis

Within the affected parts of the small bowel the peristalsis was reduced, which was often difficult to evaluate on single survey films. In the examinations with intubation technique an accentuated peristalsis was obtained which facilitated the evaluation at fluoroscopy.

Proximal Extension in the Small Bowel

This extension was revealed much more clearly with the tube technique. In 15 patients, this technique dis-

closed proximal changes which had not been demonstrated with the oral technique.

Edema

This is an early and common sign of Crohn's disease and was well demonstrated in 24 patients examined via duodenal tube (Fig. 3). In three patients the mucosal edema was also well demonstrated by oral technique, but in 13 the edema was poorly observed with this method. In 8 patients, the oral technique could not adequately show the findings.

Discussion

The evaluation of the roentgen films should preferably have been carried out with double-blind technique, but the use of double contrast in one of the methods made this impossible. Nevertheless, when two methods are to be compared, it is important to exclude sources of error due to change in the extent of the disease process in the interval between the two examinations. This is particularly difficult in Crohn's disease with a fluctuating course where the degree of illness can alter the picture completely. We tried to eliminate this source of error as far as possible by excluding all unstationary cases from the original group of patients who were examined with both techniques. The evaluation was based on anamnestic data in the clinical report. Most patients were examined first with the peroral technique and later by duodenal intubation, but there were a few patients who were examined in a reversed order. The indications for the examinations were usually routine control of the course of the disease or preoperative evaluation.

In this series, the tube technique has been compared with a peroral technique using only a small amount of contrast medium. The results, to the advantage of the tube technique, might have been less impressive if the peroral examinations had also been performed with the same amount of contrast medium.

It was always possible to evaluate a longer part of the terminal ileum with the tube technique as indicated in Table 1. In this examination the distal parts of the ileum as well as the small bowel in its entirety are definitely better shown because the intestinal loops become well distended and separated. Evaluation of the right colon is also facilitated by the tube technique because the cecum is more effectively filled with contrast medium and can be examined by double contrast method.

From the point of view of surgery, it is of value to be able to detect early and subtle findings of

Crohn's disease in the small bowel, so that the resection can be made as radical as possible. Experience with the unsatisfactory demonstration of the mucosal abnormalities with single contrast technique agrees with our results of barium enema studies. Small superficial lesions in the small intestine and colon and associated mucosal edema are often seen on the single contrast study as a stiff segment of incompletely filled intestine. This makes it impossible to evaluate the underlying pathologic process from single films that are obtained during conventional oral small bowel study. The tube technique, especially if double contrast is utilized, offers the possibility of an accurate and specific diagnosis of even such minor changes. The transmural ulcerations appear more distinctly with the double contrast technique. The ulcerations are even visible *en face*, which facilitates the estimation of the size of the lesion (Fig. 4). The cobblestone pattern of the mucosa is often easily seen, but occasionally it can be obscured by the contrast medium if the mucosal elevations are small and discrete. Similarly, the extent of the changes can easily be misinterpreted if the intestine is not properly distended.

Fistulas can often cause a diagnostic problem for the roentgenologist. Occasionally a fistula can be interpreted as a stricture, but most frequently the difficulties lie in determining the origin of a fistula. Here the tube technique is hardly to advantage. Sometimes the large amounts of contrast employed make it impossible to detect the origin of the fistula. Therefore, it may be necessary to perform the examination with a considerably smaller amount of contrast medium and with careful fluoroscopic evaluation of the suspected region.

It is important to determine the degree of severity of stenoses and strictures in advanced cases of Crohn's disease of the small bowel. With fluoroscopy and usual peroral technique the peristalsis is often of such a low activity that the examiner may not obtain a maximal distention of the involved intestinal segment.

With the tube technique, however, the peristalsis is accentuated, and a better distention of the loops permits more accurate diagnosis of stenoses and strictures.

Reduced peristalsis and edema of the mucous membrane are among the early manifestations of Crohn's disease. With the tube technique one has the advantage of the accentuated peristalsis within normal intestinal segments, and especially during the insufflation of air, the affected intestinal segments stand out clearly. We have noted examples of segmental narrowing of the small bowel on conventional studies which later proved to have a normal diameter of the lumen once fully distended by the intubation method.

Examination of the small bowel after duodenal intubation thus offers many advantages over the conventional technique. This is especially true of inflammatory intestinal diseases. Crohn's disease in the small bowel can be demonstrated more easily and more clearly with the tube technique. Superficial and deep ulcerations can be seen in profile and *en face*. The tube technique is also superior in assessing the degree of stenosis and the longitudinal extent of the changes in the small bowel.

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