

CONTRAST RADIOLOGY OF THE SMALL BOWEL

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Summary

The various methods for small bowel examination are discussed and relevant details of techniques given. Their respective advantages and limitations are given.

It is concluded that the small bowel enema is the most accurate method for small bowel study.

The radiological examination of the small bowel should begin with plain radiography, erect and supine, of the abdomen. The usefulness of the plain films of the abdomen in the diagnosis of intestinal obstruction or perforation is well known. What is not so well established is the most suitable and most informative method for barium small bowel study.

Barium can be introduced into the small bowel antegradely, retrogradely or through a duodenal tube. The purpose of this paper is to give details of techniques and to compare the advantages and limitations of the various methods and thereby conclude on which should be the method of choice.

A. *Antegrade method.*

This is really a continuation of the radiological study of the upper gastro intestinal tract. It usually consists of a series of radiographs of the abdomen at certain intervals after the ingestion of the barium suspension. The investigation of the small bowel by such routine "barium meal and follow-through" has the disadvantage that the sphincteric action of the pylorus usually prevents a continuous filling of the small bowel. Also a lesion can easily be missed on account of the anatomy of the intestine, consisting of

short loops forming a sinuous course and the diseased area can easily be overlapped and consequently obscured. Besides this, this method is time-consuming. Some people recommended mixing barium with ice-cold normal saline solution instead of plain water — this is said to hasten the transport through the small intestine and thus shorten the time taken by the examination.

Recent work has shown that such "follow-through" methods could be improved if a continuous flow of barium through the pylorus could be obtained. Neostigmine (adult dose 0.5 mgms. intravenously) has proved of some help and the small bowel is more rapidly and uniformly outlined (Margulis and Mandelstam, 1961). Neostigmine is said to increase the activity of the involuntary muscles and hence gastric evacuation is hastened. More recent studies have shown that Maxolon might be more efficient in this respect. It dilates the pylorus and duodenal cap and improves the peristalsis in the stomach. Hence gastric emptying is improved and the transit of the barium through the small intestine is hastened.

Maxolon is well absorbed by oral, intramuscular and intravenous routes and is available as tablets, syrup and ampoules for injection. We found the syrup and tablets adequate and doses of four teaspoonfuls (20 mgm.) of syrup or two tablets (10 mgm. each) thirty minutes before the barium meal hastened the transit of barium through the small bowel.

B. *Retrograde method*

This examination was first described by Greenspon and Lentino in 1960. It con-

sists of reflux filling of the small bowel from a barium enema examination, giving about 1500 ml. of barium suspension through a wide bore tubing followed by about 2000 ml. of saline.

C. *Small bowel enema*

This procedure aims at excluding the pyloric sphincter and giving a continuous flow of the barium suspension directly into the distal duodenum through a tube (Scott Harden 1960) and thus rapidly filling the small bowel. The "solution" is gradually propelled through successive loops of the small bowel under television screening; it not only fills the small bowel systematically but it also distends the intestine. By this means the whole length of the small bowel can be surveyed in about 15 minutes.

Technique

Preparation of patient

The patient is prepared as for a barium meal. The whole procedure is explained to the patient to get full co-operation.

A lignocaine lozenge is sucked beforehand, to help swallowing the tube. *Tube:* The tube I have been using is the Portex Scott-Harden duodenal intubation tube (Cat. No. G417 Mk. 2) which consists of an outer (gastric) sheath and an inner (duodenal) tube. At the end of the duodenal tube about 6 c.m. length of a Ryle's tube is fitted. This intubation tube is manufactured from polythene tubing and is easily seen on fluoroscopy. The patient, sitting up, swallows the tube; he is then screened in an erect position and the tube is advanced along the greater curvature of the stomach until the end of the Ryle's tube is pointing towards the pylorus. The patient is then put supine and the duodenal tube is gently pushed to pass through the pylorus into the duodenum until the end lies near the duodeno-jejunal flexure.

Contrast Medium

The solution used is equal parts of 50% Micropaque in water, normal saline

and 1% prepacol. About 1,500 m.l. of the mixture is used together with some air which increases the double contrast effect.

