



# Digital Small Bowel Enema

**GR Jankharia**

Hon. Radiologist – Sir Harkisondas Hospital, Jaslok Hospital;  
Ex. Hon. Professor BYL Nair Charitable Hospital & T.N. Medical College, Mumbai.

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## A B S T R A C T

The digital small bowel enema (SBE) is a well established technique in Europe and America and in India it is well accepted procedure. The technique is very safe, reliable and well tolerated by the patients. It is most useful in demonstrating lumen narrowing, whether benign, malignant or inflammatory. The author has done more than 2000 small bowel enemas and demonstration of the stricture or mucosal abnormality or evidence of adhesions is most gratifying findings. Normal SBE almost certainly rules out obstruction of the small bowel and abnormal SBE is clinically of a great importance as it puts break on further investigations, reduces the expenses, helps the clinician in further management of the patient.

The study of the small bowel by barium after intubations has been standardized by various workers since 1943. Enteroclysis is the term used in USA, while term “Small Bowel Enema” (SBE) is widely used in Europe.

In India it took sometime before enteroclysis became established procedure, but still it is not practiced in many centers because of various reasons and apathy of dedicated radiologists.

With advent of fiberoptic endoscopes and availability of well trained and devoted gastro-enterologists, barium studies of the oesophagus, stomach and duodenum and colon has virtually disappeared in well equipped medical centres. The barium studies of the small intestine has undergone modification from conventional follow through, high dose follow through, fluroscopic follow through and small bowel enteroclysis (Enteroclysis).

The small bowel enema itself has undergone evolution and author has tried single contrast barium enema, SBE with thin barium, with air contrast and with methyl cellulose, most satisfactory is with methyl cellulose.

The SBE is complimentary to other cross-sectional imaging like ultrasound, CT or MRI. The barium study is an art, more difficult than CT or MRI and tremendous operator-oriented. It cannot be left to technician to do barium without supervision and it being a dynamic process, lesion will be missed if each and every loop of the bowel is not monitored or visualized on TV fluroscopy, documented and interpreted correctly.

### TECHNIQUES OF SMALL BOWEL

Patient's co-operation and compliance are very important.

- Patient preparation and pre-medication.

The colon must be empty.

In fact for any barium study of the small bowel, colon must be devoid of faecal matter.

2 to 4 tab of Dulcolax previous early evening is usually sufficient and no food or fluid of any kind from 8PM till the examination is over.

The author does not give any sedation to the patient.

5 to 10mg of metoclopramide is helpful in negotiating the tube, as it increases the peristalsis of the stomach and small bowel.

### Tubes

A tube with guide-wire and having multiple side-holes, closed distal-end, size 12 or 10 French introduced through the nostril, into the stomach, negotiated through the pylorus into the duodenum and placed distal to the duodeno-jejunal junction, i.e. distal to the ligaments of Trietz.

Inflatable ballooned tubes are also available where balloon is proximal to side holes and inflation prevents the reflux of barium into the duodenum or stomach.

### Barium

The author uses 150 to 200ml of 95% W/v undiluted barium followed by 1000ml of methyl cellulose or till the barium reaches the ileo-caecal junction. During the procedure each and every loop of the bowel is monitored on TV fluroscopy and compression spots are taken followed by a large overcouch film for the complete road map of the small bowel.

The compression is the hall-mark of any small bowel study and compression is achieved by small rubber balloon.

Once the tube is in position, i.e. beyond ligament of Trietz, entire procedure is finished in 15 to 20 minutes.

The author over the last 15 years has tried all the techniques and double-contrast small bowel enema with methyl-cellulose is superior to other techniques. In the last 5 years the author has done more 2000 small bowel enemas and following are some of the tips.

