
International Foundation for Pediatric Imaging Aid

Radiology of constipation and defecation "views and news"

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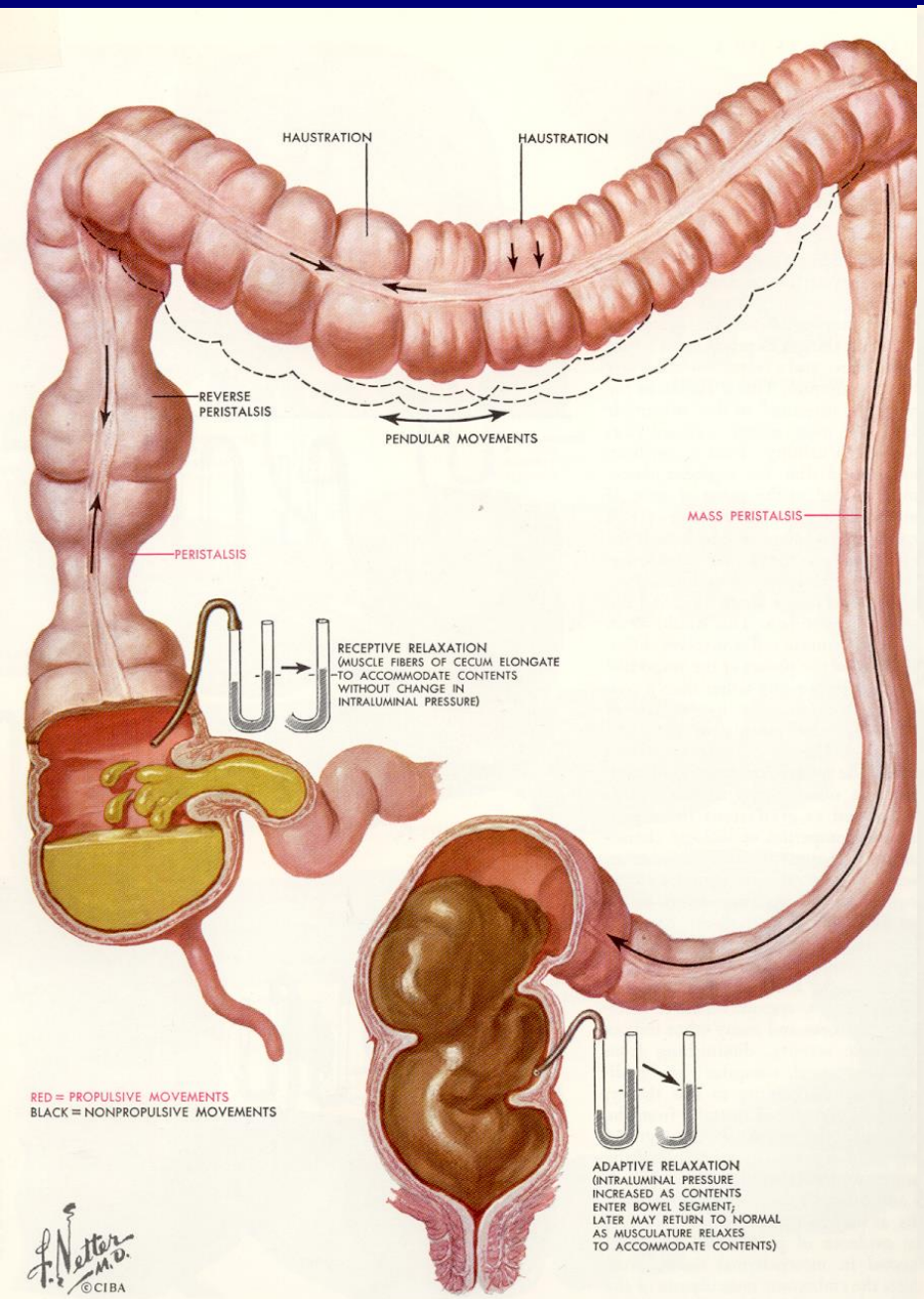
Defecation

- The stimulus to the initiation of defecation is distention of the rectum.
- Two distinct events are required to ensure satisfactory emptying of rectal contents:
  - Increased intra-abdominal pressure.
  - Relaxation of the internal anal sphincter and inhibition of external anal sphincter. Puborectalis relaxation allows widening of the anorectal angle (normal 60º to 105 – 140º).