The prepacol solution should be freshly prepared from very fine prepacol granules dissolved in cold water (10°-12° C) and the solution should be stored in a refrigerator until required, otherwise it tends to throw a precipitate. Prepacol which is a bulk producing, water retaining gel, acts as a hastener; it has recently been withdrawn from the market.

In this hospital prepacol is now replaced by a sodium carboxymethyl-cellulose solution. We find the latter just as efficient a hastener as the former. The flow of the mixture must be steadily maintained until the caecum is filled. This is usually done in 15-20 minutes. Besides this solution, we have also been injecting air — 100 ml. of air after every 200 ml. of the solution. This enhances the double contrast effect.

The only side-effects noted were:

a) Nausea if there was reflux of the "solution" in the stomach. This could usually be prevented by positioning the tip of the catheter in the distal part of the duodenum.

b) Feeling of distension towards the end of the examination. This seemed to be related to the amount of the "solution" given. We found 1500 ml. of the solution to be adequate.

The object of this procedure is to obtain an unobscured outline, in successive segments, of the whole length of the small bowel under direct television screening.

Discussion

The radiological examination of the small bowel is considered inadequate in most hospitals. This is probably due to the fact that most radiologists rely on haphazard barium-meal follow-through radiographs to exclude small bowel pathology, whereas in the case of the upper alimentary tract and large bowel the examination is carried out under screening.

In the routine "follow-through" examination, the small bowel filling is gov-

erned by an unpredictable rate of barium passage through the pylorus. This intermittent and irregular flow of contrast through the pylorus can be controlled by iatrogenically dilating the pylorus, increasing the gastro-intestinal motility of the stomach and also relieving any spasms which might be present. In my experience Maxolon is more efficient than neostigmine in accelerating the transit through the gastro-intestinal tract.

In both of these methods, however, there is no chance of a systematic examination of the whole length of the small bowel and a lesion can easily be missed. Also there is usually incomplete filling due to peristaltic waves. This lack of complete

filling and inability to test the elasticity of the bowel wall are the most severe limitations of the follow-through method. Consequently such an examination should be considered as a "general survey" of the small bowel and not suitable to exclude a small and localised small bowel lesion. Within the last two years we have seen three cases in this hospital where the small bowel was considered to be normal by a "follow-through" examination and later were shown to have Crohn's disease by a small bowel enema (Fig. 1).

The reflux examination of the small bowel has never become popular in England. Although my experience with this method is limited, a proportion of the pa-



Fig. 1. Small bowel enema.

Arrow points to a stenotic lesion due to Crohn's disease.

tients cannot be examined in this fashion either because the patient cannot retain the enema or else because of failure of the barium to reflux through the ileocaecal valve. This examination is not only uncomfortable but painful. Besides, it is also possible for a small lesion in the terminal ileum to be obscured by a barium-filled, overlapping caecum and occasionally a large redundant colon will complicate the interpretation of films.

The small bowel enema gives an antegrade study where the pyloric sphincteric action is eliminated. The transit of contrast along the small bowel depends on the continuous flow of barium solution and the "hastener". The procedure in the hands of an experienced examiner is quick, systematic and hence more accurate; it is fairly comfortable to the patient.

Disease in and around the small bowel can interfere with:

- a) Its distensibility — it may become irregular or eccentric.
- b) The mucosal folds — they may become thickened or absent.
- c) The lumen — may be distended or contracted.
- d) The bowel wall — may become thickened.

Small barium enema is the only examination which can take in consideration all these aspects.

Conclusions

1. "The follow-through" small bowel examination can be misleading although its efficiency is improved by Maxolon. However, it should be considered only as a general survey of the small bowel.

2. The reflux examination should not replace the antegrade approach but is usually carried out after inconclusive antegrade studies. (Miller, 1969). Perhaps it has got some part to play in the study of the terminal segment of the ileum, especially as the highest incidence of disease in the small bowel is located here.

3. The small bowel examination of choice, especially if a small lesion or multiple lesions are to be examined, should be the small bowel enema.

References

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