01. For Indian population 12F tube should be used and it is easy to negotiate. 14F sometimes does not pass through the nostril.
02. Tip of the guide wire should be bent to 45° to 60°, so that tip of the catheter can be flipped in desired direction.
03. Get the tube and guide wire along the greater curvature of the stomach and push towards pylorus.
04. If the tube is not entering the pylorus give a mouthful of barium and locate the pylorus.
05. As the barium enters the pylorus and the cap tube can be easily negotiated through the pylorus.
06. Keep the tip of the guide-wire in the tube at the level of the cap and push catheter while withdrawing the guide-wire but always keeping the tip at the level of the cap. This acts as a fulcrum.
07. Always check the tube in the right lateral position as it will always lie over the spine or just in front of it, if it is in the duodenum.
08. Peristaltic pumps are not available in our country and author injects barium with hand pressure.
09. 150ml of undiluted barium 90% W/V injected in the left lateral or supine position followed by 50ml of water and then 800ml to 1000ml of methylcellulose till barium reaches the ileo-caecal junction.
10. Rate of injection of barium and methyl-cellulose should be 50ml in 30 seconds.
11. All the bowel loops are documented by spot films after compression with rubber balloon.
12. Compression of the small bowel loops is the hallmark of the small bowel enema.
13. Once the barium has reached the ileo-caecal junction full 14X17 or 12X15 film to be taken in supine and prone position as it gives the road map from duodeno-jejunal to ileo-caecal junction.
14. For good small bowel enema colon must be empty. If colon is loaded with faeces, there will be slow progress of barium in the ileal loops, there by increasing the time of examination, putting more methyl cellulose and sometimes wrong interpretation of the slow transit.
15. Remove the tube once the barium reaches the ileo-caecal junction.
16. Take film of entire colon after 15 to 20 minutes as it will help in diagnosis even if clinically not indicated.
17. Before patient leaves the department, have an overall view of all the films and if doubt, repeat fluoroscopy and filming may be carried out.  
Abnormal findings should be persistent.

18. If methyl cellulose refluxes in the stomach, the patient might feel nausea and vomit and hence while injection of methyl-cellulose, keep the patient in left lateral position.

Too rapid injection of methyl cellulose might result in reflux of the methyl cellulose in the duodenum and stomach. Ballooned tubes prevent reflux but they are expensive.

19. Urgent enteroclysis can be done in small bowel obstruction.

## INDICATIONS OF SMALL BOWEL ENEMA

### Obstruction

Small bowel obstruction, partial or intermittent or suspected in bowel narrowing, small bowel enema is the single most useful investigation to confirm the diagnosis.

Patients with intermittent vomiting and distension of abdomen and pain and distension relieved after vomiting is the most important indication for small bowel enema.

In a study by Shrake et al, small bowel enema correctly predicted the presence of obstruction in 100%, absence of obstruction in 80%, etiology of obstruction in 86% of the operated patients

In closed loop obstruction and post-operative adhesions, developing metastases or radiation injury, small bowel enema correctly predicated the etiology in 90% of the cases.

Symptomatic non-obstructing or partially obstructing adhesions are readily detected by small bowel enema.

### Tuberculosis and Crohn's disease

Two most important granulomatous lesions involving small bowel are evaluated by small bowel enema and accuracy with sensibility, specificity and accuracy is 100%, 98.3% and 99.3% respectively.

The extent of the lesion, skip lesions, strictures, fistulae, narrowing due to oedema and spasm, mucosal ulceration and very rapid transit of barium in Crohn's disease help to distinguish it from Koch's.

### Occult Gastro-Intestinal Bleeding

When all other modalities like endoscopy, CT scan etc. have failed to demonstrate the cause of bleeding, small bowel enema is indicated and its diagnostic yield is between 10% to 20%.

It is suggested that if small bowel enema fails to demonstrate a lesion as the likely source of bleeding, vascular malformation (AVM) of the small bowel is the probable cause.

Benign or malignant neoplasms, Meckels' diverticulum and group of inflammatory diseases implicated as the cause of bleeding are depicted by small bowel enema.