HAUSTRATION
HAUSTRATION
REVERSE PERISTALSIS
PENDULAR MOVEMENTS
MASS PERISTALSIS
PERISTALSIS
RECEPTIVE RELAXATION
(MUSCLE FIBERS OF CECUM ELONGATE TO ACCOMMODATE CONTENTS WITHOUT CHANGE IN INTRALUMINAL PRESSURE)
RED = PROPULSIVE MOVEMENTS
BLACK = NONPROPULSIVE MOVEMENTS
ADAPTIVE RELAXATION
(INTRALUMINAL PRESSURE INCREASED AS CONTENTS ENTER BOWEL SEGMENT; LATER MAY RETURN TO NORMAL AS MUSCULATURE RELAXES TO ACCOMMODATE CONTENTS)
F. Netter M.D.
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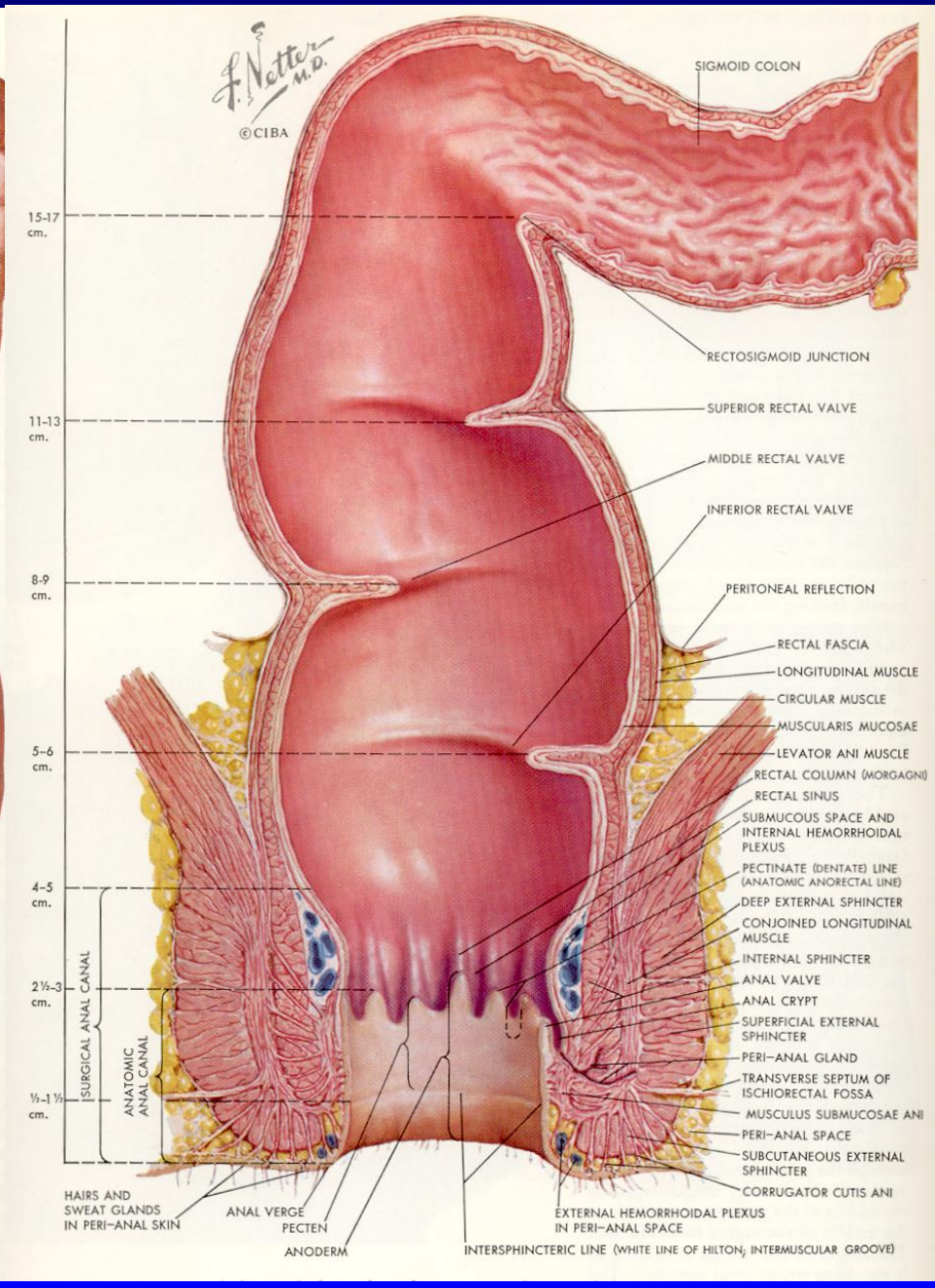
F. Netter M.D.
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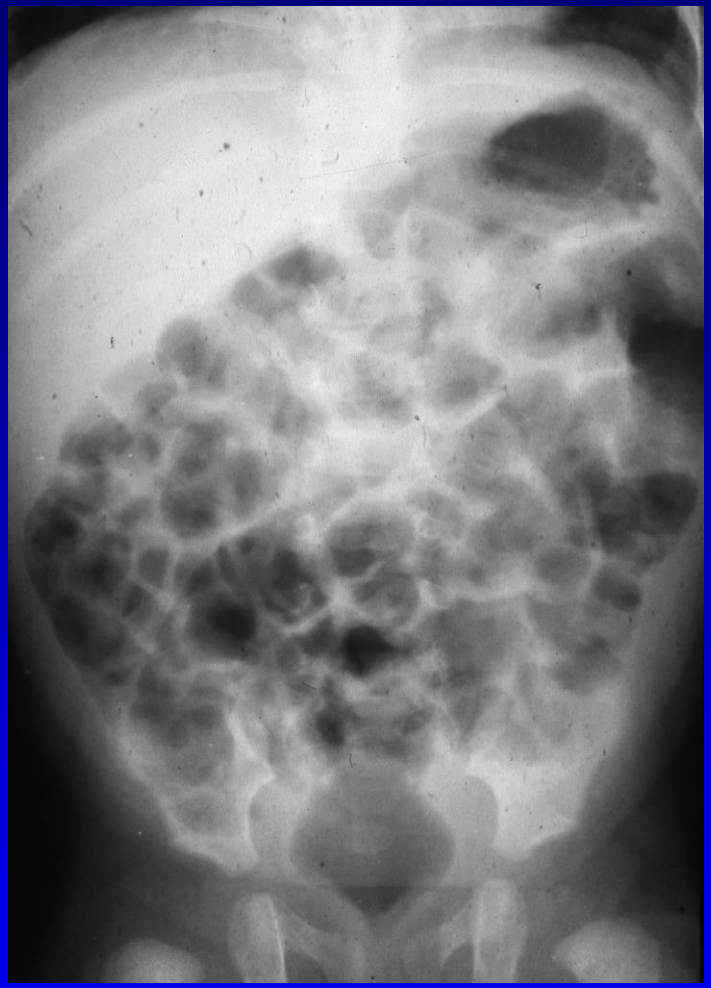
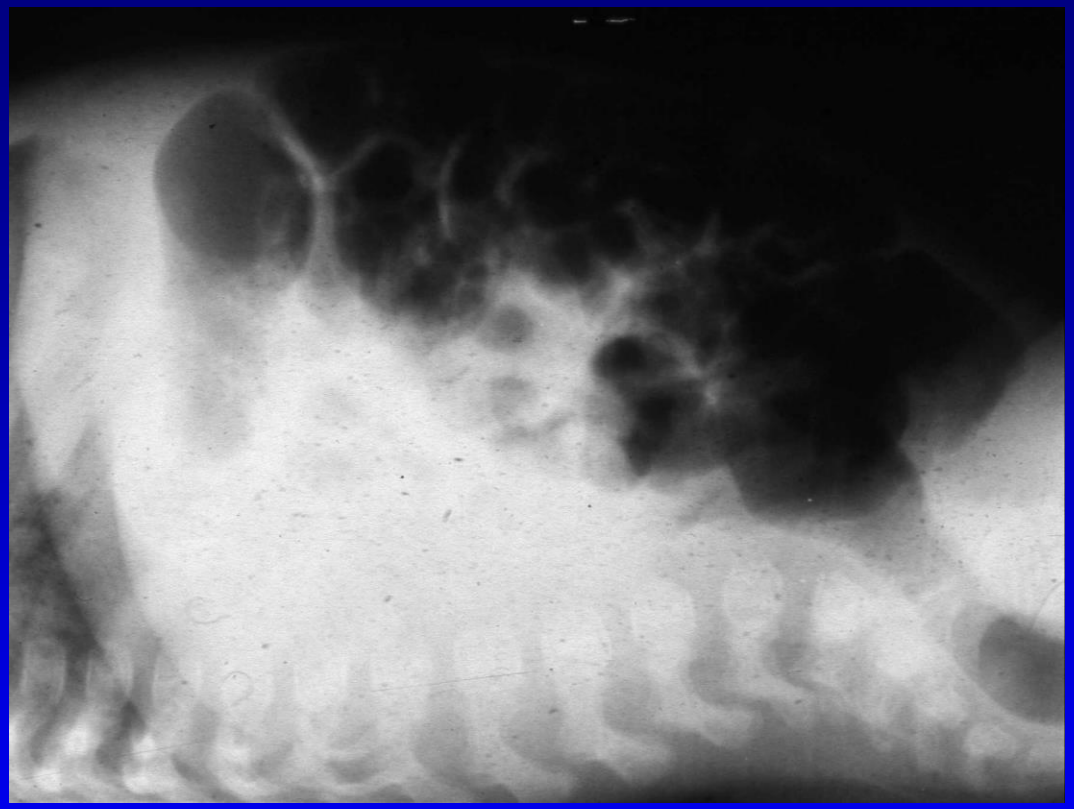
SIGMOID COLON
15-17 cm.
RECTOSIGMOID JUNCTION
11-13 cm.
SUPERIOR RECTAL VALVE
MIDDLE RECTAL VALVE
INFERIOR RECTAL VALVE
8-9 cm.
PERITONEAL REFLECTION
RECTAL FASCIA
LONGITUDINAL MUSCLE
CIRCULAR MUSCLE
MUSCULARIS MUCOSAE
5-6 cm.
LEVATOR ANI MUSCLE
RECTAL COLUMN (MORGAGNI)
RECTAL SINUS
SUBMUCOUS SPACE AND INTERNAL HEMORRHOIDAL PLEXUS
PECTINATE (DENTATE) LINE (ANATOMIC ANORECTAL LINE)
4-5 cm.
DEEP EXTERNAL SPHINCTER
CONJOINED LONGITUDINAL MUSCLE
INTERNAL SPHINCTER
2½-3 cm.
ANAL VALVE
ANAL CRYPT
SUPERFICIAL EXTERNAL SPHINCTER
PERI-ANAL GLAND
TRANSVERSE SEPTUM OF ISCHIORECTAL FOSSA
½-1½ cm.
MUSCULUS SUBMUCOSAE ANI
PERI-ANAL SPACE
SUBCUTANEOUS EXTERNAL SPHINCTER
CORRUGATOR CUTIS ANI
SURGICAL ANAL CANAL
ANATOMIC ANAL CANAL
HAIRS AND SWEAT GLANDS IN PERI-ANAL SKIN
ANAL VERGE
PECTEN
ANODERM
EXTERNAL HEMORRHOIDAL PLEXUS IN PERI-ANAL SPACE
INTERSPHINCTERIC LINE (WHITE LINE OF HILTON; INTERMUSCULAR GROOVE)





Abdominal plain film AP and lateral in a normal infant.