Meckels' diverticulum and other acquired small bowel diverticulae are consistently demonstrated by small bowel enema than by other diagnostic methods.

### Malabsorption

In celiac disease reversal of normal fold pattern is readily appreciated by small bowel enema. The reduced jejunal folds (i.e. 3 to 4 folds per inch) and increased (4 to 6 folds per inch) in the distal ileum are best demonstrated by small bowel enema. (Herlinger & Maglinter 1986)

The other causes of malabsorption like tropical sprue, bacterial overgrowth, enteroclysis may show conditions that are associated with abnormal peristaltic function, e.g. sclerodema, amyloidosis, pseudo-obstruction or demonstrated predisposing structural abnormality, e.g. jejunal diverticulosis, surgical blind loops etc.

In many medical centres of the Europe the conventional barium methods for small intestine are largely replaced by the enteroclysis procedure.

In any clinical setting where small bowel pathology is suspected small bowel enema is recommended as the initial examination and thereby reducing the cost and achieving early diagnosis.

Now more and more gastro-enterologists are appreciating the usefulness of small bowel enema and rewards are very satisfactory to the patient as well as the referring doctors.

### WHAT TO SEE ON ENTEROCLYSIS

01. Stricture
02. Filling defects
03. Segmental dilatation
04. Valvulae conniventes
05. Angulation of the loops
06. Ulcers
07. Oedema
08. Length of the involved segment
09. Ileo-caecal junction
10. Overview of the colon
11. Diverticulae
12. Fistulae
13. Judge the distention

- Stricture : Length, shouldering or tapering proximal dilatation.
- Valvulae conniventes : Valvulae Conniventes. 5-6 in jejunum, 2-3 in Ileum
- Dilatation : Distension not be confused with dilatation.  
More than 3.5 cms in jejunum and 3 cms in Ileum is abnormal.
- Angulation : No change in angle on compression.
- Ulcers : Linear, transverse or target.
- Diverticulae : Mesenteric or anti-mesenteric border
- Mucosa : Loss of normal folds and smooth outline of the loops indicate mucosal abnormality.
- Filling defects : Smooth, irregular, ulcerated, lobulated.

### NORMAL SMALL BOWEL PARAMETERS

#### a. Enteroclysis

	Jejunum	Ileum
Folds per inch	4-7	2-4
Thickness of folds	1-2 mm	1-1.5 mm
Diameter of lumen	Upto 4 cms	Upto 3 cms
Wall thickness	1-1.5 mm	1-1.5 mm

#### b. Barium Meal Follow Through

	Jejunum	Ileum
Thickness of folds	2-3 mm	1-2 mm
Diameter of lumen	Upto 3 cms	Upto 2 cms

#### c. In Children

Age	Diameter of the loops
1-3 years	16 mm
4 years	18 mm
5 years	20 mm
6-8 years	22 mm
9 years	23 mm

#### Folds

- Not visible until 3 months.
- Less than 1 mm till one year.
- 1.5mm till 6 months

It is not possible to describe the various radiological signs seen on SBE in a particular pathological disease process in this article but it is important to remember many findings seen on small bowel enema like oedema, ulceration, thickening of the folds, nodularity, spasm, spiky appearance, filling defects are non-specific and they are to be interpreted in relation with signs and symptoms of the patient, clinical findings and laboratory investigations. The demonstration of the abnormality in the small bowel by small bowel enema assumes a very important role and further management of the patient as it narrows down the differential diagnosis and hunt for the abnormalities stops once the lesion is demonstrated on small bowel enema. The greatest contribution of SBE is detection of the abnormality and normal SBE almost certainly rules out obstructive lesion in the small bowel.

#### REFERENCES

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2. Hans Herlinger MD Barium examination of the small bowel in: Text book of Gastro-Enterology by Gore & Lavin. Chapter 40. p.704-744.