Constipation

Definition of constipation (Rome II): The presence of two or more of the following symptoms and signs for at least 12 weeks in the preceding 12 months:

1. Less than three evacuations a week
2. Excessive straining, hard and/or lumpy stools
3. Sensation of incomplete evacuation

Constipation

- Constipation is a symptom rather than a disease.
- The accumulation of feces on one hand and defecation on the other hand is a physiological function of the colon and anorectal tract. Constipation is the result of an imbalance of this function.

Constipation

- Recurrent abdominal pain is in the great majority of patients not related to constipation.
- *Encopresis:* voluntary or involuntary passage of a normal bowel movement in the underwear.
- *Soiling:* involuntary passage of feces which is often associated with fecal impaction and reflects staining of the underwear.

An idiopathic functional constipation should be differentiated from other pathological conditions associated with constipation such as:

- Structural diseases of anus, rectum, colon or small intestine.
- Conditions not associated with structural anomaly of the anus.
- Secondary to abnormalities outside the colon.
  1. Endocrinologic or metabolic
  2. Neurologic
  3. Connective tissue disorders
  4. Psychological
  5. Difficulty with defecation
  6. Side effect of drugs and intoxication

Barr score

Stool retention rating record for plain films of the abdomen

Name _____ Age _____ Date _____

Scorer _____

		0	1	2	3	4	5	Elongation	Fecaloma	Ileumdilatation	Clinical diagnosis
A.	Stool in ascending colon	Small Amount	Moderate Amount	Large Throughout							
B.	Stool in transverse colon	Little or None			Moderate Amount	Large Amount	Large: Dilated				
C.	Stool in descending colon	Little or None			Moderate Amount	Large Amount	Large: Dilated				
D.	Stool in rectum	Little or None		Moderate Amount			Large Amount: Full Distally				
E.	Rock like stools	Few or None	Moderate Amount	Large Amount Transverse Descending Colon	Large Amount Ascending Colon						
F.	Granular stools	Little or None		Moderate Amount Distal*		Large Amount Distal*	Throughout Length				

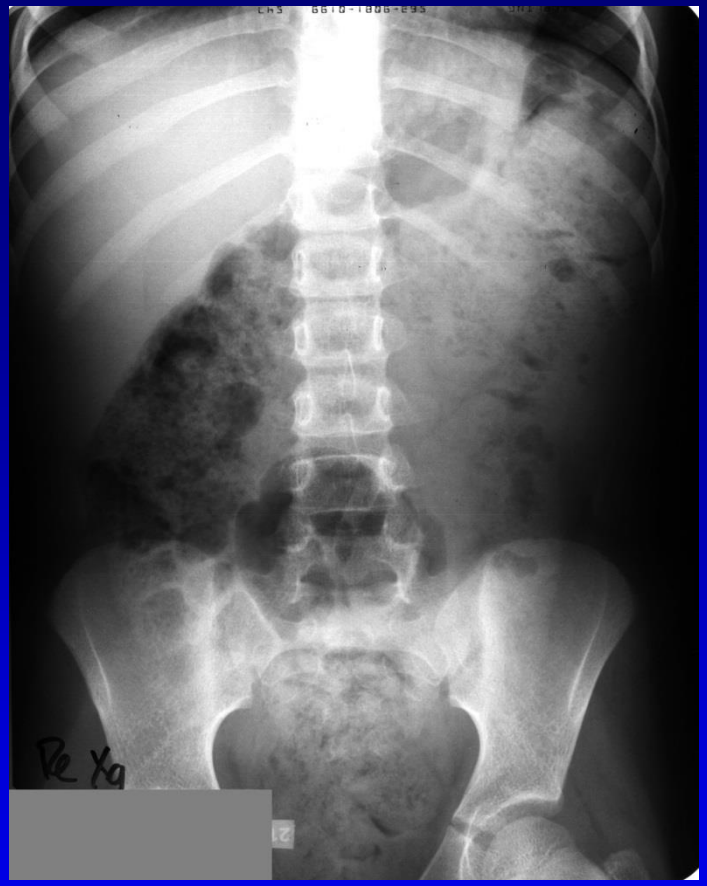
* Distal = past splenic flexure

Total score:

Barr score

Barr score < 10 points: normal

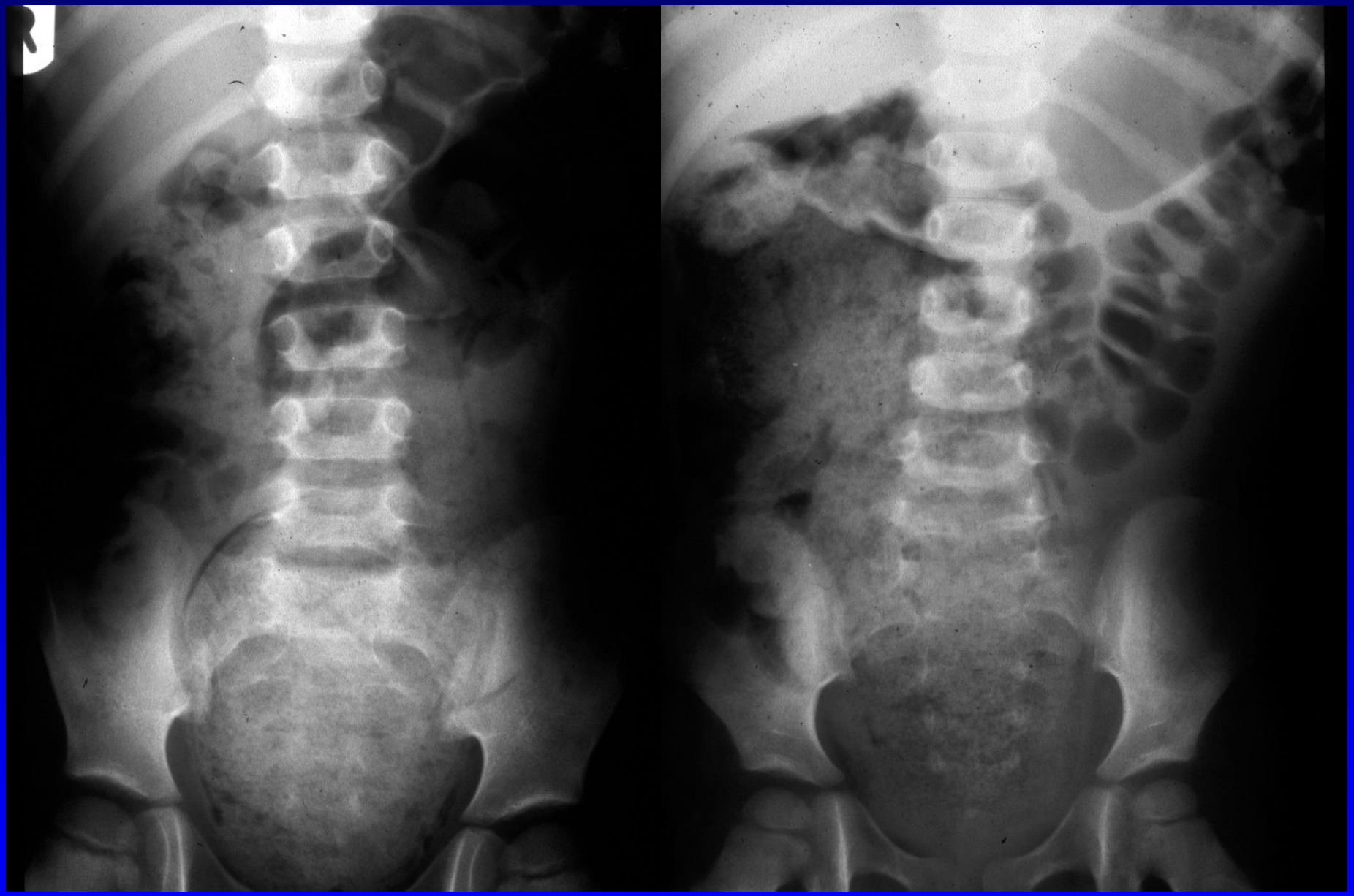
Barr score > 10-25 points: moderate to severe constipation



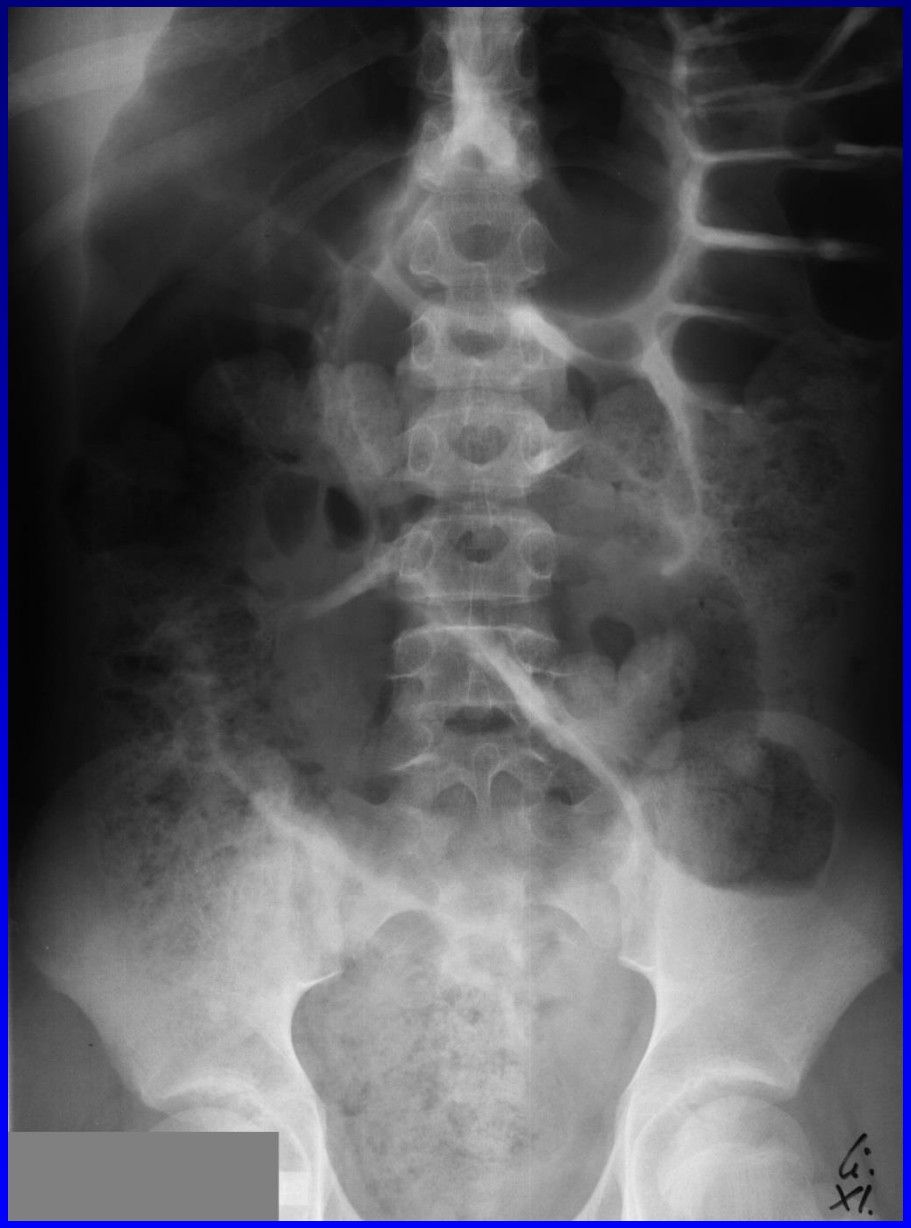
Three abdominal plain films carried out in the age from 6 to 8 years.

The Barr scores varied between 11 and 18.

Note the elongation of the left colon flexure on all three plain films.

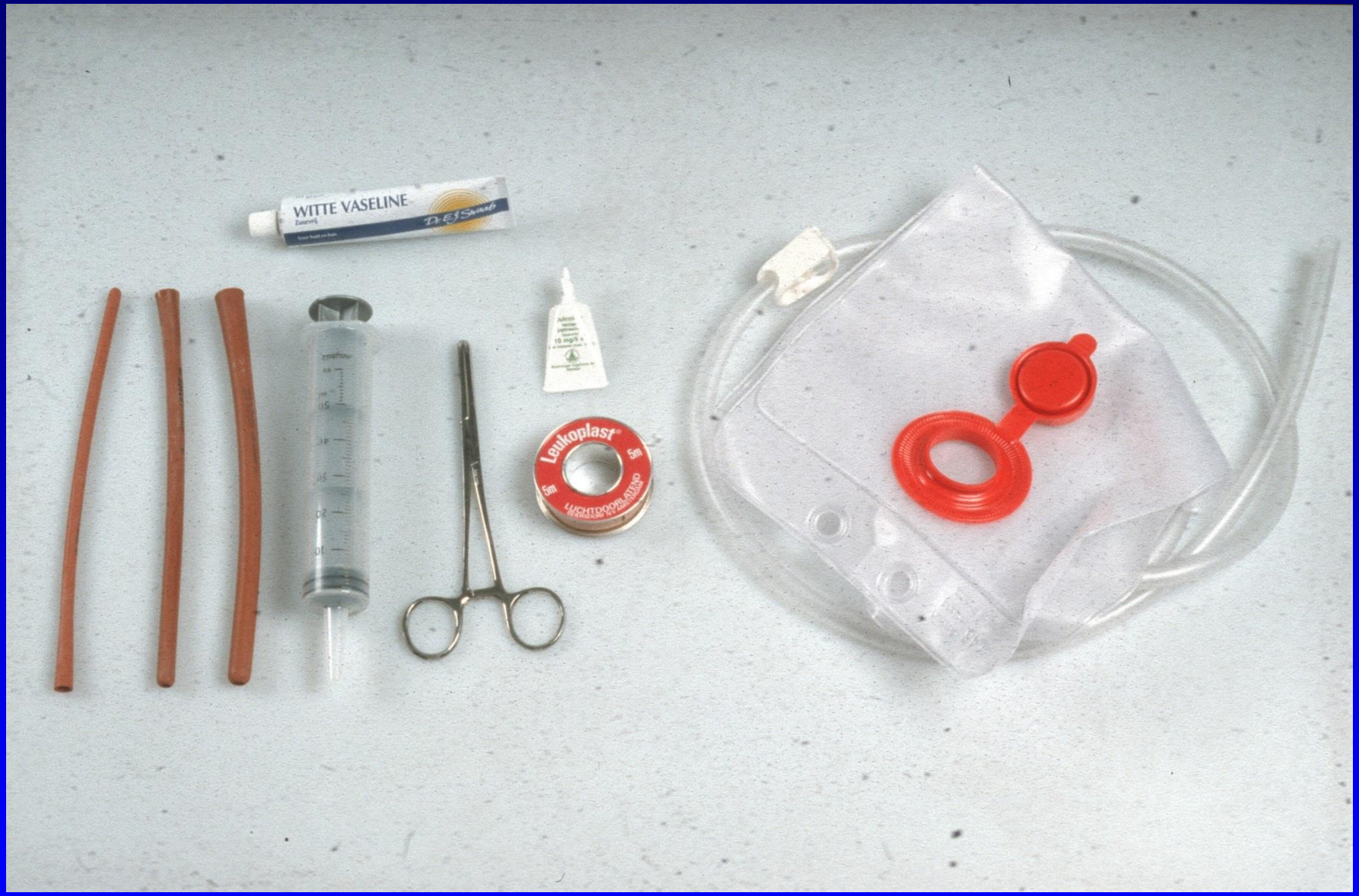


2 severe obstipated children with huge fecaloma’s



12-year-old constipated girl with a Barr score of 24.

Note the excessive dolichomegacolon on the abdominal plain film.



Instrumentation of barium enema

3-year-old girl with a history of constipation

Note the dilated rectum due to large fecaloma on Barium enema

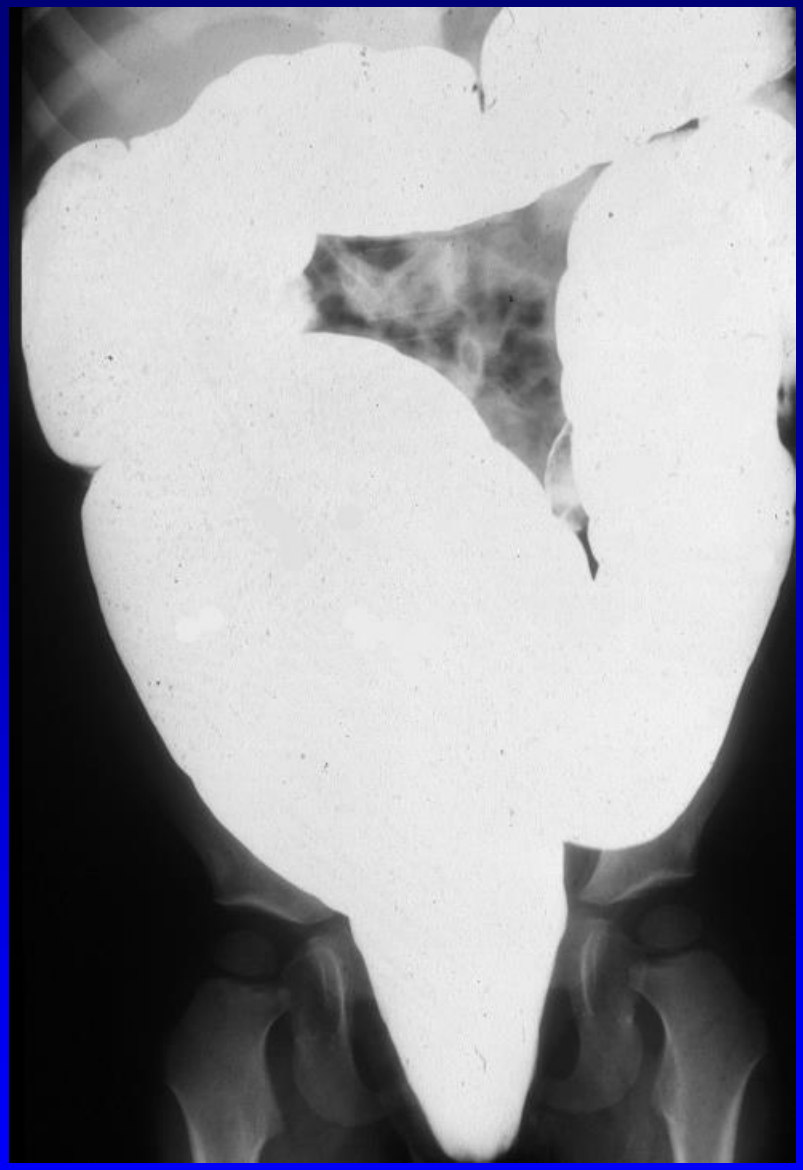
Laxated Barium enema with Bisacodyl in a child with dolichomegacolon

Note the abdominal plain film after defecation



9-year-old boy with constipation evaluated with Barium enema

Note the elongated and dilated colon but the normal defecogram



4-year-old constipated boy with dolichomegacolon

Note the Bisacodyl effect on evacuation by Barium enema

Constipation

An increase of fecal masses for a long period results in the first stage in elongation of the colon followed by dilatation.

The accumulation in the ascending colon causes a partial blockade of intestinal contents in the coecum.

Aim of study

Evaluation of segmental function of colon in relation to abdominal pain and constipation.

Material and method

- 218 abdominal plain films of 150 children with or without constipation or abdominal pain were reviewed.
- 68 males and 82 females, ages between 1-18 years (mean age 8,2 years)

Materials and methods

Evaluation by two experienced radiologists:

- Barr score
- Elongation of intraperitoneal colonic segments
- Large fecaloma’s
- Collection of air in terminal ileum
- Amount of feces in different colonic segments (in cases of Barr score > 10)

Material and method

Patients were categorized in four groups:

I. 77 constipated patients without abdominal pain.

II. 51 patients with abdominal pain and constipation.

III. 17 patients with abdominal pain requested to exclude constipation or other changes as cause of abdominal pain.

IV. 5 patients with abdominal plain film had neither constipation nor abdominal pain.

Groupe I

77 constipated patients without abdominal pain (51%)

Barr score < 10 pts	Barr score 10 – 25 pts	Elongation of colon	Large fecaloma	Aerated ileum
35 pat. (45,5%)	42 pat. (54,5%)	42 pat. (54,5%)	33 pat. (42%)	11 pat. (14%)

Groupe II

51 patients (34%) constipation with abdominal pain

Barr score < 10 pts	Barr score 10 – 25 pts	Elongation of colon	Large fecaloma	Aerated ileum
31 pat. (61%)	20 pat. (39%)	19 pat. (37%)	26 pat. (51%)	18 pat. (35%)

Groupe II

51 patients (34%)
constipation with
abdominal pain

Barr score < 10 pts	Barr score 10 – 25 pts	Elongation of colon	Large fecaloma	Aerated ileum
31 pat. (61%)	20 pat. (39%)	19 pat. (37%)	26 pat. (51%)	18 pat. (35%)

Groupe III

17 patients (11%) abdominal pain without constipation

Barr score < 10 pts	Barr score 10 – 25 pts	Elongation of colon	Large fecaloma	Aerated ileum
9 pat. (53%)	8 pat. (47%)	7 pat. (41%)	9 pat. (53%)	1 pat. (6%)

Groupe IV

5 patients (3%) with no medical history of constipation or abdominal pain

Barr score < 10 pts	Barr score 10 – 25 pts	Elongation of colon	Large fecaloma	Aerated ileum
0 pat. (0%)	0 pat. (0%)	1 pat. (20%)	1 pat. (20%)	1 pat. (20%)

Barr score 10 or more in a total of 150 patients: 75 patients (50%)

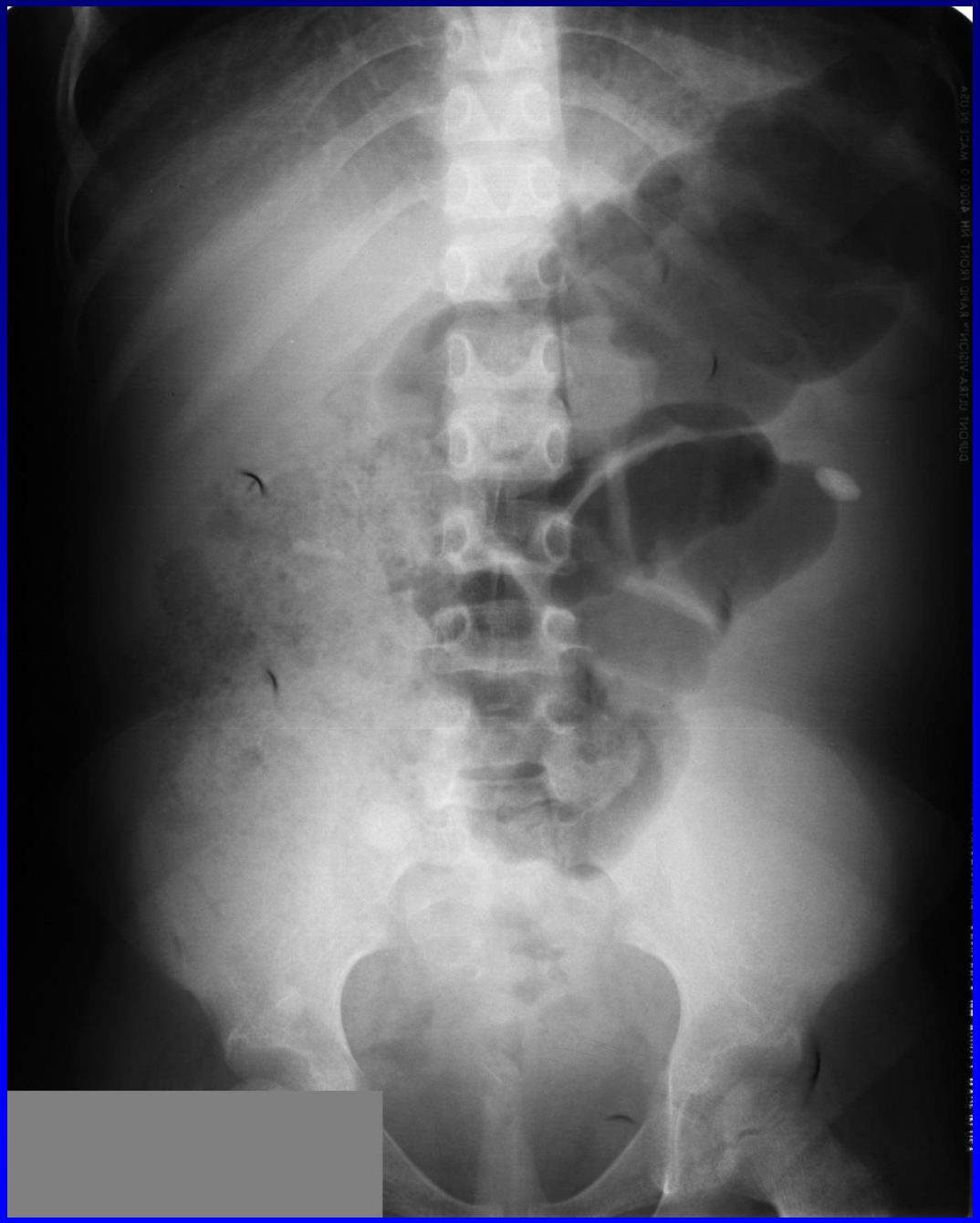
Analysis of fecal masses in different colonic segments.

- Large amount ascendens colon 75 %
- Moderate amount transverse colon 41 %
- Little to moderate amount descendens colon 64 %
- Large amount rectum 63 %

Classical left-colon syndrome with small colon descendens in a neonate.

8-year-old boy, constipated.

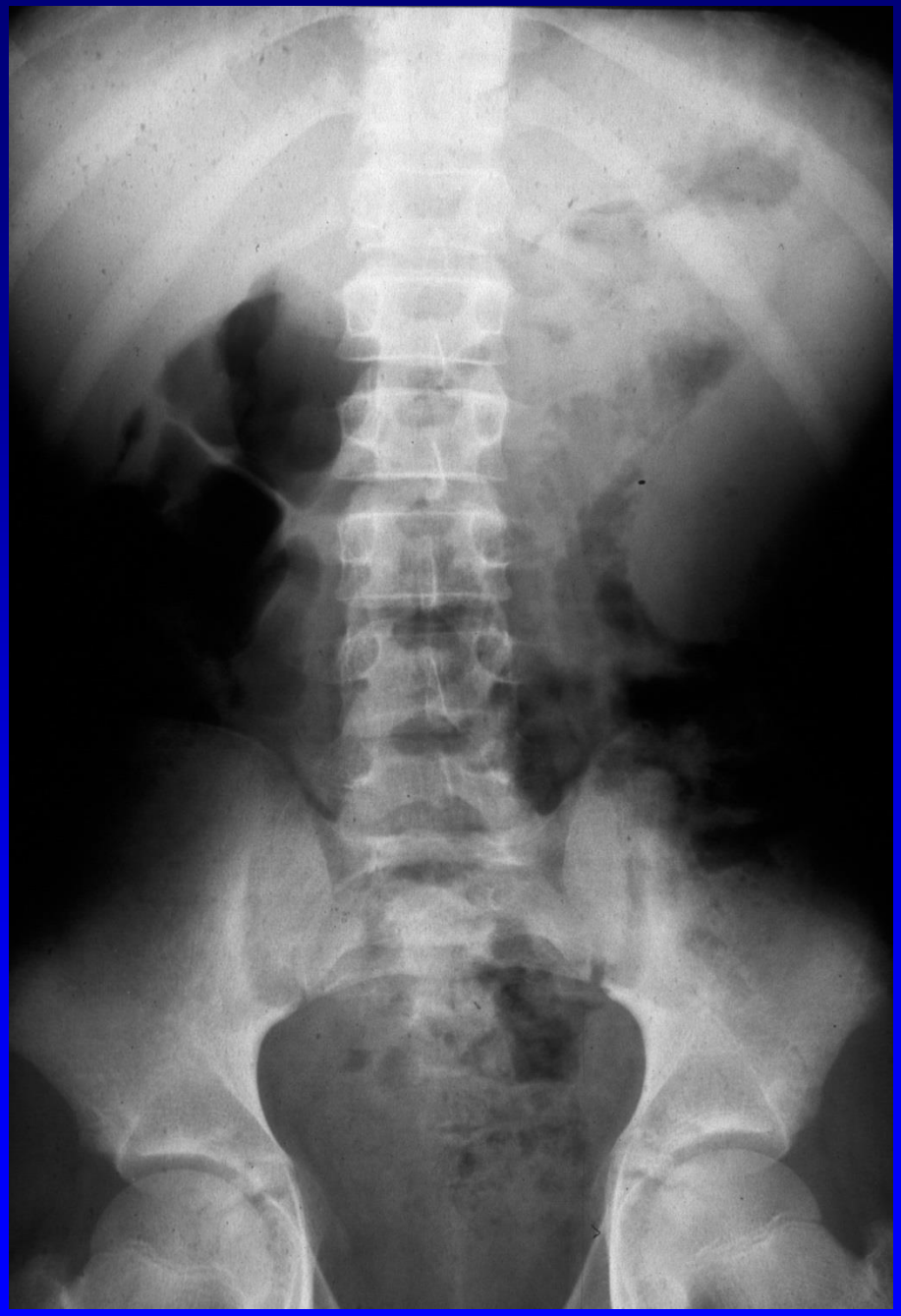
Note the elongated left colon flexure and there is no fecal impaction in descendens colon.



5-year-old girl with clinical symptoms of constipation and abdominal pain.

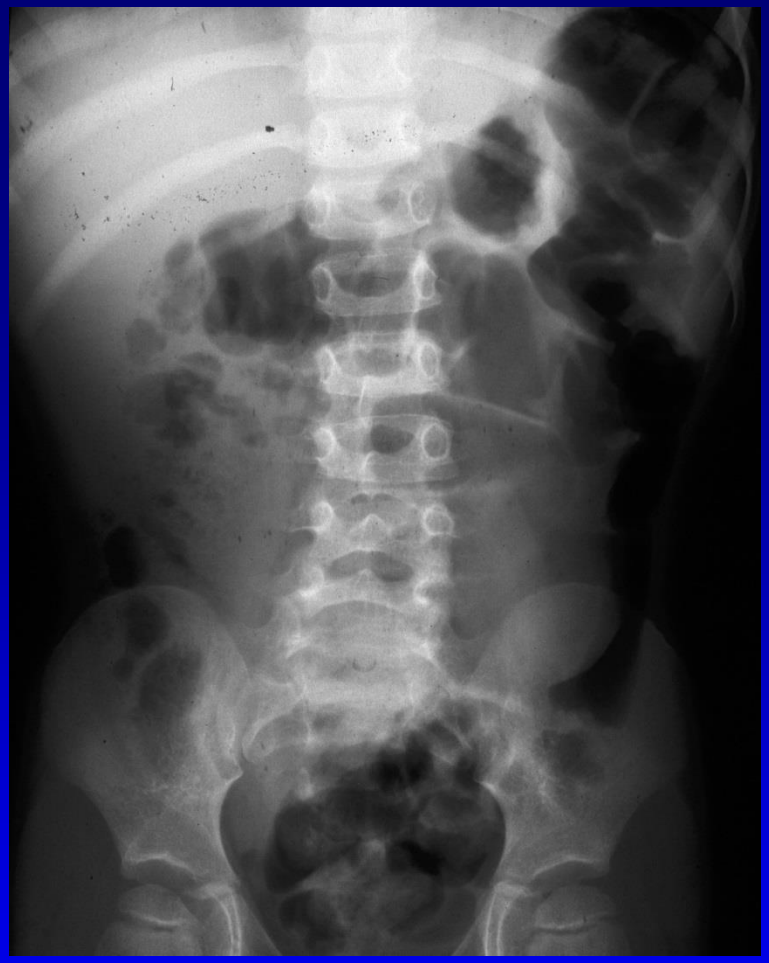
Barr score: 13

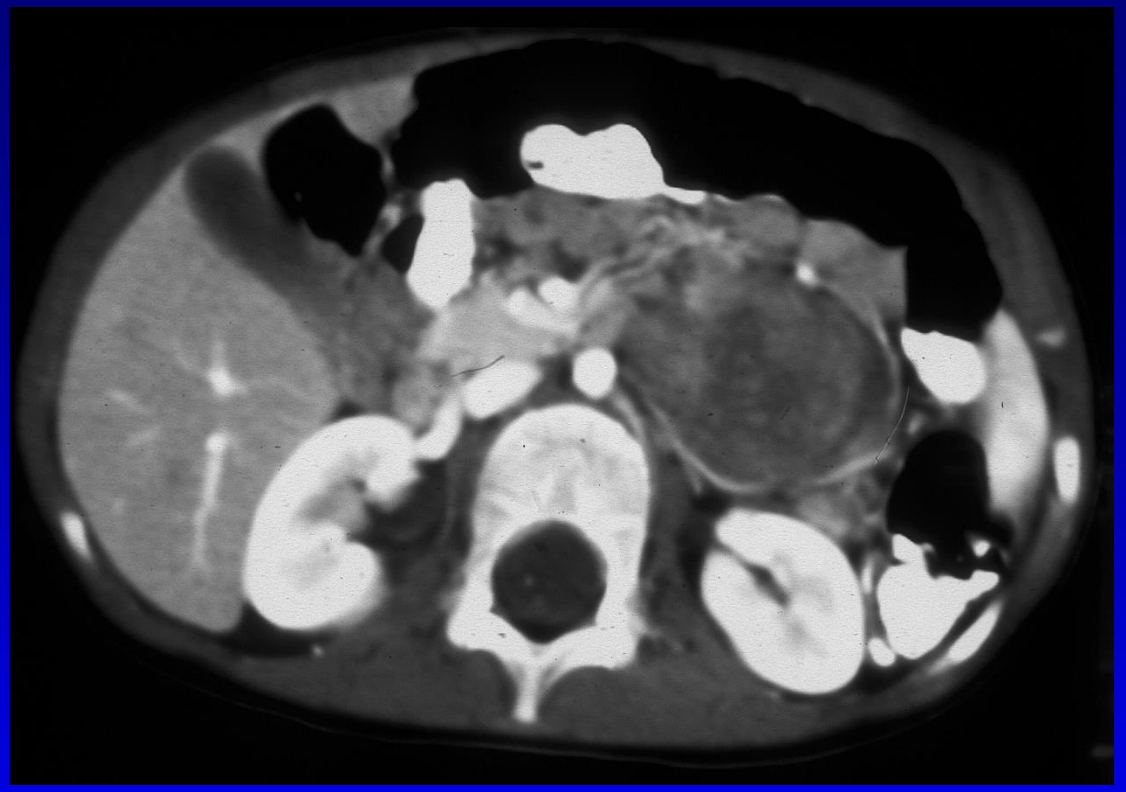
Note the dilated ileum in the right lower quadrant



12-year-old boy (cystic fibrosis) with left-sided abdominal pain.

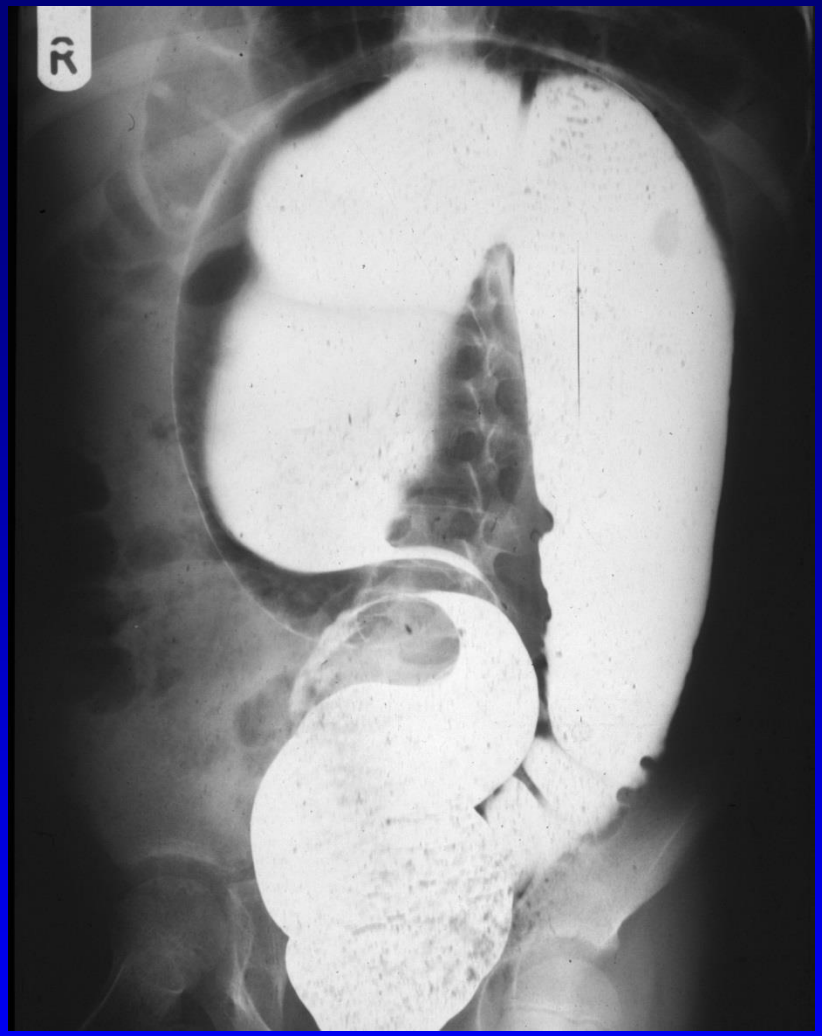
Note the splenomegaly as a cause of abdominal pain, constipation is excluded.



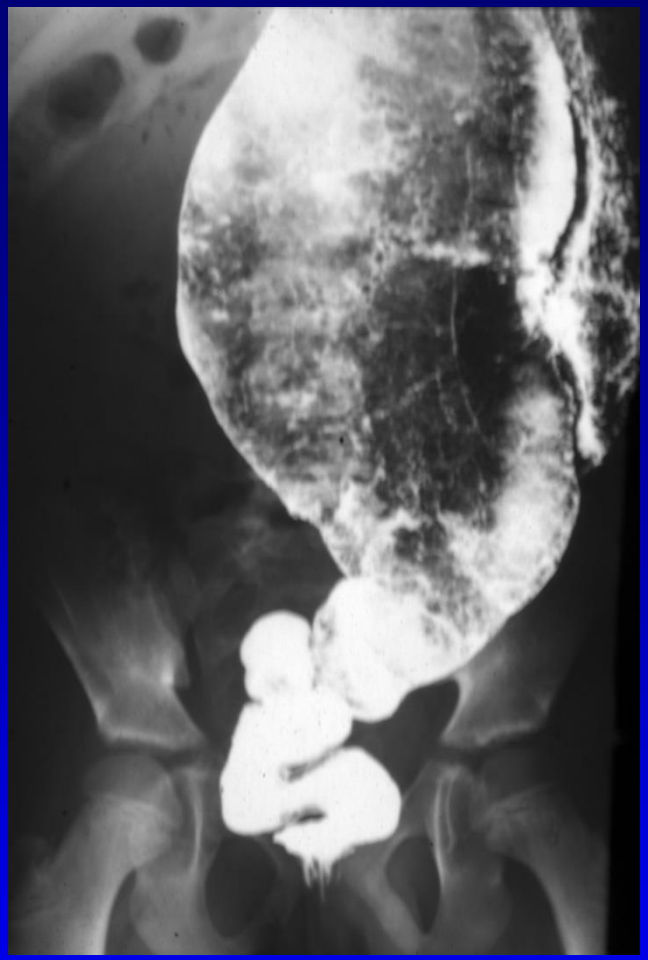


3-year-old girl with a history of constipation.

Note only the elongation of the left colon flexure without fecal impaction. See also the left paravertebral mass (diagnosed as ganglioneurinoma).



Volvulus of sigmoid by chronic constipated child



10-year-old boy with a history of constipation diagnosed as Hirschsprung disease in Teheran and operated in Rotterdam.

2,5-year-old boy severely constipated.

Note the dilated rectum occupied by a fecaloma on Barium enema.

6 months old boy after correction of anorectal malformation

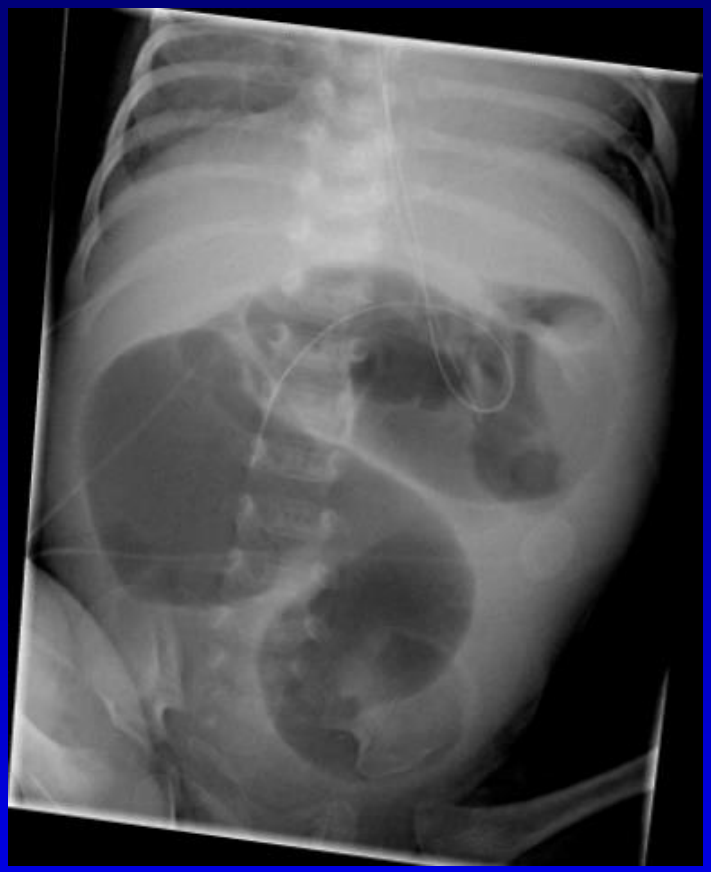
Note the large fecaloma in rectosigmoid region

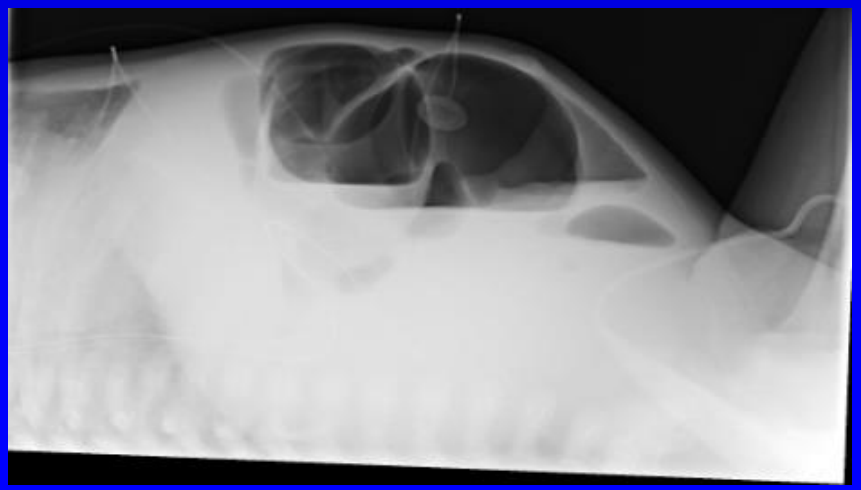
Conclusions

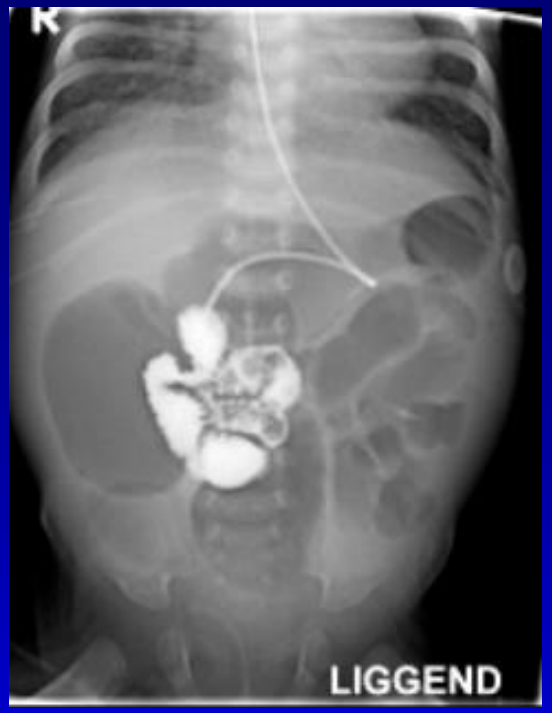
- Elongation of intraperitoneal segments of colon is a valuable sign on abdominal plain film for the diagnosis of constipation with or without fecal impaction.
- An aerated terminal ileum found in 35 % of obstipated children with abdominal pain, can be interpretated as hyperperistaltism which is probably the cause of the abdominal pain.
- The little or moderate fecal impaction in the descending colon is an argument for higher peristaltic activity of this segment.

Conclusions

- An abdominal plain film without additional medical history and physical examination is not sufficient for the diagnosis of constipation.
- The severity of constipation can be recognized on abdominal plain film or Barium enema.
- Laxated Barium enema (Bisacodyl) is an useful technique for functional and anatomic evaluation of obstipated colon.



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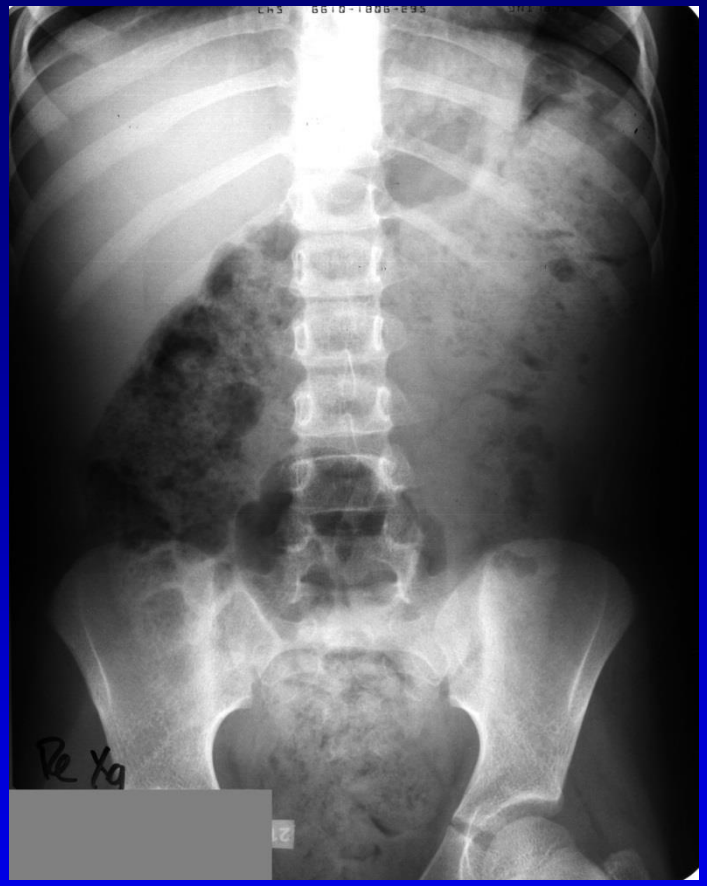

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